Oklahoma
School Testing Program / College- and Career-Readiness Assessment

Grades 3–8, 11

2022–23 Technical Report

Part I—Technical Report through Appendix L

Prepared by Cognia and

the Oklahoma Department of Education

Acknowledgments

The following individuals from the *Oklahoma State Department of Education Office of Assessments* are recognized for their dedication and contribution to the work being reported:

- Catherine Boomer, Program Director, State Assessments
- Eric Jones, Program Manager, State Assessments
- Samantha Sheppard, Project Manager, Science Assessments

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CHAPTER 1. INTRODUCTION TO THE OSTP/CCRA

1.1 Purpose and Uses of the Oklahoma School Testing Program

The Oklahoma School Testing Program (OSTP) assessments are state-mandated, criterion-referenced tests that measure student proficiency in specific content areas. Each test measures the student's knowledge relative to the Oklahoma Academic Standards (OAS)—Oklahoma's content standards for public schools (Appendix A). OSTP assessments are also used for state and federal accountability and reporting. In spring 2023, the OSTP assessments were administered to all eligible students in grades 3–8 and grade 11. The OSTP included mathematics and English language arts (ELA) for grades 3–8 and science for grades 5 and 8. The OSTP also included the College- and Career-Readiness Assessment (CCRA) in science and U.S. history for grade 11. Test forms included operational tests (OP), breach forms (replacement forms used in cases of large-scale security breaches or cheating), Braille forms, and large-print forms, which were administered when such accommodations were needed. Spanish forms were also available online.

The Oklahoma State Department of Education (SDE) contracted Cognia to develop and administer the OSTP.

1.2 Intended OSTP and CCRA Score Interpretations and Uses

The OSTP is designed, developed, and implemented to support six primary intended score interpretations and uses. All are described in the following sections. Appendix B provides a glossary of commonly used assessment terms found throughout the remainder of this report.

1.2.1 Primary Intended OSTP and CCRA Score Interpretations

OSTP scores provide reliable and valid information about student knowledge relative to the Oklahoma Academic Standards (OAS) in grade-level mathematics and English language arts for students in grades 3–8 and 11, science for students in grades 5, 8, and 11, and U.S. history for students in grade 11.

CCRA scores provide reliable and valid information about student knowledge in science and U.S. history predictive of college- and career-readiness for students in grade 11.

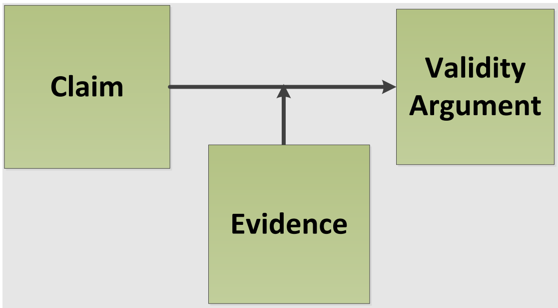
1.2.2 Primary Intended OSTP and CCRA Score Uses

- OSTP and CCRA scores provide instructionally useful information to teachers and students with appropriate detail and timely reporting.
- Teachers can use OSTP and CCRA scores to support future curricular planning and identifying instructional needs within student subgroups.
- Parents and students can use OSTP and CCRA scores to monitor academic achievement and progress toward college- and career-readiness.
- The state and districts can use OSTP and CCRA scores to support evaluation and enhancement of curricula and programs.
- The state uses OSTP and CCRA scores for comparison to national assessments such as NAEP and ACT.
- The OSTP and CCRA meet reporting requirements set by federal and state governments for their use in making accountability decisions.
- OSTP and CCRA scores can be used as a point-in-time indicator of student knowledge, skills, and abilities of the Oklahoma Academic Standards.

1.3 Validity Arguments for the OSTP and CCRA

This technical report describes several procedural and psychometric processes of the OSTP and CCRA. These processes contribute to the accumulation of validity evidence supporting the score interpretations that, in turn, support the intended uses of the OSTP and CCRA assessments. Because tests themselves are only validated in terms of score interpretability for their intended uses, this report presents gathered evidence of the validity of the intended interpretations and uses of the OSTP and CCRA test scores (AERA, APA, & NCME, 2014, p. 11). Each chapter in this report contributes important information about the OSTP and CCRA: test design and development, test administration, scoring, reliability, performance levels, and reporting. The information to support validity arguments for intended OSTP and CCRA score interpretations and uses, summarized in the last section of each chapter, and then compiled and fully summarized in Chapter 10, is formed as claims: elements that underlie the interpretations and uses articulated within the validity argument. Strength of the validity argument is established by providing evidence supporting each of these claims. The logic of the validity argument structure is shown in Figure 1-1.

Figure 1-1. Logic of Validity Arguments for Tests



The phrase “intended score interpretations for uses” appears several times in the *Standards for Educational and Psychological Testing* (AERA et al., 2014) and is the core of the field’s views on validity and validation. For the OSTP and CCRA (and assessment programs more generally), the phrase refers broadly to test scores (e.g., total test scale scores, aggregations of test scores, the percentage of students at or above a given level), and other test performance information elements (e.g., the definition of a given level in the performance level descriptors). The *Standards for Educational and Psychological Testing* also provides a framework for describing sources of evidence that should be considered when constructing a validity argument. These sources include evidence based on the following five areas: test content, response processes, internal structure, relationship to other variables, and consequences of testing. These sources address different aspects of supporting evidence for validity arguments but are not considered distinct types of validity. Instead, each contributes to a body of evidence about the individual validity argument and overall arguments for the validity of intended score interpretations and uses. Moreover, these sources represent only a partial list of potential sources of evidence from the OSTP and CCRA design, development, test administration, analysis, and reporting processes that are relevant to the overall validity arguments for intended interpretations and uses of the OSTP and CCRA scores and related information.

Validity arguments for the OSTP and CCRA are crafted to not just provide evidence that all steps in the test design, development, and implementation process are done correctly, but that they are working together to ensure that the resulting scores validly support intended interpretations and uses. The arguments and the logical inferential steps they provide are structured based upon the framework developed by Chappelle (2020) and can be summarized as follows:

1.1 Description Inference: Items sampling from the domain is appropriate such that high-quality forms can be produced. (Domain to Item)

1.2 Evaluation Inference: Form sampling from the items appropriate such that observed scores reflective of the domain can be produced. (Item to Form)

1.3 Generalization Inference: Observed scores from individual forms are reliable such that they are reflective of expected scores across forms. (Form to Score) *

1.4 Explanation Inference: Expected scores are associated with classification cuts such that classification decisions are interpretable. (Score to Classification)

1.5 Extrapolation Inference: Classification decisions are accurate such that intended interpretations correspond to other valid metrics of knowledge, skills, and ability. (Classification to Interpretation)

1.6–1.10 Utilization Inferences: Interpretations of scores and classifications are used as intended and only in ways considered appropriate and fair. (Interpretation to Use)

Note: It is important for the gathering of information in support of the Generalization Inference (1.3) to define what is meant by the term “form” in this context. A test form, in the context of the validity argument, is not just the set of items on which the score is based, but the structure of the exam in terms of all elements that can affect an individual’s performance. This can include, among other things, the raters scoring an exam, the occasion on which the exam is administered, and the setting in which it is administered. Generalization from observed to expected score is optimized when all sources of potential variability of test scores are identified and accounted for such that observed scores maximally reflect a student’s ability and not the influence of unwanted sources of variance.

1.4 Excerpts from the Assessment System and Assessment Requirements Report

For the full report, go to: Assessment System and Assessment Requirements Full Report.

1.4.1 From the Executive Summary

The Oklahoma Legislature directed the State Board of Education (OSBE) to evaluate Oklahoma’s current state assessment system and make recommendations for its future. As a result, the Oklahoma State Department of Education (OSDE) held regional meetings across the state and convened the Oklahoma Assessment and Accountability Task Force to deliberate over many technical, policy, and practical issues associated with implementing an improved assessment system. The 95 Task Force members met four times between August 4 and October 18, 2016. The results of those deliberations were presented in the form of recommendations from the OSDE to the Oklahoma State Board of Education (OSBE).

1.4.2 House Bill 3218

In June 2016, Oklahoma Governor Mary Fallin signed House Bill 3218 (HB 3218), which relates to the adoption of a statewide system of student assessments. HB 3218 required the OSBE to study and develop assessment recommendations for the statewide assessment system. The House Bill specifically tasks the OSBE, in consultation with representatives from the Oklahoma State Regents for Higher Education, the Commission for Educational Quality and Accountability, the State Board of Career and

Technology Education, and the Secretary of Education and Workforce Development, to study and develop assessment requirements. Additionally, HB 3218 requires the State Board to address accountability requirements under ESSA, which is presented in a separate report for accountability. This report focuses specifically on the assessment requirements of HB 3218, which include the degree to which the Oklahoma assessment:

- aligns to the Oklahoma Academic Standards (OAS);
- provides a measure of comparability among other states;
- yields both norm-referenced and criterion-referenced scores;
- has a track record of statistical reliability and accuracy; and
- provides a measure of future academic performance for assessments administered in high school.

1.4.3 Collecting Feedback from Regional Engage Oklahoma Meetings and the Oklahoma Task Force

Prior to convening Oklahoma's Assessment and Accountability Task Force, the OSDE held regional meetings in Broken Arrow, Sallisaw, Durant, Edmond, Woodward, and Lawton. These meetings yielded responses to various questions addressing the desired purposes and types of assessments. This regional feedback was incorporated in the discussions with the Oklahoma Assessment and Accountability Task Force. The Task Force included 95 members who represented districts across the state, educators, parents, business and community leaders, tribal leaders, and lawmakers. Additionally, members from the Oklahoma State Regents for Higher Education, the Commission for Educational Quality and Accountability, the State Board of Career and Technology Education, and the Secretary of Education and Workforce Development were also represented on the Task Force. For a complete list of Task Force members, refer to Appendix A of the Assessment System and Assessment Requirements Full Report.

On four occasions, the members of the Task Force met with experts in assessment and accountability to consider each of the study requirements and provide feedback to improve the state's assessment and accountability systems. Two of those experts also served as the primary facilitators of the Task Force: Juan D'Brot, Ph.D., from the National Center for the Improvement of Educational Assessment (NCIEA) and Marianne Perie, Ph.D., from the University of Kansas' Achievement and Assessment Institute. These meetings occurred on August 4 and 5, September 19, and October 18, 2016. At each meeting, the Task Force discussed the elements of HB 3218, research and best practices in assessment and accountability development, and feedback addressing the requirements of HB 3218. This feedback was subsequently incorporated into OSDE's recommendations to the OSBE.

1.4.4 Key Summative Assessment Recommendations

Oklahoma's Assessment and Accountability Task Force and the OSDE recognized that assessment design is a case of optimization under constraints[1]. In other words, there may be many desirable purposes, uses, and goals for assessment, but they may be in conflict. Any given assessment can serve only a limited number of purposes well. Finally, assessments always have some type of restrictions (e.g., legislative requirements, time, and cost) that must be weighed in finalizing recommendations. Therefore, a critical early activity of the Task Force was to identify and prioritize desired characteristics and intended uses for a new Oklahoma statewide summative assessment for OSDE to consider.

Upon consolidating the uses and characteristics, the facilitators returned to the Task Force with draft goals for the assessment system. The Task Force provided revisions and input to these goals. Facilitators then presented the final goals to the Task Force. Once goals were defined, the desired uses and characteristics were clarified within the context of the Task Force's goals. The members of the Task Force agreed to the following goals for OSDE to consider for Oklahoma's assessment system:

1. Provide instructionally useful information to teachers and students with appropriate detail (i.e., differing grain sizes for different stakeholder groups) and timely reporting;
2. Provide clear and accurate information to parents and students regarding achievement and progress toward college- and career-readiness using an assessment that is meaningful to students;
3. Provide meaningful information to support evaluation and enhancement of curriculum and programs; and
4. Provide information to appropriately support federal and state accountability decisions.

Following discussion of the Oklahoma assessment system's goals, the Task Force worked with the facilitators to articulate feedback for the grade 3–8 and high school statewide summative assessments. This feedback was subsequently incorporated into the OSDE's recommendations to the State Board. These recommendations are separated into those for grades 3–8 and those for high school.

1.4.5 Recommendations for Assessments in Grades 3–8

The feedback provided by the Task Force and subsequently incorporated by the OSDE for grades 3–8 can be grouped into four categories: Content Alignment and Timing, Intended Purpose and Use, Score Interpretation, and Reporting and State Comparability. The OSDE's recommendations are as follows:

1 *See Braun (in press).*

1.4.5.1 CONTENT ALIGNMENT AND TIMING

- Maintain the focus of the new assessments on the Oklahoma Academic Standards (OAS) and continue to administer them at the end of grades 3 through 8; and
- Include an adequate assessment of writing to support coverage of the Oklahoma English Language Arts (ELA) standards.

1.4.5.2 INTENDED PURPOSE AND USE

- Ensure the assessment can support calculating growth for students in at least grades 4–8 and explore the potential of expanding growth to high school depending on the defensibility of the link between grade 8 and high school assessments and intended interpretations; and
- Ensure the assessment demonstrates sufficient technical quality to support the intended purposes and current uses of student accountability (e.g., promotion in grade 3 based on reading).

1.4.5.3 SCORE INTERPRETATION

- Provide a measure of performance indicative of being on track to college- and career-readiness, which can inform preparation for the Oklahoma high school assessment;
- Support criterion-referenced interpretations (i.e., performance against the OAS) and report individual claims including, but not limited to, scale score[2], Lexile[3], Quantile[4], content cluster[5], and growth[6] performance; and
- Provide normative information to help contextualize the performance of students statewide, such as intra-state percentiles.

1.4.5.4 REPORTING AND STATE COMPARABILITY

- Support aggregate reporting on claims including, but not limited to, scale score, Lexile, Quantile, content cluster, and growth performance at appropriate levels of grain size (e.g., grade, subgroup, teacher, building/district administrator, state); and

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2 A scale score (or scaled scores) is a raw score that has been transformed through a customized set of mathematical procedures (i.e., scaling and equating) to account for differences in difficulty across multiple forms and to enable the score to represent the same level of difficulty from one year to the next.

3 A score developed by MetaMetrics that represents either the difficulty of a text or a student's reading ability level.

4 A score developed by MetaMetrics that represents a forecast of or a measure of a student's ability to successfully work with certain mathematics skills and concepts.

5 A content cluster may be a group of items that measures a similar concept in a content area on a given test.

6 Growth can be conceptualized as the academic performance of the same student over two or more points in time. This is different from improvement, which is change in performance over time as groups of students matriculate or when comparing the same collection of students across time (e.g., grade 3 students in 2016 and grade 3 students in 2015).

- Utilize the existing National Assessment of Educational Progress (NAEP) data to establish statewide comparisons at grades 4 and 8. NAEP data should also be used during standard-setting[7] activities to ensure the CCRA cut score is set using national and other state data.

1.4.6 Recommendations for Assessments in High School

The feedback provided by the Task Force and subsequently incorporated by the OSDE can be grouped into four categories: Content Alignment and Timing, Intended Purpose and Use, Score Interpretation, and Reporting and State Comparability. The OSDE's recommendations are presented below.

1.4.6.1 CONTENT ALIGNMENT AND TIMING

- Use a commercial off-the-shelf college-readiness assessment (e.g., SAT, ACT) in lieu of state-developed high school assessments in ELA and mathematics; and
- Consider how assessments measuring college readiness can still adequately address assessment peer review requirements, including, but not limited to, alignment.

1.4.6.2 INTENDED PURPOSE AND USE

- Ensure the assessment demonstrates sufficient technical quality to support the need for multiple and differing uses of assessment results;
- Explore the possibility of linking college-readiness scores to information of value to students and educators (e.g., readiness for postsecondary, prediction of STEM readiness, remediation risk);
- Maintain a focus on rigorous expectations of college- and career-readiness; and
- Ensure that all students in the state of Oklahoma can be provided with a reliable, valid, and fair score, regardless of accommodations provided or the amount of time needed for a student to take the test.

1.4.6.3 SCORE INTERPRETATION

- Support criterion-referenced interpretations (i.e., performance against the OAS) and report individual claims appropriate for high school students;
- Provide evidence to support claims of college- and career-readiness. These claims should be (1) supported using theoretically related data in standard-setting activities (e.g., measures of college readiness and other nationally available data) and (2) validated empirically using available postsecondary data linking to performance on the college- readiness assessment; and
- Provide normative information to help contextualize the performance of students statewide, such as intra-state percentiles.

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7 The process through which subject matter experts set performance standards, or cut scores, on an assessment or series of assessments

1.4.6.4 REPORTING AND STATE COMPARABILITY

- Support aggregate reporting on claims at appropriate levels of grain size for high school assessments (e.g., grade, subgroup, teacher, building/district administrator, state); and
- Support the ability to provide norm-referenced information based on other states that may be administering the same college-ready assessments, as long as unreasonable administration constraints do not inhibit those comparisons.

1.4.7 Key Considerations for Summative Assessment Recommendations

While the Task Force addressed a targeted set of issues stemming from HB 3218, the facilitators were intentional in informing Task Force members of three key areas that must be considered in large-scale assessment development and/or selection:

1. **Technical quality**, which serves to ensure the assessment is reliable, valid for its intended use, and fair for all students;
2. **Peer Review**, which serves as a means to present evidence of technical quality; and
3. **Accountability**, which forces the issue of intended purpose and use.

In the time allotted, the Task Force was not able to consider all the constraints and requirements necessary to fully expand upon their feedback to the OSDE. The facilitators worked to inform the Task Force that the desired purposes and uses reflected in their feedback would be optimized to the greatest extent possible in light of technical- and policy-based constraints. As historically demonstrated, we can expect that the OSDE will continue to prioritize fairness, equity, reliability, and validity as the agency moves forward in maximizing the efficiency of Oklahoma's assessment system. A more detailed explanation of the context and considerations for adopting OSDE's recommendations is provided in the full report.

1.5 MEETING RESULTS

The conversations that occurred among Task Force members, assessment and accountability experts, and the OSDE resulted in a cohesive set of goals for an aligned comprehensive assessment system that includes state and locally selected assessments designed to meet a variety of purposes and uses. These goals are listed on page 9 of the full report (Assessment System and Assessment Requirements Full Report). The feedback provided by the Task Force and the recommendations presented by the OSDE, however, are focused only on Oklahoma's statewide summative assessments.

While the OSDE's recommendations can be grouped into the four categories of (1) Content Alignment and Timing, (2) Intended Purpose and Use, (3) Score Interpretation, and (4) Reporting and State Comparability, it is important to understand how these recommendations address the overarching requirements outlined in HB 3218.

1.5.1 Alignment to the OAS

Summative assessments used for accountability are required to undergo peer review to ensure the assessments are reliable, fair, and valid for their intended uses. One such use is to measure student progress against Oklahoma's college- and career-ready standards. The Task Force and OSDE believe it is of vital importance that students have the opportunity to demonstrate their mastery of the state's standards. However, there is also a perceived need to increase the relevance of assessments, especially in high school. The Task Force and OSDE believe a state-developed set of assessments for grades 3–8 and a college-readiness assessment in high school would best support teaching and learning efforts in the state.

1.5.1.1 COMPARABILITY WITH OTHER STATES

Throughout feedback sessions, Task Force meetings, and OSDE deliberations, the ability to compare Oklahoma performance with that of other states was considered a valuable feature of the assessment system. However, there are tensions among administration constraints, test design requirements, and the strength of the comparisons that may make direct comparisons difficult. Currently, Oklahoma can make comparisons using statewide aggregated data (e.g., NAEP scores in grades 4 and 8, college-readiness scores in grade 11) but is unable to support comparisons at each grade. Task Force feedback and OSDE recommendations suggest leveraging available national comparison data beyond its current use and incorporating it into assessment standard-setting activities. This will allow the OSDE and its stakeholders to determine college- and career-readiness cut scores on the assessment that reflect nationally competitive expectations.

1.5.1.2 NORM-REFERENCED AND CRITERION-REFERENCED SCORES

Based on Task Force feedback, the OSDE confirmed that reported information supporting criterion-referenced interpretations (e.g., scale score, Lexile, Quantile, content cluster, and growth performance) are valuable and should continue to be provided in meaningful and accessible ways. Additional feedback and OSDE's recommendations note that norm-referenced interpretations would enhance the value of statewide summative assessment results by contextualizing student learning and performance. By working with a prospective vendor, the OSDE should be able to supplement the information provided to stakeholders with meaningful normative data based on the performance of other Oklahoma students.

1.5.1.3 STATISTICAL RELIABILITY AND ACCURACY

The technical quality of an assessment is an absolute requirement for tests intended to communicate student grade-level mastery and for use in accountability. The *Standards for Educational and*

Psychological Testing (AERA et al., 2014) present critical issues that test developers and test administrators must consider during assessment design, development, and administration. While custom state-developed assessments require field testing and operational administration to accumulate evidence of statistical reliability and accuracy, the quality of the processes used to develop those assessments can be easily demonstrated by prospective vendors and the state. In contrast, off-the-shelf assessments should already have evidence of this, and the state can generalize their technical quality if the assessment is given under the conditions defined for the assessment. Thus, the technical quality of an assessment is a key factor in ensuring assessment results are reliable, valid, and fair.

1.5.1.4 FUTURE ACADEMIC PERFORMANCE FOR ASSESSMENTS ADMINISTERED IN HIGH SCHOOL

As noted earlier in this report, there is a clear value in high school assessment results being able to predict future academic performance. Based on OSDE's recommendation of using a college-readiness assessment in high school, the state and its prospective vendor should be able to determine the probability of success in early post-secondary academics based on high school assessments.

However, the state and its prospective vendor should amass additional Oklahoma-specific evidence that strengthens the claims of likely postsecondary success. This can be supported both through standard-setting activities and empirical analyses that examine high school performance based on postsecondary success. The recommendations made to the OSDE in the previous section offer relatively fine-grain suggestions that can be interpreted through the lens of the HB 3218 requirements. These recommendations also reflect the Task Force's awareness of the three areas of technical quality, peer review requirements, and accountability uses, which were addressed throughout deliberations. Through regional meetings and in-depth conversations with the Task Force, the OSDE was able to critically examine the feedback provided and present recommendations to support a strong statewide summative assessment that examines the requirements of HB 3218 and seeks to maximize the efficiency of the Oklahoma assessment system in support of preparing students for college and careers.

1.5.1.5 ISSUES IN SUBSCORE REPORTING

Subscores serve as achievement reports on subsets of the full set of knowledge and skills represented by a total score. For example, many ELA summative assessments produce a total score for ELA, subscores for at least reading and writing, and often finer grained subscores for topics such as informational and literary reading. Similarly, a mathematics test typically yields an overall mathematics score and potential subscores in topics such as numbers and operations, algebraic reasoning, measurement and geometry, and data and probability. One of the greatest challenges in current large-scale summative assessment design is to create tests that are no longer than necessary to produce a very reliable total score while yielding adequately reliable subscores to help educators and others gain more instructionally relevant information than gleaned from just the total score.

Unfortunately, there is a little-known aspect of educational measurement (outside of measurement professionals) that large-scale tests are generally designed to report scores on a “unidimensional” scale. This means the grade 5 mathematics test, for example, is designed to report overall mathematics performance, but not to tease out differences in performance on things like geometry or algebra, because the only questions that survive the statistical review processes are those that relate strongly to the total score of overall mathematics. If the test were designed to include questions that better distinguish among potential subscores, the reliability (consistency) of the total score would be diminished. There are “multidimensional” procedures that can be employed to potentially produce reliable and valid subscores, but these are much more expensive and complicated to implement to ensure the comparability of these subscores and the total score across years. The National Assessment of Educational Progress (NAEP) is the one example of a well-known assessment designed to produce meaningful results at the subscore level, but NAEP has huge samples to work with and more financial resources and psychometric capacity at its disposal than any state assessment. In other words, it is not realistic at this time to consider moving away from a unidimensional framework for Oklahoma’s next statewide summative assessment, which means the subscores will unfortunately be much less reliable estimates of the total score than useful content-based reports. This is true for essentially all commercially available interim assessments as well, so despite user reports that they like assessment X or Y because it produces fine grain subscores useful for instructional planning, any differences in subscores are likely due to error rather than anything educationally meaningful. Neither summative assessments nor comprehensive-blueprint interim assessments are designed to guide detailed instructional planning; their design and structure supports aggregate and program level evaluations.

Despite this widely held knowledge by measurement professionals, every state assessment designer knows they need to produce scores beyond the total score; otherwise, stakeholders would complain they are not getting enough from the assessment. Producing very reliable total scores is critical for accountability uses of statewide assessments and, all things being equal, the reliability is related to the number of questions (or score points) on a test.

Therefore, most measurement experts recommend having at least 10 score points for each subscore to achieve at least some minimal level of reliability, so statewide summative tests tend to get longer to accommodate subscore reporting. Therefore, one way to lessen the time required on the statewide summative assessment is to focus the summative assessment on reporting the total score and use optional modules for districts that would like more detailed and accurate information about particular aspects of the content domain.

CHAPTER 2. OVERVIEW OF THE OSTP AND CCRA

2.1 History of the Oklahoma School Testing Program

On July 1, 2016, a new Oklahoma legislative bill HB 3218 went into effect that made several changes to Oklahoma's student assessment and accountability system, including high school graduation requirements. The most significant change is that it is no longer a state requirement for Oklahoma students to pass End-of-Instruction exams to graduate with a standard high school diploma. HB 3218 directed the Oklahoma State Board of Education (OSBE) to establish a new system of assessments that students who entered grade 9 in 2017–2018 would be required to take to graduate with a standard diploma. The End-of-Instruction (EOI) exams and Achieving Classroom Excellence (ACE) graduation requirements were repealed as of July 1, 2016. During the 2016–17 academic year, students in grade 10 took assessments in ELA, mathematics, and science. Grade 10 assessments were no longer administered. Beginning with the 2017–18 school year, grade 11 students took either the ACT or the SAT and a grade 11 science content assessment to determine college- and career-readiness and high school accountability. In 2019, a grade 11 U.S. history content assessment was also added.

The U.S. history content assessment was field tested in 2019, 2021, and 2022. U.S. history standard setting occurred in June 2022. U.S. history cut scores were approved as of August 2022, and information from that assessment will be included in the technical report for 2023.

In addition, the United States Department of Education Office of Elementary and Secondary Education issued a determination letter based on OSDE's January 2018 Title I Assessment Peer Review submission. According to the October 2018 determination letter issued by Frank T. Brogan, Assistant Secretary for Elementary and Secondary Education, OSDE's assessment system "substantially meets requirements" for OSTP 3–8 reading/language and mathematics and OSTP science general assessments in grades 5 and 8 in accordance with section 1111(b)(1) and (3) of the Elementary and Secondary Education Act (ESEA).

2.2 OSTP and CCRA Participation

The OSTP assessments are administered to all public-school students in grades 3–8 and 11. The OSTP includes mathematics and English language arts (ELA) testing for grades 3–8 and science testing for grades 5 and 8. The OSTP also includes the College- and Career-Readiness Assessment (CCRA) in science and U.S. history for grade 11 students.

CHAPTER 3. TEST CONTENT AND DEVELOPMENT

3.1 GRADES 3–8 OSTP ELA ASSESSMENTS

3.1.1 Develop/Review/Approve Test Blueprints with DOK Percentages

All items on the OSTP ELA tests for grades 3–8 were developed specifically for Oklahoma and are directly aligned to the Oklahoma Academic Standards (OAS). The standards are the basis for the reporting categories developed for each content area and are used to help guide the development of test items. Each item was designed to measure a specific standard and objective. The test blueprints were developed by the SDE, and test specifications were done in collaboration between Cognia, SDE, and Oklahoma educators.

The test blueprints identify the amount of content covered on the tests and are based on the importance and coverage of the OAS in Oklahoma schools. The ideal test blueprints developed by the SDE are provided in Appendix C and at the SDE website: https://sde.ok.gov/assessment-material.

The distribution of emphasis for grades 3–8 ELA content standards is shown in Tables 3-1 and 3-2. As indicated in the tables, the actual distribution of OAS ELA standards fall within the ideal distribution on each OSTP test for all grade levels. The ideal percentage of items aligned to each group of standards can be found in Appendix C.

Table 3-1. Distribution of Emphasis in Terms of Target Percentage of Test by Grade—Grades 3–5 OAS ELA Standards, 2022–23

Standard	Grade 3		Grade 4		Grade 5	
	Ideal Percentage	Actual Percentage	Ideal Percentage	Actual Percentage	Ideal Percentage	Actual Percentage
2: Reading and Writing Process	38—42%	38%	30–34%	30%	30–34%	34%
3: Critical Reading and Writing	12–18%	12%	18–22%	22%	22–26%	22%
4: Vocabulary	22–26%	24%	22–26%	24%	18–22%	18%
5: Language	12–18%	14%	12–18%	12%	12–18%	14%
6: Research	12–18%	12%	12–18%	12%	12–18%	12%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 3-2. Distribution of Emphasis in Terms of Target Percentage of Test by Grade—Grades 6–8 OAS ELA Standards, 2022–23

Standard	Grade 6		Grade 7		Grade 8	
	Ideal Percentage	Actual Percentage	Ideal Percentage	Actual Percentage	Ideal Percentage	Actual Percentage
2: Reading and Writing Process	34–38%	34%	34–38%	34%	24–30%	26%
3: Critical Reading and Writing	18–22%	22%	18–22%	22%	24–30%	30%
4: Vocabulary	18–22%	20%	14–20%	18%	14–20%	20%
5: Language	12–18%	12%	12–18%	12%	12–18%	12%
6: Research	12–18%	12%	12–18%	14%	12–18%	12%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Each item on the OSTP ELA tests for grades 3–8 was assigned a Depth of Knowledge (DOK) level according to the cognitive demand of the item. DOK is not synonymous with difficulty. The DOK level rates the complexity of the mental processing a student must use to answer the question. Items at each DOK level can be found in the Test and Item Specifications documents at https://sde.ok.gov/assessment-material.

DOK 1—RECALL AND REPRODUCTION: This level requires students to recall, observe, question, or represent facts, simple skills, or abilities. It requires only surface understanding of text, often verbatim recall. Level 1 activities include supporting ideas by reference to details in the text; using a dictionary to find meaning; identifying figurative language in a passage; and identifying the correct spelling or meaning of words.

DOK 2—SKILLS AND CONCEPTS: This level requires processing beyond recall and observation; requires both comprehension and subsequent processing of text; and involves ordering and classifying text, as well as identifying patterns, relationships, and main points. Level 2 activities include using context to identify unfamiliar words; predicting logical outcomes; identifying and summarizing main points; applying knowledge of conventions of Standard American English; composing accurate summaries; and making general inferences and predictions for a portion of a text.

DOK 3—STRATEGIC THINKING: This level requires students to go beyond the text; requires students to explain, generalize, and connect ideas; involves inferencing, predicting, elaborating, and summarizing; and requires students to support positions using prior knowledge and to manipulate themes across passages. Level 3 activities include determining the effect of the author's purpose on text elements; summarizing information from multiple sources; critically analyzing literature; composing focused, organized, coherent, and purposeful prose; and making explanatory and descriptive inferences and interpretations across an entire passage.

Tables 3-3 and 3-4 show that for each DOK level, the actual percentages of items on the test mostly fell within the recommended range for each grade level.

Table 3-3. ELA DOK Levels by Grade—Form A, 2022–23

Grade	DOK 1		DOK 2		DOK 3	
	Recommended	Actual	Recommended	Actual	Recommended	Actual
3	15–30%	20%	65–80%	68%	5–10%	12%
4	10–20%	16%	65–75%	72%	5–15%	12%
5	5–15%	16%	70–85%	70%	5–20%	14%
6	5–15%	16%	70–85%	72%	5–20%	12%
7	5–15%	8%	70–85%	78%	5–20%	14%
8	5–10%	10%	60–75%	72%	20–30%	18%

Table 3-4. ELA DOK Levels by Grade—Breach Form, 2022–23

Grade	DOK 1		DOK 2		DOK 3	
	Recommended	Actual	Recommended	Actual	Recommended	Actual
3	15–30%	18%	65–80%	70%	5–10%	12%
4	10–20%	16%	65–75%	68%	5–15%	16%
5	5–15%	18%	70–85%	70%	5–20%	12%
6	5–15%	10%	70–85%	80%	5–20%	10%
7	5–15%	8%	70–85%	74%	5–20%	18%
8	5–10%	10%	60–75%	66%	20-30%	24%

3.1.2 Test and Item Specification Development

Multiple-choice items were administered in grades 3–8 ELA assessments. Multiple-choice items require students to demonstrate a wide range of knowledge and skills. Each item requires approximately one minute for most students to answer. This item type affords efficient use of limited testing time and allows coverage of a wide range of knowledge and skills. In addition, technology-enhanced items (TEIs) were developed for grades 6–8. TEIs are used to address some aspects of the OAS performance expectations more authentically and/or to provide more opportunity for students to construct rather than select their response. Interaction types are drag-and-drop and drop-down. Each TEI contains only one interaction type per item. For grades 3, 4, 6 and 7, short constructed-response items were also included, providing students with the opportunity to respond to items in their own words. A typical response is 1–3 sentences. For grades 5 and 8, the writing portion of the ELA tests included extended responses that were associated with reading passages. Responses were scored with rubrics that assessed ideas and development; organization, unity, and coherence; word choice; sentences and paragraphs; and grammar, usage, and mechanics. Examples of test items for public use are provided by the SDE in the Test and Item Specifications documents at http://sde.ok.gov/sde/assessment-material.

The test framework for each ELA assessment is based on the OAS. Each test item is designed to measure a specific standard and objective. The measure of Oklahoma students' level of proficiency responding to a variety of items linked to grade-level ELA content standards are identified in the OAS. The five assessable content standards in the OAS are shown in Table 3-5.

Table 3-5. OAS ELA Assessable Content Standards

Grades 3–8
Standard 2 Reading and Writing Process
Standard 3 Critical Reading and Writing
Standard 4 Vocabulary
Standard 5 Language
Standard 6 Research

3.1.3 Passage Development

The OSTP ELA passages contain identifiable key concepts with relevant supporting details. Each passage is appropriate for determining the purpose for reading, such as analyzing character traits; comparing and contrasting; problem-solving and deriving solutions; interpreting; application; analyzing; synthesizing; drawing conclusions; making an inference; determining relationships in vocabulary analogies; and other relevant reading tasks as defined by the OAS for the specific grade level.

The passages have a variety of sentence types and lengths, may include dialogue, reflect Oklahoma's cultural diversity, and possess sufficient structural integrity to allow the passages to be self-contained.

The passages reflect a balance of genres from literary to expository texts, as shown in Table 3-6. Most passages selected for the ELA assessments include authentic literature; a minor portion have been selected from commissioned works.

The passages were reviewed by both SDE and Cognia not only for content, but also to eliminate cultural or other forms of bias that might disadvantage any group(s) of students. Further, passages were reviewed by teacher committees who had received bias and sensitivity training. The passages avoid subject matter that might prompt emotional distress. Permissions to use selections from copyrighted material were obtained as necessary.

The readability level of all passages was evaluated using recognized readability formulas. The formulas chosen for each grade varied according to the purpose for which the formula was developed. Appropriate readability formulas for the passages included the Flesch-Kincaid Rating, the Dale-Chall Readability Formula, and other formulas considered reliable.

In addition, sentence structure, length, vocabulary, content, visuals, and organization were reviewed when selecting appropriate grade-level passages for the ELA assessments. The teacher panel that reviewed the passages provided the final evaluation used to decide on the readability of a passage.

The vocabulary words tested in OSTP ELA assessments come directly from the passage content. Words used for vocabulary items have sufficient surrounding context clues for the reader to determine the meaning. Students may encounter words in the text that are not tested but are above the student's grade placement. In grades 3–5, these challenging words and their definitions may appear in a word box above the story or article. In grades 6–8, the definitions of challenging words may appear in footnotes.

Since there is no single source available to determine the reading level of individual words, the appropriateness and difficulty of vocabulary words were determined in different ways. Vocabulary words were checked in the following sources: *EDL Core Vocabularies in Reading, Mathematics, Science, and Social Studies* (Taylor, 1989); or other reliable readability sources. In addition, each vocabulary item was approved by Oklahoma's Content Review Committee. The committee, composed of Oklahoma educators from across the state, reviewed proposed vocabulary items for grade-level appropriateness. For ELA, the tested vocabulary is at grade level (and 1-2 grades above when assessing context clues); in the tests for all other subject areas, the vocabulary level is below the grade being tested, except for content words. Grades 3–4 are one grade level below, and grades 5–8 are two grade levels below.

New passages were identified to develop field-test items for the 2022–23 ELA administration. Grades 3–6 each had a single narrative and informational passage. Grade 7 had a narrative pair and an informational pair. Grade 8 had a single narrative and an informational pair. All of the passages were individually selected to eliminate cultural or other forms of bias that might disadvantage any group(s) of students.

Table 3-6. Grades 3–8 ELA and Eligible Passage Types

Grades	Literary	Expository
3–5	contemporary realistic fiction, historical fiction, modern fantasy, poetry, drama, and traditional stories (legends, myths, fairy tales, and fables)	informational, biography, autobiographies, and functional text
6–7	short story, novel excerpt, drama, poetry, fable, folktale, mystery, and myth	informational, biography, autobiographies, and functional text
8	short story, novel excerpt, drama, lyric poetry, historical fiction, fable, folktale, mystery, myth, limericks, tall tales, and plays	informational, biography, autobiographies, and functional text

3.1.4 Item Development

In preparation for the 2022–23 OSTP ELA administration, a gap analysis of the existing Oklahoma item bank was conducted. The purpose of this analysis was to identify any deficits for particular standards and objectives, and item counts were determined to address those deficits during development.

3.1.5 Spring 2023 Test Design and Development

The 2022–23 OSTP ELA test forms were structured using both operational items (designated to contribute to the student's score) and embedded field-test items (not designated to contribute to the student's score). Operational items were taken by all students in a given grade level. Across the operational and breach forms that were constructed, there were common linking items that both forms shared, and unique items associated with each particular form. Student scores were based only on operational items. Breach forms were a reuse of spring 2022 forms.

The percentages of common linking items for the 2022–23 OSTP ELA tests for grades 3–8 are shown in Table 3-6.

Table 3-6. Percentages of Common Linking Items across Operational and Breach Forms, 2022–23

Content	Grade	Common Linking Items across Operational and Breach Forms
ELA	3	46%
	4	56%
	5	42%
	6	70%
	7	50%
	8	42%

In the 2022–23 administration, each form in grades 3, 4, 6, and 7 included 60 items: 50 operational items contributed to the student's score and 10 were field-test items (did not contribute to the student's score). In grades 5 and 8, each form included 61 items: 51 operational items contributed to the student's score and 10 were field-test items (did not contribute to the student's score).

The student experience for the 2022–23 OSTP ELA tests for grades 3–8 is shown in Tables 3-7 through 3-9. In grades 3–8, all students experienced 60 items (50 operational items and 10 field-test items) addressing either single or paired passages. Students in grades 5 and 8 experienced 60 multiple-choice items and experienced a writing prompt related to a paired passage. Students in grades 3, 4, 6, and 7 experienced 56 multiple-choice items and four constructed-response items.

Table 3-7. ELA Grades 3–8 Student Test Experience: Operational Items Across Forms, 2022–23

	WP		MC		CR		TEI/PE		Total	
Grades	Items	Pts	Items	Pts	Items	Pts	Items	Points	Items	Pts
3–4	0	0	48	48	2	4	0	0	50	52
5	1	4	50	50	0	0	0	0	51	54
6–7	0	0	48	48	2	4	0	0	50	52
8	1	4	50	50	0	0	0	0	51	54

WP = Writing Prompt, MC = Multiple Choice, CR = Constructed Response

Table 3-8. ELA Grades 3–8 Student Test Experience: Field-Test Items Across Forms, 2022–23

	WP		MC		CR		TEI/PE		Total	
Grades	Items	Pts	Items	Pts	Items	Pts	Items	Points	Items	Pts
3–4	0	0	8	8	2	4	0	0	10	12
5	0	0	10	10	0	0	0	0	10	10
6–7	0	0	6	6	2	4	2	2	10	12
8	0	0	8	8	0	0	2	2	10	10

WP = Writing Prompt, MC = Multiple Choice, CR = Constructed Response

Table 3-9. ELA Grades 3–8 Student Test Experience: Combined Operational and Field-Test Items Across Forms, 2022–23

	WP		MC		CR		**TEI/PE**		**Total**	
Grades	Items	Pts	Items	Pts	Items	Pts	**Items**	**Points**	**Items**	**Pts**
3–4	0	0	56	56	4	8	**0**	**0**	**60**	**64**
5	1	4	60	60	0	0	**0**	**0**	**61**	**64**
6–7	0	0	54	54	4	8	**2**	**2**	**60**	**64**
8	1	4	58	58	0	0	**2**	**2**	**61**	**64**

WP = Writing Prompt, MC = Multiple Choice, CR = Constructed Response

3.1.6 Writing (Grades 5 and 8)

Student essays in grades 5 and 8 were assessed according to a holistic writing rubric on a 1–4 scale, with 4 as the highest score. All student responses were scored using grade-specific rubrics that assessed idea development, organization (including unity and coherence), word choice, sentence structure, grammar, usage, and mechanics. Students were asked to demonstrate these skills by integrating them in producing a unified essay. The final score represents the overall writing performance to a mode-specific prompt and its associated passages; students were expected to address the task appropriately and incorporate ideas from the passages to connect with the audience. To help guide students, a reference sheet that contained a writer's checklist was provided (https://oklahoma.onlinehelp.cognia.org/writers-checklist/). Examples of student responses to previous test items released for public use are available in the Extended Constructed Response/Writing Resources for Grades 5 & 8 section at http://sde.ok.gov/sde/ assessment-material.

3.1.7 Reading Sufficiency Act

The purpose of the Reading Sufficiency Act (RSA) is to ensure that all Oklahoma students are reading at grade level at the end of third grade (a critical juncture that occurs when students go from learning to read, to reading to learn). As part of meeting the requirements of the RSA, student performance on a subset of 32 items on the OSTP ELA will be used as one of the criteria to determine student readiness to be promoted to the fourth grade. These 32 items measure ELA Standard 2 (Reading and Writing Process) and Standard 4 (Vocabulary). Separate performance level descriptors (PLDs), provided in Appendix D, were developed to support standard setting and score reporting for RSA requirements as follows:

- **Meets RSA Criteria**—Third-grade students meeting the RSA criteria are performing at or above grade level on the reading portion of the grade 3 OSTP ELA assessment.
- **Does Not Meet RSA Criteria**—Third-grade students not meeting the RSA criteria are performing below grade level on the reading portion of the grade 3 OSTP ELA assessment.

3.1.8 Data Review

A conference call/Zoom meeting between the SDE and Cognia was conducted to review the content of spring 2023 ELA field-test items that were flagged due to psychometric criteria. Table 3-10 shows the criteria used for reviewing the flagged items.

Table 3-10. ELA Flagged Item Criteria

Statistic	Flagging for Dichotomous Items	Flagging for Polytomous Items
Item Difficulty (*p*-value)	Below 0.2 may be too difficult; above 0.9 may be too easy.	Below 0.2 may be too difficult; above 0.9 may be too easy.
Item Discrimination (corrwtotal)	Generally, 0.20 or higher is desired; must be >0.10; negative or zero values should not be used. For values between 0.10 and 0.20, difference between corrwtotal and any distractor option correlation value must be ≥ 0.09.	Must be ≥ 0.40.
Differential Item Functioning (DIF)	Values +/-C are serious DIF that must be looked at closely; +/-B values indicate moderate DIF that may warrant inspection.	Values +/-C are serious DIF that must be looked at closely; +/-B values indicate moderate DIF that may warrant inspection.

Statistics for flagged field-test items were reviewed by considering item difficulty (*p*-value), item discrimination (corrwtotal), and differential item functioning (DIF). (Section 6.2 drills down into the DIF statistical testing.) Decisions were made whether flagged items should be included in the Oklahoma item bank for future operational use. A total of 31 ELA items were flagged for review in the Data Review meeting due to psychometric criteria, with 77% of the flagged items being accepted for future operational use in spring 2024 and beyond. The summary results of 2023 field testing are presented in Table 3-11, showing the final adjudication of all 20 field test items in each grade, inclusive of both the acceptable and flagged items.

Table 3-11. ELA Data Review Results for 2022–23

Grade	Accepted	Rejected	Revise & reFT	Total
3	17	3	0	20
4	18	2	0	20
5	19	1	0	20
6	16	4	0	20
7	18	2	0	20
8	18	2	0	20
Total	**106**	**14**	**0**	**120**

3.1.9 Item Types

ELA item types include: MS1(machine scored, 1 point), CR (open ended response, 2 points), Writing prompt ER (open ended response, 4 points).

Most items are arranged in item clusters; a few items are presented as stand-alone items. Presenting the items in item clusters allows for better alignment to the breadth and depth of the standards in the OAS-ELA. Examples of test items for public use are provided by the SDE in the Test and Item Specifications documents at https://sde.ok.gov/assessment-material.

3.2 Grades 3–8 OSTP Mathematics Assessments

3.2.1 Develop/Review/Approve Test Blueprints with DOK Percentages

All items on the OSTP mathematics tests for grades 3–8 were developed specifically for Oklahoma and are directly aligned to the Oklahoma Academic Standards (OAS). The standards are the basis for the reporting categories developed for each content area and are used to help guide the development of test items. Each test item was designed to measure a specific standard and objective. The test blueprints were developed by the SDE, and test specifications were done in collaboration between Cognia and the SDE.

The test blueprints identify the amount of content covered on the tests and are based on the importance and coverage of the OAS in Oklahoma schools. The ideal test blueprints developed by the SDE are provided in Appendix C and at the SDE website: https://sde.ok.gov/assessment-material.

The distribution of emphasis for grades 3–8 mathematics content standards is shown in Tables 3-12 and 3-13. As indicated in the tables, the actual distribution of OAS mathematics standards fall within the ideal distribution on each OSTP test for all grade levels. The ideal percentage of items aligned to each group of standards can be found in Appendix C.

Table 3-12. Distribution of Emphasis in Terms of Target Percentage of Test by Grade—Grades 3–5 OAS Mathematics Standards, 2022–23

Standard	Grade 3		Grade 4		Grade 5	
	Ideal Percentage	Actual Percentage	Ideal Percentage	Actual Percentage	Ideal Percentage	Actual Percentage
Number and Operations	44–48%	46%	42–46%	46%	44–48%	44%
Algebraic Reasoning	12–18%	14%	14–18%	14%	16–20%	18%
Geometry and Measurement	26–30%	28%	26–30%	28%	22–26%	26%
Data and Probability	12–18%	12%	12–18%	12%	12–18%	12%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 3-13. Distribution of Emphasis in Terms of Target Percentage of Test by Grade—Grades 6–8 OAS Mathematics Standards, 2022–23

Standard	Grade 6		Grade 7		Grade 8	
	Ideal Percentage	Actual Percentage	Ideal Percentage	Actual Percentage	Ideal Percentage	Actual Percentage
Number and Operations	38–42%	42%	18–22%	20%	16–20%	18%
Algebraic Reasoning	20–24%	22%	28–32%	30%	44–48%	44%
Geometry and Measurement	22–26%	24%	28–32%	32%	18–22%	22%
Data and Probability	12–16%	12%	18–22%	18%	14–18%	16%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Each item on the OSTP mathematics tests for grades 3–8 was assigned a DOK level according to the cognitive demand of the item. DOK ranges are based on the DOK of the OAS. As discussed earlier, DOK is not synonymous with difficulty. Instead, the DOK level rates the complexity of the mental processing a student must use to answer the question. Items at each DOK level can be found in the Test and Item Specifications documents at https://sde.ok.gov/assessment-material.

DOK 1—RECALL AND REPRODUCTION: This level requires the student to recall facts, terms, definitions, or simple procedures, and to perform simple algorithms or apply formulas. One-step, well-defined, or straight algorithmic procedures should be included at this level.

DOK 2—SKILLS AND CONCEPTS: This level requires the student to make some decisions as to how to approach the problem or activity. Level 2 activities include making observations and collecting data; classifying, comparing, and organizing data; and organizing and displaying data in tables, charts, and graphs.

DOK 3—STRATEGIC THINKING: This level requires reasoning, planning, using evidence, and a higher level of thinking. Level 3 activities include making conjectures, drawing conclusions from observations, citing evidence, and developing a logical argument for concepts, explaining phenomena in terms of concepts, and using concepts to solve non-routine problems.

The distribution of DOK levels in the OSTP mathematics tests is shown in Tables 3-14 and 3-15. The tables show that for each grade level, the actual percentage of items at each DOK level fell within the recommended range, except for the DOK 3 level in the grade 8 breach form. Note the recommended DOK distributions shift to reflect that as students continue through the grades, the standards increase grade-level expectations and rigor and set expectations for students to be college- and career-ready.

Table 3-14. Mathematics DOK Levels by Grade—Form A, 2022–23

Grade	DOK 1		DOK 2		DOK 3	
	Recommended	Actual	Recommended	Actual	Recommended	Actual
3	40–50%	40%	45–55%	50%	5–10%	10%
4	25–35%	32%	60–70%	60%	5–15%	8%
5	20–30%	26%	65–75%	66%	5–15%	8%
6	15–25%	24%	65–75%	66%	10–20%	10%
7	15–25%	22%	65–75%	66%	10–20%	12%
8	10–20%	18%	65–75%	66%	15–25%	16%

Table 3-15. Mathematics DOK Levels by Grade—Breach, 2022–23

Grade	DOK 1		DOK 2		DOK 3	
	Recommended	Actual	Recommended	Actual	Recommended	Actual
3	40–50%	44%	45–55%	46%	5–10%	10%
4	25–35%	34%	60–70%	60%	5–15%	6%
5	20–30%	20%	65–75%	66%	5–15%	14%
6	15–25%	26%	65–75%	64%	10–20%	10%
7	15–25%	22%	65–75%	70%	10–20%	8%
8	10–20%	20%	65–75%	66%	15–25%	14%

3.2.2 Test and Item Specification Development

Multiple-choice items were administered in grades 3–8 mathematics assessments. Multiple-choice items require students to demonstrate a wide range of knowledge and skills. Each item requires approximately one minute for most students to answer. This item type affords efficient use of limited testing time and allows coverage of a wide range of knowledge and skills. In addition, technology-enhanced items (TEIs) were administered for grades 3–8. TEIs are used to address some aspects of the OAS performance expectations more authentically and/or to provide more opportunity for students to construct rather than select their response. Interaction types are matching, hot-spot, drag-and-drop, and drop-down. Each TEI contains only one interaction type per item. Examples of test items for public use are provided by the SDE in the Test and Item Specifications documents at https://sde.ok.gov/assessment-material.

The test framework for each mathematics assessment is based on the OAS. Each test item is designed to measure a specific standard and objective. The measure of Oklahoma students' level of proficiency in responding to a variety of items linked to grade-level mathematics content standards are identified in the OAS. The mathematics standards are organized into four content strands:

Table 3-16. OAS Mathematics Assessable Content Standards

Grades 3–8
Number and Operations
Algebraic Reasoning and Algebra
Geometry and Measurement
Data and Probability

3.2.3 Item Development

New items were developed for this administration. In preparation for the 2022–23 OSTP mathematics administration, a gap analysis of the existing Oklahoma item bank was conducted to identify any deficits in particular standards and objectives and to determine item counts needed to address those deficits during development.

3.2.4 Spring 2023 Test Design and Development

The 2022–23 OSTP mathematics test forms were structured using both operational items (designated to contribute to a student's score) and embedded field-test items (not designated to contribute to the student's score). Operational items were taken by all students in a given grade level. Across the operational and breach forms that were constructed, there were common linking items that both forms shared, and unique items associated with each particular form. Student scores were based only on operational items. Operational items and field-test items were not distinguishable to students.

In the 2022–23 administration, each form included 60 items: 50 operational items contributed to the student's score and 10 were field-test items (did not contribute to the student's score). Breach forms were rebuilt in grades 3–8 so that they met psychometric requirements. The percentages of common linking items for the 2022–23 OSTP mathematics tests for grades 3–8 are shown in Table 3-17.

Table 3-17. Percentages of Common Linking Items across Operational and Breach Forms, 2022–23

Content	Grade	Common Linking Items across Operational and Breach Forms
Mathematics	3	38%
	4	42%
	5	34%
	6	40%
	7	36%
	8	50%

The student experience for the 2022–23 OSTP mathematics tests for grades 3–8 is shown in Tables 3-18 through 3-20. In grades 3–5, all students experienced 58 multiple-choice items and 2 technology-enhanced items. In grades 6–8, all students experienced 55 multiple-choice items and 5 technology-enhanced items.

Table 3-18. Mathematics Grades 3–8 Student Test Experience: Operational Items Across Forms, 2022–23

	MC		TEI/PE		**Total**	
Grades	Items	Pts	Items	Pts	**Items**	**Pts**
3–5	49	49	1	1	**50**	**50**
6–8	47	47	3	3	**50**	**50**

MC = Multiple Choice, TEI = Technology-Enhanced Item, PE = Paper Equivalent

Table 3-19. Mathematics Grades 3-8 Student Test Experience: Field-Test Items Across Forms, 2022–23

	MC		TEI/PE		**Total**	
Grades	Items	Pts	Items	Pts	**Items**	**Pts**
3–5	9	9	1	1	**10**	**10**
6–8	8	8	2	2	**10**	**10**

MC = Multiple Choice, TEI = Technology-Enhanced Item, PE = Paper Equivalent

Table 3-20. Mathematics Grades 3–8 Student Test Experience: Combined Operational and Field-Test Items Across Forms, 2022–23

Grades	MC		TEI/PE		Total	
	Items	Pts	Items	Pts	Items	Pts
3–5	58	58	2	2	60	60
6–8	55	55	5	5	60	60

MC = Multiple Choice, TEI = Technology-Enhanced Item, PE = Paper Equivalent

3.2.5 Data Review

A conference call/Zoom meeting between the SDE and Cognia was conducted to review the content of spring 2023 mathematics field-test items that were flagged due to psychometric criteria. Table 3-21 shows the criteria used for reviewing the flagged items.

Table 3-21. Mathematics Flagged Item Criteria

Statistic	Flagging for Dichotomous Items	Flagging for Polytomous Items
Item Difficulty (*p*-value)	Below 0.2 may be too difficult; above 0.9 may be too easy.	Below 0.2 may be too difficult; above 0.9 may be too easy.
Item Discrimination (corrwtotal)	Generally, 0.20 or higher is desired; must be >0.10; negative or zero values should not be used. For values between 0.10 and 0.20, difference between corrwtotal and any distractor option correlation value must be ≥ 0.09.	Must be ≥ 0.40.
Differential Item Functioning (DIF)	Values +/-C are serious DIF that must be looked at closely; +/-B values indicate moderate DIF that may warrant inspection.	Values +/-C are serious DIF that must be looked at closely; +/-B values indicate moderate DIF that may warrant inspection.

Statistics for flagged field-test items were reviewed by considering item difficulty (*p*-value), item discrimination (corrwtotal), and DIF. Decisions were made whether flagged items should or should not be included in the Oklahoma item bank for future operational use. A total of 15 mathematics items were flagged for review in the Data Review meeting due to psychometric criteria, with 86.6% of the flagged items being accepted for future operational use in spring 2024 and beyond. The summary results of 2023 field testing are presented in Table 3-22, showing the final adjudication of all field test items in each grade, inclusive of both the acceptable and flagged items.

Table 3-22. Mathematics Data Review Results 2022–23

Grade	Accepted	Rejected	Revise & reFT	Total
3	20	0	0	20
4	20	0	0	20
5	19	1	0	20
6	19	0	1	20
7	20	0	0	20
8	20	0	0	20
Total	**118**	**1**	**1**	**120**

3.2.6 Use of Calculators and Reference Sheets

Approved calculators were allowed for the OSTP mathematics assessments for grades 6–8. Reference sheets were provided to students in grades 6–8 during the test. For approved calculators, see the calculator policy posted on the SDE website at https://sde.ok.gov/sites/default/files/documents/files/FINAL_Calculator%20Policy%202017.

3.3 Grades 5 and 8 OSTP Science Assessments

3.3.1 Develop/Review/Approve Test Blueprints

All items on the OSTP science tests for grades 5 and 8 were developed specifically for Oklahoma and are directly aligned to the Oklahoma Academic Standards (OAS). The standards are the basis for the reporting categories developed for each content area and are used to help guide the development of test items. Each item was designed to measure a specific standard. The test blueprints were developed by the SDE, and test specifications were completed via collaboration between Cognia and the SDE, with additional stakeholder input from district administrators and teachers.

The test blueprints identify the amount of content covered on the tests and are based on the importance and coverage of the OAS in Oklahoma schools. The ideal test blueprints developed by the SDE are provided in Appendix C and at the SDE website: https://sde.ok.gov/assessment-material.

The distribution of emphasis for grades 5 and 8 assessable content standards is shown in Table 3-23. As indicated in the table, the ideal distribution of OAS science standards and the actual distribution on each OSTP test match reasonably for each grade level. The ideal percentage of items aligned to each group of standards can be found in Appendix C.

Table 3-23. Distribution of Emphasis in Terms of Target Percentage of Test by Grade—Grades 5 and 8 OAS-Science Standards, 2022–23

Standards Domain	Grade 5		Grade 8	
	Ideal Percentage	Actual Percentage	Ideal Percentage	Actual Percentage
Physical Sciences	27–33%	33.3%	33–40%	33.3%
Life Sciences	27–33%	33.3%	40-46%	46.7%
Earth and Space Sciences	33–40%	33.3%	21-27%	20%
Total	**100%**	**100%**	**100%**	**100%**

3.3.2 Item Development

The OSTP science tests consist of clusters of items. A cluster is a set of items linked to a common stimulus. No new on-grade multiple choice (MC) clusters were developed for the grade 5 or grade 8 science assessment for field testing in 2023. Field test positions on the 2023 grade 5 and grade 8 were utilized to test items to release for instructional use in the OAS-S frameworks.

3.3.3 Spring 2023 Test Design and Development

The 2022–23 OSTP science test forms were structured using both operational items (designated to contribute to a student's score) and embedded field-test items (not designated to contribute to the student's score). The items used on the OSTP science tests for grades 5 and 8 were written as clusters of items aligned to the OAS science standards.

Operational items (or equivalent items in the paper form for technology-enhanced items in the online form for grade 8 science) were taken by all students at a given grade level. One operational form and one breach form were constructed for each grade level. Across the operational and breach forms, 49% of the grade 5 science items and 64% of the grade 8 science items were common linking items; the rest of each form contained unique items. There was a total of 15 operational clusters (45 operational items) on each form.

Field-test items for a range of science standards were tested to continue building an item bank that will support an appropriate sampling of the assessable standards each year. Field-test items were embedded in each form. Four online forms were administered for each of grades 5 and 8, with a paper form as an accommodation in each grade level. Each form contained three field-test clusters (nine field-test items in total). Field-test items were not distinguishable to students. Student scores were based only on the operational items. Breach forms were rebuilt in grades 5 and 8 so that they met psychometric requirements.

The student experience for the 2022–23 OSTP science tests for grades 5 and 8 is shown in Tables 3-24 through 3-26.

Table 3-24. Science Clusters in Core/Operational Items Across Forms, 2022–23

	Stm	MC		TEI/PMC		**Total**	
Grade	Single	Items	Pts	Items	Pts	**Items**	**Pts**
5	15	45	45	0	0	**45**	**45**
8	15	42	42	3	6	**45**	**48**

MC = Multiple Choice, TEI = Technology-Enhanced Item, PMC = Paired Multiple Choice

Table 3-25. Science Clusters to Field Test/Field-Test Items Across Forms, 2022–23

	Stm	MC		TEI/PMC		**Total**	
Grade	Single	Items	Pts	Items	Pts	**Items**	**Pts**
5	3	8	8	1	2	**9**	**10**
8	3	8	8	1	2	**9**	**10**

MC = Multiple Choice, TEI = Technology-Enhanced Item, PMC = Paired Multiple Choice

Table 3-26. Science Clusters in Combined Test/Operational and Field-Test Items Across Forms, 2022–23

	Stm	MC		TEI/PMC		**Total**	
Grade	Single	Items	Pts	Items	Pts	**Items**	**Pts**
5	18	53	53	1	2	**54**	**55**
8	18	50	50	4	8	**54**	**58**

MC = Multiple Choice, TEI = Technology-Enhanced Item, PMC = Paired Multiple Choice

3.3.4 Data Review

A conference call/Zoom meeting between the SDE and Cognia was conducted to review the content of spring 2023 grades 5 and 8 science field-test items that were flagged due to psychometric criteria. Table 3-27 shows the criteria used for reviewing the flagged items.

Table 3-27. Science Flagged Item Criteria

Statistic	Flagging for Dichotomous Items	Flagging for Polytomous Items
Item Difficulty (*p*-value)	Below 0.2 may be too difficult; above 0.9 may be too easy.	Below 0.2 may be too difficult; above 0.9 may be too easy
Item Discrimination (corrwtotal)	Generally, 0.20 or higher is desired; must be >0.10; negative or zero values should not be used. For values between 0.10 and 0.20, difference between corrwtotal and any distractor option correlation value must be ≥ 0.09.	Must be ≥ 0.40.
Differential Item Functioning (DIF)	Values +/-C are serious DIF that must be looked at closely; +/-B values indicate moderate DIF that may warrant inspection.	Values +/-C are serious DIF that must be looked at closely; +/-B values indicate moderate DIF that may warrant inspection.

Statistics for flagged field-test items were reviewed by considering item difficulty (*p*-value), item discrimination (corrwtotal), and DIF. Decisions were made whether flagged items should or should not be included in the Oklahoma item bank for future operational use. A total of 13 grade 5 and 8 science items were flagged for review in the Data Review meeting due to psychometric criteria, with 31% of the flagged items being accepted for future operational use in spring 2024 and beyond (in addition to the items not flagged and automatically accepted). The summary results of 2023 field testing are presented in Table 3-28, showing the final adjudication of all field test items in each grade, inclusive of both the acceptable and flagged items.

Table 3-28. Science Data Review Results for 2022–23

Grade	Accept	Reject	Re-Field Test	Total
5	31	0	1	32
8	23	0	9	32
Total	**59**	**19**	**9**	**87**

3.3.5 Standards

The test framework for each science assessment is based on the OAS-Science. Test items are developed within clusters, and each cluster/item is designed to measure a specific standard in the OAS-Science. The science standards for grade 5 and grade 8 science are organized across three content domains: Physical Sciences (PS), Life Sciences (LS), and Earth and Space Sciences (ESS).

3.3.6 Item Types

The grade 5 science test consists of clusters of multiple-choice items. Some item clusters with two multiple-choice items and a technology-enhanced item linked with a common stimulus were introduced in the field test portion of the test only. The grade 8 science test consists of item clusters that are either a set of three multiple-choice items linked with a common stimulus or a set of two multiple-choice items and a technology-enhanced item linked with a common stimulus, across both core and field test portions of the test. On the accommodated paper form, the technology-enhanced items are replaced by paired multiple-choice items.

All items are arranged in item clusters; no items are presented as stand-alone items. Presenting the items in clusters allows for better alignment to the breadth and depth of the standards in the OAS-Science. Examples of test items for public use are provided by the SDE in the Test and Item Specifications documents at sde.ok.gov/sde/assessment-material.

3.3.7 Cognitive Complexity

The OSTP science assessments consist of items within a cluster structured to assess a range of skills and knowledge applications within a standard. Clusters require sense-making and problem-solving using the three dimensions of the standards (Science & Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts). Sense-making happens when students must apply, via science and engineering practices, their understanding of core ideas and crosscutting concepts to address the uncertainty associated with a scenario. The degree of sense-making required to complete an item is directly correlated to the level of cognitive complexity the student must engage with, as described in Figure 3-1. The Reference Guide first provides definitions to identify the level of engagement of the student (full, partial, n/a) for each dimension, and then provides definitions to identify the level of sense-making that is required of the student (low, medium, high) to answer each item.

Figure 3-1. OSTP Levels of Cognitive Complexity

Alignment and Cognitive Complexity Evaluation Tool

Use this screener tool to evaluate the items independently and then the cluster overall.

Alignment to the dimensions

To what extent does the item require the student to engage with the dimension (low, medium, and high). We first evaluate the SEP, CCC, and DCI individually as part of assigning a cognitive complexity ranking to the item. The below scale is used to evaluate individual dimensions. If an item is lacking a dimension (Oklahoma requires a minimum of two dimensions be present in any one item) indicate that with N/A in the box.

SEP (SCIENCE AND ENGINEERING PRACTICE)	
Questions to help determine how students' use of the SEP contributes to cognitive complexity/sense-making in the item: • How is the SEP being used to explore/understand the phenomenon? • How much scaffolding is provided for students to use the SEP? • Is the SEP used independently of any occurrence in the DCI or CCC? (No double counting)	
Low	• Students only need to use the SEP in a simple, straightforward way that is absent of or minimally uses sense-making • Large amounts of scaffolding are supplied to help the students apply the SEP • Isolated component of SEP is used
Medium	• Students must apply the SEP to make sense of the phenomenon • Typically some scaffolding is provided that helps students apply the SEP
High	• Students must apply the SEP to make sense of the phenomenon (e.g., synthesis to perform more connections. SEP elements are used in combination, such as having to combine data, produce a new graph or model as evidence, etc.) • Often little to no scaffolding is in place to help students apply the SEP • The SEP is used in sense-making that bridges across diverse contexts

DCI (DISCIPLINARY CORE IDEA)	
Questions to help determine how students' use of the DCI contributes to cognitive complexity/sense-making in the item: • How do the DCIs contribute to sense-making as the student engages with the phenomenon? • How much scaffolding is provided for students to use the DCI? • Is the DCI used independently of any occurrence in the SEP or CCC? (No double counting)	
Low	• Students use the DCI in a simple, straightforward way (e.g., little to no application or reasoning) • Often a large amount of scaffolding that helps students apply the DCI • Producing previously learned ideas and conceptual procedures in routine, well-practiced ways
Medium	• Students must apply or reason with DCI concepts to make sense of the phenomenon • Supported applications of science ideas in typical contexts • Some scaffolding that helps students apply the DCI

High	• Students must apply and connect DCI concepts in a sophisticated way to make sense of the phenomenon, e.g.,
	    ○ application of science ideas (often multiple ideas) in new ways or combinations
	    ○ knowledge transfer to construct new understanding, make sense of novel phenomena
	• Often little to no scaffolding that helps students apply the DCI
	• There is some uncertainty associated with the outcome of the scenario

CCC (CROSSCUTTING CONCEPT)	
Question to help determine how students' use of the CCC contributes to cognitive complexity/sense-making in the item: • How is the lens of the CCC used to understand the phenomenon? • How much scaffolding is provided for students to use the CCC? • Is the CCC used independently of any occurrence in the SEP or DCI? (No double counting)	
Low	• CCCs are implicitly part of the task, but they are not required in service of sense-making
Medium	• Students use the CCC in a general way (e.g., item includes and/or could have students use the general CCC concept) • Used for minimal sense making
High	• Students use the CCC in an in-depth way (e.g., drawing on the understandings of the CCC sub-bullet detail to make sense of the phenomenon) • Used in part or fully to bridge a gap in DCI knowledge and/or sense making

Stimulus Question
Can the questions of the task be answered without using information provided by the task scenario or context? **Yes ! or No**

Cognitive Complexity Table

Category	Description
Scripted	• Only one dimension is present, or two dimensions are present but only one is used in application or reasoning for sense-making. • Heavy scaffolding ○ Scripted "Cookbook instructions" • Little to no sense making
Moderate Support	• Multidimensional 2-3 dimensions are evident but only one is heavily used in sense-making while the other may be used minimally. • Moderate scaffolding ○ Students have to apply ideas and practices; however, they are often told which ones to engage with and supported in using them • Low to Medium degree of sense making

Low Support	• Multidimensional 2-3 dimensions are evident with at least 2 being necessary to use or reason within sense-making.
	• Minimal scaffolding
	  ○ Students are cued and guided to pursue certain lines of thinking, but have to make some decisions about how and what to engage
	• Medium to High degree of sense making
	  ○ High: Students must connect multiple pieces of information in a novel way

Doing (rarely achievable on summative assessments)	• The three dimensions are used together to engage in sense-making to a high degree throughout the task • Student-designed exploration of science • Limited to no scaffolding • Students work like scientists to use various scientific practices to be able to develop or deepen an understanding of a scientific idea or problem as they explore a phenomenon. In most cases if a student actually is engaged in 3 dimensions and has to develop the model or develop the explanation or develop the argument from raw data or information, they are being asked to do science.

Note: These descriptions are adapted from Achieve

3.3.8 Use of Calculators and Reference Sheets

Approved calculators were allowed for the grade 8 OSTP science test. No other resource materials or reference sheets could be used by students during the test. See https://sde.ok.gov/sites/ok.gov.sde/files/CalculatorPolicy17-18%20ver%202.pdf.

3.4 Grade 11 CCRA Science & U.S. History

3.4.1 Develop/Review/Approve Test Blueprints

Science

All items on the CCRA science test for grade 11 were developed specifically for Oklahoma and are directly linked to the Oklahoma Academic Standards for Science (OAS-S). The standards are the basis for the reporting categories developed for each content area and are used to help guide the development of test items. Each item was designed to measure a specific standard. The test blueprints were developed by the SDE, and test specifications were completed via collaboration between Cognia and the SDE, with additional stakeholder input from district administrators and teachers.

The test blueprints identify the amount of content covered on the tests and are based on the importance and coverage of the OAS-S in Oklahoma schools. The ideal test blueprints developed by the SDE are provided in Appendix C and at the SDE website: https://sde.ok.gov/assessment-material.

The distribution of emphasis for the CCRA science assessable standards is shown in Table 3-29. The actual distributions of standards on each assessment fall within the ideal percentages defined. The ideal percentage of items aligned to each group of standards can be found in Appendix C.

Table 3-29. Distribution of Emphasis in Terms of Target Percentage of Test by Grade—Grade 11 OAS-Science Standards, 2022–23

Standards Domain	Grade 11	
	Ideal Percentage	Actual Percentage
Physical Sciences	45–55%	50%
Life Sciences	45–55%	50%
Total	**100%**	**100%**

U.S. History

All items on the CCRA U.S. history test for grade 11 were developed specifically for Oklahoma and are directly linked to the Oklahoma Academic Standards. The standards are the basis for the reporting categories developed for each content area and are used to help guide the development of test items. Each item was designed to measure a specific standard and objective. The test blueprints were developed by the SDE, and test specifications were completed via collaboration between Cognia and the SDE.

The test blueprints identify the amount of content covered on the tests and are based on the importance and coverage of the OAS in Oklahoma schools. The ideal test blueprints developed by the SDE are provided in Appendix C and at the SDE website: https://sde.ok.gov/assessment-material.

The distribution of emphasis for the U.S. history assessable content standards is shown in Table 3-30. As indicated in the table, the actual distribution of OAS U.S. history standards meets the ideal distribution of OAS U.S. history standards. The ideal percentage of items aligned to each group of standards can be found in the test blueprints in Appendix C.

Table 3-30. Distribution of Emphasis in Terms of Target Percentage of Test by Grade—Grade 11 OAS-U.S. History Standards, 2022–23

Standards Category	Grade 11	
	Ideal Percentage	Actual Percentage
U.S. History	45–55%	48%
Civics	45–55%	52%
Total	100%	100%

3.4.2 Item Development

New items were developed for this administration for both grade 11 science and U.S. history. In preparation for the 2022–23 CCRA administration, a gap analysis of the existing Oklahoma item banks was conducted to identify any deficits in particular standards and objectives and to determine item counts needed to address those deficits during development.

3.4.3 Spring 2023 Test Design and Development

Science

The grade 11 CCRA science test forms were structured using both operational items (designated to contribute to a student's score) and embedded field-test items (not designated to contribute to the student's score). Operational items (or equivalent items in the paper form for technology-enhanced items in the online form) were taken by all students in this grade level. One operational form and one breach form were constructed. Across the operational and breach forms, approximately 52% of the items were common linking items; the rest of each form contained unique items. There was a total of 20 operational clusters (60 operational items) on each form.

Field-test items were embedded in each form. In grade 11, eight online forms were administered, with a paper form as an accommodation. Each form contained two field-test clusters (six field-test items in total). Field-test items were not distinguishable to students. Student scores were based only on the operational items.

The student experience for the 2022–23 CCRA science tests for grade 11 is shown in Tables 3-31 through 3-33.

Table 3-31. CCRA Science Clusters in Core/Operational Items Across Forms, 2022–23

	Stimulus	MC		TEI/PMC		Total	
Grade	Single	Items	Pts	Items	Pts	Items	Pts
11	20	58	58	2	4	60	62

MC = Multiple Choice, TEI = Technology-Enhanced Item, PMC = Paired Multiple Choice

Table 3-32. CCRA Science Clusters to Field Test/Field-Test Items Across Forms, 2022–23

	Stimulus	MC		TEI/PMC		Total	
Grade	Single	Items	Pts	Items	Pts	Items	Pts
11 (varies per form)	2	6	6	0	0	6	6
	2	5	5	1	2	6	7

MC = Multiple Choice, TEI = Technology-Enhanced Item, PMC = Paired Multiple Choice

Table 3-33. CCRA Science Clusters in Combined Test/Operational and Field-Test Items Across Forms, 2022–23

	Stimulus	MC		TEI/PMC		Total	
Grade	Single	Items	Pts	Items	Pts	Items	Pts
11 (varies per form)	22	64	64	2	4	66	68
	22	63	63	3	6	66	69

MC = Multiple Choice, TEI = Technology-Enhanced Item, PMC = Paired Multiple Choice

U.S. History

The grade 11 CCRA U.S. history test forms were structured using both operational and embedded field-test items. Operational items were taken by all students in this grade level. One operational form and one breach form were constructed. The Breach form was a 'scramble' operational form. There was a total of 50 operational items on each form.

Field-test items were embedded in each form. In grade 11, two online forms were administered, with a paper form as an accommodation. Each form contained ten field-test items in total. Field-test items were not distinguishable to students. Student scores were based only on the operational items.

The student experience for the 2022–23 CCRA U.S. history test for grade 11 is shown in Tables 3-34 through 3-36.

Table 3-34. CCRA U.S. History Items in Core/Operational Items Across Forms, 2022–23

	Cluster Sets	Cluster Items		Standalone Items		Total	
Grade		Items	Pts	Items	Pts	Items	Pts
11	2	8	8	42	42	50	50

MC = Multiple Choice

Table 3-35. CCRA U.S. History Items to Field Test/Field-Test Items Across Forms, 2022–23

Grade	Cluster Sets	Cluster Items		Standalone Items		Total	
		Items	Pts	Items	Pts	**Items**	**Pts**
11	1	4	4	6	6	**10**	**10**

MC = Multiple Choice

Table 3-36. CCRA U.S. History Clusters in Combined Test/Operational and Field-Test Items Across Forms, 2022–23

Grade	Cluster Sets	Cluster Items		Standalone		Total	
		Items	Pts	Items	Pts	**Items**	**Pts**
11	3	12	12	48	48	**60**	**60**

MC = Multiple Choice

3.4.4 Data Review

A conference call/Zoom meeting between the SDE and Cognia was conducted to review the content of spring 2023 grade 11 CCRA science and U.S. history field-test items that were flagged due to psychometric criteria. Table 3-37 shows the criteria used for reviewing the flagged items.

Table 3-37. Flagged Item Criteria

Statistic	Flagging for Dichotomous Items	Flagging for Polytomous Items
Item Difficulty (*p*-value)	Below 0.2 may be too difficult; above 0.9 may be too easy.	Below 0.2 may be too difficult; above 0.9 may be too easy.
Item Discrimination (corrwtotal)	Generally, 0.20 or higher is desired; must be > 0.10; negative or zero, values should not be used. For values between 0.10 and 0.20, difference between corrwtotal and any distractor option correlation value must be ≥ 0.09.	Must be ≥ 0.40.
Differential Item Functioning (DIF)	Values +/- C are serious DIF that must be looked at closely; +/- B values indicate moderate DIF that may warrant inspection.	Values +/- C are serious DIF that must be looked at closely; +/- B values indicate moderate DIF that may warrant inspection.

<u>Science</u>

Statistics for flagged field-test items were reviewed by considering item difficulty (*p*-value), item discrimination (corrwtotal), and DIF. Decisions were made whether flagged items should or should not be included in the Oklahoma item bank for future operational use. A total of 17 grade 11 science items were flagged for review in the Data Review meeting due to psychometric criteria, with 24% of the flagged items (n=4) being accepted for future operational use in spring 2024 and beyond (along with the other 21 field test items with acceptable statistics/not flagged), and the other 13 flagged items being rejected or marked for re-field test. The summary results of 2023 field testing are presented in Table 3-38, showing the final adjudication of all field test items in each grade, inclusive of both the acceptable and flagged items.

Table 3-38. Science Data Review Results for 2022–23

Grade	Accepted	Rejected	Re-Field test	Total
11	25	10	3	38

**This table shows the total number of items field tested. Following acceptance at Data Review, these items are available for operational use in 2023–24 and beyond.*

U.S. History

Statistics for flagged field-test items were reviewed by considering item difficulty (*p*-value), item discrimination (corrwtotal), and DIF. Decisions were made whether flagged items should or should not be included in the Oklahoma item bank for future operational use. A total of 2 U.S. history items were flagged for review in the Data Review meeting due to psychometric criteria. The summary results of 2023 field testing are presented in Table 3-39, showing the final adjudication of all field test items in each grade, inclusive of both the acceptable and flagged items.

Table 3-39. U.S. History Data Review Results for 2022–23

Grade	Accepted	Rejected	Re-Field Test	Total
11	18	0	2	20

**This table shows the total number of items field tested. Following acceptance at Data Review, these items are available for operational use in 2023–24 and beyond.*

3.4.5 Standards

Science

The test framework for the grade 11 science assessment is based on the OAS-Science. Test items are developed within clusters, and each cluster/item is designed to measure a specific standard in the OAS-Science. The grade 11 science standards are organized across two content domains: Physical Sciences (PS) and Life Sciences (LS).

U.S. History

The test framework for the grade 11 U.S. history assessment is based on the OAS-U.S. History. Test items include multiple-choice items and complex stimuli clusters. The complex stimuli clusters consist of multiple stimuli and multiple-choice items. The stand-alone items are multiple-choice items. All U.S. history items are aligned to the OAS-U.S. History standards. The grade 11 U.S. history standards are organized across two content domains: U.S. History and Civics.

3.4.6 Item Types

Science

The grade 11 science test consists of clusters of items. A cluster is either a set of three multiple-choice items linked with a common stimulus or a set of two multiple-choice items and a technology-enhanced item linked with a common stimulus. On the accommodated paper form for grade 11, the technology-enhanced items are replaced by paired multiple-choice items.

All items are arranged in item clusters; no items are presented as standalone items. Presenting the items in item clusters allows for better alignment to the breadth and depth of the standards in the OAS-Science. Examples of CCRA test items for public use are provided by the SDE in the Test and Item Specifications documents at https://sde.ok.gov/college-and-career-readiness-assessments.

U.S. History

The grade 11 CCRA U.S. history test consists of multiple-choice items and complex stimuli clusters. The complex stimuli clusters consist of multiple stimuli and multiple-choice items. Examples of CCRA test items for public use are provided by the SDE in the Test and Item Specifications documents at https://sde.ok.gov/college-and-career-readiness-assessments.

3.4.7 Cognitive Complexity and DOK

Science

The CCRA science tests consist of items within a cluster structured to assess a range of skills and knowledge applications within a standard. This is the same item design as used in grades 5 and 8 science; in all grades of science, clusters require sense-making and problem-solving using the three science dimensions. The degree of sense-making required to complete an item is directly correlated to the level of cognitive complexity the student must engage with. The process for determining cognitive complexity for the items within a cluster is the same for grades 5, 8, and 11, and was described in section 3.3.7.

U.S. History

Each item on the CCRA U.S. history test was assigned a DOK level according to the cognitive demand of the item. DOK ranges are based on the DOK of the OAS. As discussed earlier, DOK is not synonymous with difficulty. Instead, the DOK level rates the complexity of the mental processing a student must use to answer the question. Items at each DOK level are provided in the CCRA U.S. History Test and Item Specifications document at https://sde.ok.gov/college-and-career-readiness-assessments.

DOK 1—RECALL: asks the students to recall facts, terms, concepts, and trends or to recognize or identify specific information contained in graphics. This level generally requires students to identify, list, or define. The terms at this level usually ask the student to recall who, what, when, and where. Items that require students to “describe” and/or “explain” could be classified at Level 1 or Level 2, depending on what is to be described and/or explained. A Level 1 “describe and/or explain” would require students to recall, recite, or reproduce information. Items that require students to recognize or identify specific information contained in documents, excerpts, quotations, maps, charts, tables, graphs, or illustrations are generally Level 1.

DOK 2—BASIC REASONING: This level includes the engagement of some mental processing beyond recalling or reproducing a response. Level 2 generally requires students to contrast and compare people, places, events, and concepts; convert information from one form to another; give an example; classify or sort items into meaningful categories; and/or describe, interpret or explain issues and problems, patterns, reasons, cause and effect, significance or impact, relationships, point of view, or processes. A Level 2 "describe" and/or "explain" would require students to go beyond a description or explanation of recalled information to describe and/or explain a result or "how" or "why."

DOK 3—COMPLEX AND EXTENDED REASONING: This level requires reasoning, using evidence, and a higher level of thinking than Level 1 and Level 2. Students will go beyond explaining or describing "how" and "why" to justifying the "how" and "why" through application and evidence. The cognitive demands at Level 3 are more complex and more abstract than at Level 1 or Level 2. Items at Level 3 include drawing conclusions, citing evidence, applying concepts to new situations, using concepts to solve problems, analyzing similarities and differences in issues and problems, proposing and evaluating solutions to problems, recognizing and explaining misconceptions, or making connections across time and place to explain a concept or "big idea."

For U.S. history, the actual percentage of items at each DOK level fell within the recommended range, as shown below in Table 3-40 and 3-41.

Table 3-40. U.S. History DOK Levels—Form A, 2022–23

Grade	DOK 1		DOK 2		DOK 3	
	Recommended	Actual	Recommended	Actual	Recommended	Actual
11	10–15%	14%	60–70%	62%	15–25%	24%

Table 3-41. U.S. History DOK Levels—Breach, 2022–23

Grade	DOK 1		DOK 2		DOK 3	
	Recommended	Actual	Recommended	Actual	Recommended	Actual
11	10–15%	14%	60–70%	62%	15–25%	24%

3.4.8 Use of Calculators and Reference Sheets

Approved calculators were allowed for the CCRA grade 11 science test. For approved calculators, see the calculator policy posted on the SDE website: https://sde.ok.gov/sites/default/files/documents/files/FINAL_Calculator%20Policy%202017-2018_Updated%202020.pdf. Students were also provided a periodic table of elements (see https://oklahoma.onlinehelp.cognia.org/wp-content/uploads/sites/5/2023/03/OK_PeriodicTable_English_ADA.pdf).

3.5 Overall Test Development Process

3.5.1 Item Selection and Operational Test Assembly

In preparation for the item selection meeting, the test developers and psychometricians at Cognia considered the following when selecting sets of items to propose for the common (including items for release) and the embedded field-test items:

- **Content coverage/match to test design:** The test design stipulates a specific number of multiple-choice items from each content area.
- **Item difficulty and complexity:** Item statistics drawn from the data analysis of previously tested items were used to ensure similar levels of difficulty and complexity from year to year, as well as for quality psychometric characteristics.
- **"Cueing" items:** Items were reviewed for any information that might "cue" or provide information that would help students to answer another item.

During assembly of the test forms, the following criteria were considered:

- **Option balance:** Items were balanced among the forms so that each form contained an approximately equal distribution of keys (correct answers).
- **Key patterns:** The sequence of keys was reviewed to ensure that key order appeared random.
- **Page fit:** Item placement was modified to ensure the best fit and arrangement of items on any given page.
- **Facing-page issues:** For multiple items associated with a single stimulus (inquiry task) and multiple-choice items with large graphics, consideration was given to whether those items needed to begin on a left- or a right-hand page and to the nature and amount of material that needed to be placed on facing pages. These considerations serve to minimize the amount of page-flipping required of students.
- **Relationship between forms:** Although equating and field-test items differ across forms, these items must take up the same number of pages in each form so that sessions begin on the same page in every form. Therefore, the number of pages needed for the longest form often determines the layout of each form.
- **Visual appeal:** The visual accessibility of each page of the form was taken into consideration, including such aspects as the amount of white space, the density of the text, and the number of graphics.

3.5.2 Item Writer Training

Item writing for the summative assessment is primarily done internally with Senior Specialists overseeing all development.

OK SDE and Cognia also hosted an item writing workshop for high school educators in May 2023. High school science and U.S. history educators attended and received training on item writing aligned to the content, structure, and format of CCRA Science and U.S. History items. Educators then authored new items through the remainder of the workshop. Completed items are being reviewed by Cognia and SDE, with the intent of releasing the final items as a resource for educators to use in the classroom to support instruction of the Oklahoma Academic Standards in those subject areas.

3.5.3 Operational Test Draft Review

After the forms were laid out as they would appear in the final test booklets, the forms were again thoroughly reviewed by Cognia editors and test developers to ensure that the items appeared exactly as the state specialists had requested. Finally, all the forms were reviewed by the state specialists for their final approval.

3.5.4 Alternative Presentations

One form of each grade content area was translated into Braille by a subcontractor who specializes in test materials for students who are blind or visually impaired. In addition, this Braille form was also adapted into a large-print version. The Braille vendor reviewed the form concurrently with the SDE review. This review included looking at items for any potential Braille ability issues. No concerns were identified for the items in the forms.

3.6 Relating Evidence Regarding Test Content and Development to the Validity Arguments

Chapter 3 provides evidence in support of Claims related to Arguments 1.1, 1.2, and 1.3, specifically relating the following evidence regarding test content and development to the validity arguments:

1.1 Argument: Observations of performance on the OSTP reflect the knowledge, skills, and abilities (KSA) articulated in the OAS with appropriate assessment tasks representing the full breadth and depth of the domain as articulated within these standards. (Description Inference)

1.1.1 ***Claim***: Expected knowledge, skills, and abilities are thoroughly articulated and considered appropriate to the grade and content area being assessed.

Evidence: The direct link between the OAS and the assessments throughout the test design, development, and implementation processes for all grades and content areas is thoroughly articulated in Chapter 3.

1.1.2 ***Claim:*** Assessment tasks are developed to provide evidence of the expected knowledge and abilities for each grade and content area being assessed.

Evidence: Subsections 3.x.1 (each 3."x" about a different content area of the OSTP) all explicitly state that OSTP items in the content area and grades being assessed “were developed specifically for Oklahoma and are directly linked to the OAS.” Subsection 3.1.3 describes passage development for ELA specifically in terms of how reading passages are selected for alignment to the OAS. Subsections 3.1.4, 3.2.3, 3.3.2, and 3.4.2 describe item development for specific content areas.

1.2 Argument: Each test form, an organized sampling of assessment tasks, results in an observed score that reflects a student’s knowledge and abilities in the content area being assessed through appropriate test assembly, administration, and scoring procedures. (Evaluation Inference)

1.2.1 ***Claim:*** Each form is constructed to draw from available items such that the underlying domain of knowledge and abilities is adequately sampled.

Evidence: Subsections 3.x.1 describe blueprints for identifying the amount of content covered on the test forms, specifically stating that test blueprints "are based on the importance and coverage of [the OAS] in Oklahoma schools." Ideal blueprints are included in Appendix C. For existing assessments (all but CCRA-Science), tables are provided showing that content and Depth of Knowledge distributions on test forms are within the target blueprint ranges for all assessments.

1.2.4 ***Claim:*** Items on the assessment demonstrate appropriate statistical quality.

Evidence: Subsections 3.1.8, 3.2.5, 3.3.4, and 3.4.4 describe the review process for evaluating items flagged by item analyses.

1.3 Argument: The observed score on any specific test form for a given grade and content area is reflective of the expected score on any form of the test for that grade and content area. (Generalization Inference)

1.3.1 ***Claim:*** Task specifications adequately inform production or selection of items with similar content and statistical characteristics.

Evidence: Subsections 3.1.2 and 3.2.2 contain some information about item specifications for ELA and mathematics assessments, respectively. It is stated that "each item was designed to measure a specific standard and objective" in the OAS.

1.3.2 ***Claim:*** Test specifications result in forms of similar length and task distribution.

Evidence: Section 3.5 describes the test development process in detail, specifically outlining item selection, test assembly, and review to ensure the equivalency of forms based on a robust set of criteria. Within Chapter 3, the section for each OSTP content area has a subsection on Test Design and Development for the current year's assessments. These demonstrate the common structure of forms within a given grade and content area. Subsections 3.x.1, which describe blueprint distributions, provide further evidence that the selection of tasks considers and meets content coverage requirements.

1.4 Argument: Expected scores are attributable to proficiency in the target knowledge and abilities. (Explanation Inference)

1.4.3 Claim: Characteristics of knowledge expected to affect task difficulty correlate with empirical item difficulty.

Evidence: Subsections 3.1.1, 3.2.1, and 3.3.1 contain Depth of Knowledge distributions for ELA, mathematics, and science, respectively. Subsections 3.3.7 and 3.4.7 describe how cognitive complexity is captured within the science and history exams. These are attributes that are incorporated within item development approaches that correlate with expected item difficulty.

CHAPTER 4. TEST ADMINISTRATION

4.1 General Administration Information and Guiding Principles

Table 4-1. 2022–23 Testing Windows for 2022–23

	Grade	Paper-based Testing Window	Computer-based Testing Window	Assessments
OSTP	Grade 3	4/17/23–5/3/23	4/17/23–5/17/23	ELA and Mathematics
	Grade 4	4/20/23–5/3/23	4/20/23–5/17/23	ELA and Mathematics
	Grade 5	4/20/2.–5/3/2.	4/20/2.–5/17/2.	ELA, Mathematics, and Science
	Grade 6	4/20/2.–5/3/2.	4/20/23–5/17/23	ELA and Mathematics
	Grade 7	4/20/23–5/3/23	4/20/22–5/17/23	ELA and Mathematics
	Grade 8	4/20/23–5/3/23	4/20/23–5/17/23	ELA, Mathematics, and Science
CCRA	Grade 11	4/3/23–4/14/23	43/23–4/27/23	Science and U.S. History

Total administration by test mode, of either paper-based tests (PBT) or online computer-based tests (CBT), for each grade and content area is shown in Table 4-2 below. All OSTP assessments for grades 3–8 and 11 are offered as online assessments with paper assessments available only as an accommodation. CBT tests of the OSTP and CCRA may be administered on a variety of device types including different operating systems and displays. Evidence of comparability between groups using different approved CBT device types and online accommodation tools is provided in Appendix E

Table 4-2. Administration by Grade and Test Mode

Grade	Content Area and Form	Test Mode	Count
3	ELA Breach Form	Online	29
	ELA Operational Form	Online	49,685
	ELA Operational Form	Paper	193
	MAT Breach Form	Online	58
	MAT Operational Form	Online	49,497
	MAT Operational Form	Paper	205
	MAT Spanish Form	Online	104
4	ELA Breach Form	Online	7
	ELA Operational Form	Online	49,122
	ELA Operational Form	Paper	230
	MAT Breach Form	Online	13
	MAT Operational Form	Online	48,975
	MAT Operational Form	Paper	217
	MAT Spanish Form	Online	122
5	ELA Breach Form	Online	57
	ELA Operational Form	Online	48,575
	ELA Operational Form	Paper	170
	MAT Breach Form	Online	15
	MAT Operational Form	Online	48,451
	MAT Operational Form	Paper	175
	MAT Spanish Form	Online	128

continued

Grade	Content Area and Form	Test Mode	Count
5	SCI Breach Form	Online	8
	SCI Operational Form	Online	48,421
	SCI Operational Form	Paper	154
	SCI Spanish Form	Online	146
6	ELA Breach Form	Online	8
	ELA Operational Form	Online	48,771
	ELA Operational Form	Paper	163
	MAT Breach Form	Online	13
	MAT Operational Form	Online	48,569
	MAT Operational Form	Paper	164
	MAT Spanish Form	Online	132
7	ELA Breach Form	Online	3
	ELA Operational Form	Online	49,871
	ELA Operational Form	Paper	187
	MAT Breach Form	Online	5
	MAT Operational Form	Online	49,621
	MAT Operational Form	Paper	186
	MAT Spanish Form	Online	169
8	ELA Breach Form	Online	18
	ELA Operational Form	Online	51,246
	ELA Operational Form	Paper	147
	MAT Breach Form	Online	9
	MAT Operational Form	Online	51,012
	MAT Operational Form	Paper	147
	MAT Spanish Form	Online	151
	SCI Breach Form	Online	4
	SCI Operational Form	Online	50,996
	SCI Operational Form	Paper	139
	SCI Spanish Form	Online	130
11	SCI Breach Form	Online	21
	SCI Operational Form	Online	48,813
	SCI Operational Form	Paper	62
	SCI Spanish Form	Online	93
	USH Operational Form	Online	48,819
	USH Operational Form	Paper	66
	USH Spanish Form	Online	129

4.2 Roles and Responsibilities for Administration

The *2022–23 OSTP Test Administration Manual* indicated that school principals and/or their designated OSTP test coordinators were responsible for the proper administration of the OSTP tests. Uniformity of administration procedures from school to school was ensured by using manuals that contained explicit directions and scripts to be read aloud to students by test administrators and by providing training. The SDE also conducted site-monitoring visits during the test administration to ensure all guidelines were followed.

4.3 Administration Procedures

Assessment training modules, test administration workshops, prerecorded webinars, and test administration manuals were provided to District Test Coordinators and to other assessment support staff, to give clear direction and support for the test administration for paper-based and computer-based assessments. Refer to section 4.5 for a brief description of the training. The districts' designated OSTP test coordinators were instructed by the SDE to read the *2022–23 OSTP Test Administration Manual*. The checklists included in the *2022–23 OSTP Test Administration Manual* outlined tasks to be performed by school staff before, during, and after test administration. In addition to these checklists, the *2022–23 OSTP Test Administration Manual* described the testing material sent to each school and how to inventory it, track it during administration, and return it after testing was complete. An additional focus was on maintaining security of the test materials. The *2022–23 OSTP Test Administration Manual* included checklists for the administrators to use to prepare themselves, their classrooms, and the students for the administration of the tests. The *2022–23 OSTP Test Administration Manual* contained sections that detailed the procedures to be followed for each testing session and instructions for preparing paper-based and computer-based materials before the test coordinator returned them to Cognia.

4.4 Participation Requirements and Documentation

The intent of the SDE in Oklahoma is for all public-school students in grades 3–8 and 11 to participate in the OSTP assessments through a standard administration, an administration with test accommodations , or an alternate assessment (see Appendix F for participation rates). Furthermore, any student who is absent during any session of the assessment is expected to take a make-up test within the testing window. The state of Oklahoma does not recognize OSTP opt-outs. Approximately 98.9% of students in grades 3–8 participated in the 2022–23 OSTP, and approximately 97.0% of students in grade 11 participated in the CCRA.

Because of statutory and rule requirements resulting from the adoption of House Bill 3218, there is no opt-out option offered through the SDE. Schools were required to return a Student Answer Document for every enrolled student in the grade level, except for students who took an alternate assessment. Students who were alternately assessed in the 2022–23 school year were not required to participate in the 2022–23 OSTP. On those occasions when it was deemed impossible to test a particular student, school personnel were required to inform the SDE. A summary of participation in the 2022–23 OSTP and CCRA by demographic category and content area is shown in Appendix F.

4.4.1 Students with Disabilities

All students were expected to participate in the 2022–23 OSTP and CCRA unless they completed an alternate assessment during the 2022–23 school year.

4.4.2 English Learners

Students who had received fewer than 12 months of consecutive instruction in a U.S. public school and were designated as English Learners (Els) were required to take the ELA, mathematics, and science

OSTP tests. Spanish versions of mathematics and science tests were provided for computer-based assessments.

4.5 Administrator Training

In addition to distributing the *2022–23 OSTP Test Administration Manual*, the SDE and Cognia conducted test administration workshops and webinars to inform school personnel about the OSTP tests and to provide training on the policies and procedures regarding administration of the tests. Six virtual trainings were conducted in February 2023. District Test Coordinators were required to attend the trainings, while other support personnel were optional attendees. Approximately twelve hundred people attended the trainings. In addition, an audio PowerPoint test administration workshop presentation was prerecorded and provided to the state for inclusion on the SDE website. These trainings were geared toward the District Test Coordinators.

Test Administrators and Test Proctors were also required to attend training in their schools or districts prior to administration. These trainings were in the form of online modules. A test was provided at the end of the module requiring a score of at least 80% to pass. Test Administrators and Test Proctors were required to pass this test and provide their Building Test Coordinator a copy of the certificate that prints upon completion.

4.6 Documentation of Accommodations

A test accommodation is a change in the way a test is administered or in the way a student responds to test questions. Similar to instructional accommodations, test accommodations are intended to offset the effects of a student’s disability and to provide him or her with the opportunity to demonstrate knowledge and skills on statewide assessments. The right of a student with a disability to receive allowable accommodations on OSTP tests is protected by both federal and state laws.

The student’s current individualized education program (IEP) or 504 plan must specify precisely which test accommodation(s) he or she will receive. In cases where an IEP/504 plan is under development, the IEP/504 team must have already met and agreed upon the necessary accommodation(s) before a student may be provided the accommodation(s).

A student who does not have a documented disability or is not served by a current IEP/504 plan is not eligible to receive accommodations on OSTP tests, except for Emergency Accommodation situations. Scribes may be provided for any student (with or without an IEP/504 plan) who has a short-term medical condition that affects his or her physical dexterity and thus impedes his or her ability to respond to the assessment format. For more detailed information regarding assessment accommodations for students with an IEP/504 plan, see Appendix E or access the *OSTP Accommodations Manual* at https://sde.ok.gov/state-testing-resources.

Large-print versions of the tests were created using Form 1 of the tests at all grade levels for students with visual impairments. At all grades, only the operational items were translated into Braille by American Printing House for the Blind, a subcontractor that specializes in test materials for students who are blind or who need accommodations due to visual impairments.

For computer-based testing (CBT), the following accommodations were available:

- Color Contrast, where the student can select alternative background colors;
- Screen Zoom, where the entire screen is zoomed up to 300%;
- Text-to-Speech, where the computer reads the text to the student.

The *OSTP Accommodations Manual* provides directions for coding information related to test accommodations and modifications in the Student Answer Document. All accommodations used during any test session were required to be coded by authorized school personnel—not by students—after testing was completed.

See Table 4-3 for the numbers of students tested with and without accommodations. In addition, the number of students who were tested with online testing accommodations are presented by accommodation type in Appendix G.

Table 4-3. Numbers of Students Tested with and Without Accommodations by Content Area and Grade

Tested Grade	Content Area	Number of Students	
		With Accommodations	Without Accommodations
3	ELA	435	49,472
	Mathematics	8,504	41,360
4	ELA	380	48,979
	Mathematics	8,850	40,477
5*	ELA	6,770	42,032
	Mathematics	8,297	40,472
	Science	7,969	40,760
6	ELA	288	48,654
	Mathematics	7,430	41,448
7	ELA	200	49,861
	Mathematics	7,049	42,932
8*	ELA	5,043	46,368
	Mathematics	6,865	44,454
	Science	6,413	44,856
11	Science	2,636	46,353
	U.S. History	2,608	46,406

**For spring 2023 this includes read aloud for the G5 and G8 writing prompt which does not require SDE approval.*

4.7 Test Security

Maintaining test security is critical to the success of the OSTP. The *2022–23 OSTP Test Administration Manual* explains in detail all test security measures and test administration procedures. The SDE takes the matter of test security very seriously and has implemented stringent procedures to protect the security of the OSTP.

Each District Test Coordinator, Building Test Coordinator, Test Administrator, and Test Proctor was responsible for receiving all secure test materials and for returning all secure test materials (see Section 210:10-13-4 of the Oklahoma Administrative Code available here: https://rules.ok.gov/code?q=). Violation of regulations could result in revocation of a person's teaching, counseling, administrative, and/or other certificates. The tests, and all the materials associated with these tests, were to be considered secure materials. It was important to prevent any student from having access to the tests, and thus, an advantage over other students before the administration of the tests. Prior exposure to the tests or to individual items would invalidate scores. It was expressly forbidden that the materials associated with these tests be photographed, photocopied, or reproduced in any other fashion, including paraphrasing—to do so would be in violation of copyright law. All test items had been copyrighted by the SDE. In addition, students were not permitted to have cell phones during testing, to avoid reproduction or communication of secure test materials.

The *2022–23 OSTP Test Administration Manual* describes in detail the policy and procedures for nondisclosure of test content, securing test materials, use of proctors, use of security forms, test administrator responsibilities, and reporting test irregularities. The SDE also conducted site visits during test administration to assure compliance with policies. During this administration, 272 sites were selected for desk monitoring and 36 sites for on-site monitoring. On-site monitoring included the following:

1. Assessment monitors checked into the site offices, presenting proper identification. They asked to see the Building Test Coordinator and signed in.
2. If time permitted, prior to the beginning of the testing session, monitors conducted a walkthrough of the testing rooms, observed the location where the secure materials were kept, and checked the copiers for the required signage.
3. When observing assessment activities, monitors practiced the principle of "observation from a distance," with the understanding that the site staff needed to go about performing their job tasks while taking little or no notice of their observers. Monitors must be able to conduct their observation without participating in the administration in any way.
4. Most of the activities on assessment day were easily visible to observers. Before and after the administration, the observer may have walked among the district and site assessment personnel to view their work.
5. The State (SDE) Office of Assessment observers may have requested access to view documentation for students who were receiving accommodations on the assessments.
6. During the assessment, the monitors attempted to seat themselves where they could observe all assessment activities and complete the observation checklist while maintaining a comfortable distance from students and the site assessment personnel.
7. The observation may have been extended after the conclusion of the assessment so that post-assessment activities could be observed.
8. If district or site staff were not following assessment protocol, this would be noted on the observation checklist. The observer was not to correct site staff or make comments about task performance while in a testing room.

9. If an observation was made that needed immediate attention, monitors were to notify the Office of Assessments and Accountability for additional guidance and permission to invalidate assessments. District Test Coordinators would be notified of the violation and concern.
10. At the end of the visit, observation feedback was submitted to the State Office of Assessments and Accountability using the checklist document (paper-based or electronic versions).
11. The section for Other Comments was available for observers to include their thoughts about administration of the assessment, such as appropriate tone, management, and monitoring of the session; provision for security and confidentiality of test materials; school and student information; any information that might require action during this assessment cycle; and overall impressions of the assessment administration.
12. Completed checklists were to be submitted to the State (SDE) Office of Assessment in a timely manner, preferably within two days of completing the visit.

Materials were inventoried when returned to Cognia at the end of the test administration. A materials discrepancy report was provided after all secure materials were scanned. Cognia used this report to note and then make all attempts to recover any missing materials. The process for researching any missing materials includes the following directions:

- Contact the District Test Coordinators at schools on the list and have them conduct a search for any missing materials to ensure they were returned. If those materials are located, Cognia arranges for the return of those materials. (Cognia also conducts a physical box search on site at their facilities to search for materials.)
- Maintain a spreadsheet to document the missing materials if materials were not located by Cognia or the District Test Coordinator.

At the end of the secure material discrepancy clean-up period for 2023, there were 44 test booklets that were not recovered. These materials included a combination of test booklets, integrated test booklets, and large-print kits; all those materials are listed in Table 4-4 below.

Table 4-4. Secure Material Discrepancy

Grade	ELA	Mathematics	Science	U.S. History
3				
4				
5				
6	9 Regular Print	7 Regular Print		
7				
8				
11			1 Regular Print	1 Regular Print
Totals	**9**	**7**	**1**	**1**

Additionally, Cognia uses two statistical methods for detecting possible test security violations: inordinate response similarity analyses and inordinate score gain analyses. Statistical detection findings, provided in Appendix H, are used to indicate whether additional follow-up may be required to determine if a test security violation may have occurred.

4.8 Test and Administration Irregularities

There were no major testing irregularities to report during this administration. The only situation to note was an issue with the writing portion of the ELA test during the first few days of operational testing. Due to a setting in the testing platform, the spellcheck button was inadvertently turned on for students to use. Cognia Psychometrics reviewed statistics for students who had the spellcheck available during their writing tests and did not observe any abnormalities in scoring or reporting results.

4.9 Service Center

To provide additional support to schools before, during, and after testing, Cognia operates the OSTP Service Center. The support of a service center is essential to the successful administration of any statewide testing program. The service center provides a centralized location that individuals in the field can call, using a toll-free number or chat feature, to ask specific questions or to report any problems with paper-based testing or computer-based testing. Representatives are responsible for receiving, responding to, and tracking calls, and then routing issues to the appropriate person(s) for resolution. All calls are logged into a database that includes entry for notes regarding the issue and resolution of each call.

The service center is staffed year-round and is available to receive calls from 7:30 a.m. to 4:30 p.m. CST, Monday through Friday. The service center is staffed accordingly year-round to meet the SDE's needs throughout the year. Hours of operation are Monday - Friday from 7:30 a.m. to 4:30 p.m. CST and 6:00 a.m. to 6:00 p.m. CST during the test administration. There are three levels of support provided:

- Level 1 Support—Cognia Technical Product Support
- Level 2 Support—Cognia OSTP Program Help Desk
- Level 3 Support—eMetric Support for Computer-Based Testing Issues

Technical Support Figure 4-1 shows the “total contacts” (phone calls + email tickets) during the testing window.

Figure 4-1. Total Contacts (Phone Calls + Email Tickets) During Testing Window

Figure 4-2 shows the summary of "total contacts" (phone calls + email tickets) by category during the testing window.

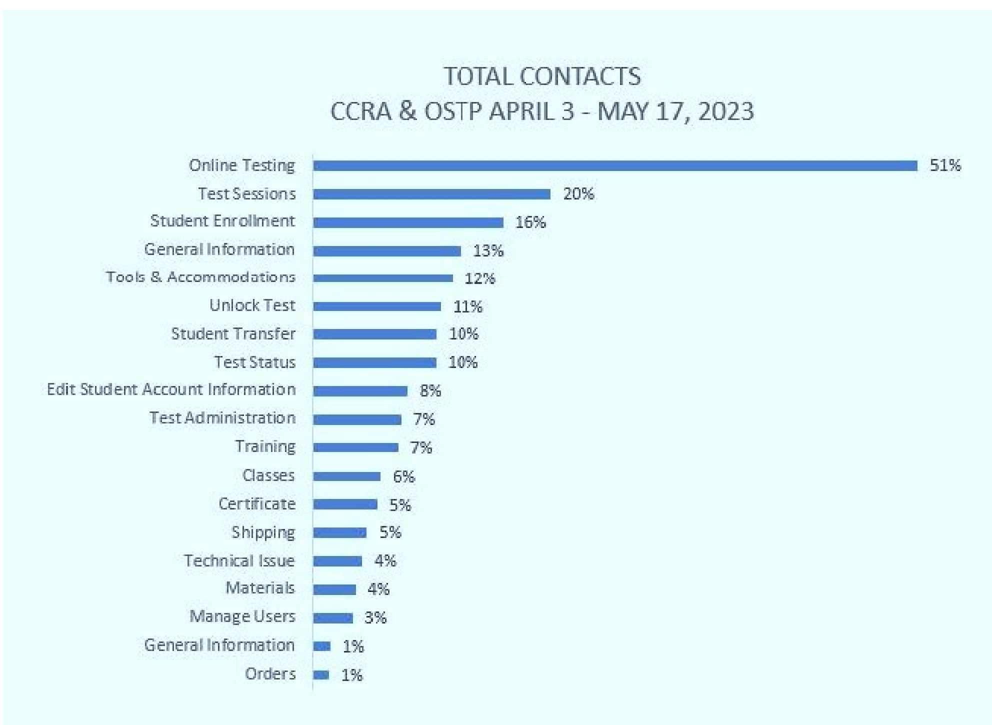


Figure 4-2. Summary of Total Contacts by Category

4.10 Relating Evidence Regarding Test Administration to the Validity Arguments

Chapter 4 provides evidence in support of Argument 1.2, specifically relating the following evidence regarding test administration to this validity argument and related claims:

1.2 ***Argument:*** Each test form, an organized sampling of assessment tasks, results in an observed score that reflects a student's knowledge and abilities in the content area being assessed through appropriate test assembly, administration, and scoring procedures. (Evaluation Inference)

1.2.2 ***Claim:*** The assessment is administered under appropriate conditions.

Evidence: Chapter 4 describes the administration process for the OSTP assessments. This includes administration modes, procedures, requirements and documentation, training, accommodations, test security, documentation of irregularities, and support provided by the OSTP Service Center. The administration process is described in greater detail in an administration manual. Details about the accommodations are provided in Appendix E.

CHAPTER 5. SCORING

Following a handoff from the test administration platform to the scoring system, all open-response items administered through computer-based testing were scored in iScore, a secure server-to-server electronic scoring software designed by Cognia for hand-scoring. Very few booklets from paper-based testing (less than 0.5% across all grades) were received for importing into iScore. The scoring of student work from both CBT and PBT follow the same scoring rules and specifications. All imaged data for multiple-choice responses were machine-scored.

5.1 Machine-Scored Items

Multiple-choice responses were compared to scoring keys using item analysis software. Correct answers were assigned a score of 1 point; incorrect answers were given a score of 0 points. Student responses with multiple marks or blank responses were also assigned 0 points.

The hardware elements of the scanners monitored themselves continuously for correct reads, and the software driving these scanners monitored the correct data reads. Standard checks included recognition of a sheet that did not belong or was positioned upside down or backward; identification of missing critical data, including a student ID number or test form that was out of range or missing; and identification of page/document sequence errors. When a problem was detected, the scanner stopped and displayed an error message directing the operator to investigate and correct the situation.

5.2 Scoring Platform and Scoring Positions

iScore is the proprietary image-based scoring system used by Cognia to view and record scores submitted by scorers for each open-ended item. The iScore system ensures the security of student responses and test items. During scoring, no student names or schools/districts associated with viewed student work are visible to scorers, and all Scoring Services temporary associates are subject to the same nondisclosure requirements as full-time Cognia staff. Cognia maintained security during scoring by using a highly secure, server-to-server interface, ensuring that access to all student response images was limited only to scorers and appropriate Cognia staff.

Scorers evaluated most student responses from images rendered by the online testing platform and a small number of responses from scanned images of paper-based tests. Whether administered in an online or a paper-based environment, all responses were scored applying the same scoring criteria.

Prior to the beginning of scoring, Cognia's iScore operational management created a contract database, and student responses were subsequently uploaded into the iScore system. To provide maximum security for all test and scoring materials in a distributed scoring environment, scorers were asked to download the iScore Kiosk onto their computers. The iScore Kiosk is a security feature that locks down the user's operating system so that no other application outside of iScore can run during scoring. Scorers and scoring leadership were given unique user authorization passwords as additional components of Cognia's stringent security procedures. Each scorer was required to log on to the image scoring system using a unique combination of an assigned username, a password, and a 6-digit code that was delivered via text and email.

The following staff members were involved with scoring the 2022–23 OSTP and CCRA responses:

- The Scoring Project Manager and the Director of Scoring Content and Quality oversaw communication and coordination of scoring, scheduling of activities, and general management of all Oklahoma scoring-related tasks.
- The iScore Operations Manager guided the technical aspects of the iScore scoring platform.
- The Scoring Content Specialist ensured consistency of scoring and managed the scoring leadership teams for all grades. The Scoring Content Specialist was responsible for monitoring scorer accuracy and accepting or rejecting the work product of scorers.
- Multiple Scoring Supervisors trained staff and oversaw items at each grade level. They were selected from a pool of experienced Scoring Team Leaders for their proven ability to score accurately and to instruct and train other scorers. Scoring Supervisors trained Scoring Team Leaders and scorers on the item, answered questions during the scoring process, and worked closely with the Scoring Content Specialist.
- Numerous Scoring Team Leaders (STLs), selected from a pool of skilled and experienced scorers, performed read-behind activities for the scorers to whom they were assigned. Scoring Team Leaders worked closely with the Scoring Supervisors to ensure accurate and consistent scoring for their assigned grade levels.
- Per OSTP requirements as expressed in the scoring specifications document, Scoring Supervisors, STLs, and scorers were required to hold a bachelor's degree with coursework related to the content area being scored. All potential scorers and leadership staff submitted documentation (e.g., résumés and/or transcripts) as evidence of meeting the education and experience requirements. As well, each scorer and leadership staff signed a binding non-disclosure/confidentiality agreement. Table 5.1 summarizes the qualifications of the 2022–23 OSTP scoring leadership and scorers.

Table 5-1. Educational Background of Scorers and Scoring Leadership for OSTP

Education	Scorers		Scoring Leadership	
	Total	Percentage	Total	Percentage
Bachelor's degree	104	56%	24	69%
Master's degree	69	37%	10	28%
Doctorate	12	7%	1	3%

5.3 Scoring of Writing Prompts

5.3.1 Scope of Work and Scoring Methodology

The writing component for grades 5 and 8 consisted of one item per grade. Responses to all writing prompts were scored on a holistic 1–4 scale. Scorers assigned one of the following codes to those responses that did not meet the criteria of the scoring rubric:

- **Blank**—No response or no intentional marks on the answer space.
- **Unreadable**—Response could not be read, either due to a scanning error, light or hard-to-read handwriting, or for other reasons. Unreadable responses were sent to Edit Scoring Supervisors who reviewed the paper copy of the test book to assess the response. This designation typically applied to PBT responses only.
- **Non-English**—Response was written in a language other than English.
- **Off Topic**—Response included a direct copy of the prompt without any original text, an irrelevant response that did not respond to the prompt, or any unrelated artwork.
- **Refusal**—Response indicated a clear refusal to answer the prompt.
- **Illegible**—Response showed illegible handwriting, a random sequence of keystrokes, or spelling that was so poor that the response could not be evaluated.

5.3.2 Leadership Training

Scoring Supervisors reviewed training materials and consulted with the Scoring Content Specialist in advance of scorer training to ensure full understanding of the scoring parameters and decisions for the item. Scoring Supervisors then conducted training for Scoring Team Leaders in a separate training session prior to scorer training. In addition to a discussion of the items and their responses, leadership training included greater detail on the client's scoring rationale of each score point, so that as leaders they would be better equipped to handle questions from the scorers.

5.3.3 Scorer Training

Scorer training began with an introduction of all scoring staff and an overview of the purpose and goals of the project—including discussion about the security, confidentiality, and proprietary nature of testing materials, scoring materials, and procedures. Next, scorers thoroughly reviewed and discussed the rubric as well as the anchor and practice set for each item before taking a qualification set.

Rubric Training

The grade 5 and grade 8 OSTP Holistic Writing rubrics served as tools for providing a single score to student writing based on its overall qualities. Feedback was given on a scale of 1–4. The rubrics delineated clear cut-points between score points using distinctly scaffolded language. While rubric training focused on the holistic nature of the rubrics, the individual features that contributed to determining each specific holistic score point were thoroughly reviewed. Those features were:

- **Content:** The degree of appropriateness related to the audience and task/purpose of the writing, the extent to which the focus was clearly maintained, and the depth of idea development.
- **Organization:** The degree of unity and coherence, the presence and impact of introduction and conclusion, and the use of sequencing tools such as transitions.
- **Word Choice:** The degree of variety of vocabulary used and the effectiveness of the language.
- **Sentence Structure:** The degree of variety of structures and correctness of sentences.
- **Grammar, Usage, and Mechanics:** The degree of control over grammar, usage, and mechanics.

These criteria served as excellent tools reflecting the key holistic features at each score point level. However, they were not intended to be used in isolation, but in concert with anchor exemplars that defined those features and provided context.

Anchor Set

Responses in anchor sets were typical, midrange examples of each score point. They were read aloud in ascending order of score points. By announcing the true score of each anchor response, trainers facilitated group discussion of responses in relation to score point descriptions to help scorers internalize the characteristics associated with each score point. This anchor set continued to serve as a reference for scorers as they went on to qualification, scoring, and recalibration activities for that item.

Practice Set

To mimic live scoring, scorers practiced applying the rubric and anchors to responses in the practice set. As such, scorers assigned scores without any knowledge of the given score. After scorers independently read and scored each response in the practice set, trainers would poll scorers, taking note of their initial assignments of scores. Trainers then led a group discussion of the responses, directing scorers' attention to difficult scoring issues (e.g., the borderline between two score points). Throughout the training, trainers modeled how to evaluate student responses by referring to the scoring standards as defined by the rubric and exemplified in the anchor set.

Qualifying Set

Scorers were required to score responses accurately and reliably in the qualifying set. The ten responses in the qualifying set were selected from an array of responses that clearly represented and illustrated the range of score points for that item as reviewed and approved by the state specialists.

To be eligible to score, scorers were required to achieve a scoring accuracy rate of at least 70% exact agreement and at least 90% exact or adjacent agreement.

5.3.4 Monitoring Scoring Quality

Scorers were required to demonstrate and maintain their ability to score student responses accurately and consistently throughout the scoring process. The iScore image-scoring system enabled scoring leadership to measure and monitor individual and group performance on each scored item in terms of accuracy and consistency and in terms of read rate (scoring speed) and overall production rate on a constant, real-time basis. The iScore scoring tools that measured OSTP scoring quality were as follows:

- Read-behind scoring
- Double-blind scoring
- Recalibration sets

Read-behind and double-blind statistics were reviewed daily. Recalibration sets were administered consistently during the project. The use of these multiple monitoring techniques is critical for monitoring scorer accuracy during the process of live scoring.

Each scorer's performance on the above quality measures was monitored and recorded by iScore and scoring leadership could review data related to the accuracy, consistency, and overall quality of scoring. Scoring leadership was always available to answer scorer questions. They also counseled and retrained scorers as needed to determine whether a scorer should continue scoring. Scorers who demonstrated inaccurate or inconsistent scoring through these quality control measures were stopped from scoring and retrained. Upon approval by the Scoring Supervisor or Scoring Content Specialist, the scorer could resume scoring. If a scorer's performance warranted removal from scoring, scoring leadership initiated a process through which that scorer's work was invalidated and returned to the scoring queue of unscored responses to be re-scored by those scorers who demonstrated scoring accuracy at or above standard.

Read-Behind Scoring Procedures

Read-behind scoring allowed scoring leadership to monitor each scorer's performance by way of an immediate real-time snapshot of the scorer's accuracy. The data that was generated by read-behind scoring presented leadership with opportunities to answer questions and to provide counsel to scorers who may have had trouble maintaining the scoring standards. iScore is designed such that the selection of any scored student responses for read-behind scoring was done without a scorer knowing which response was selected for a read-behind. The Scoring Team Leader (STL) would, at various points throughout the scoring session, instruct the system to assign the next one, two, or three responses per scorer to be placed into the read-behind queue at a time. Responses could be pulled for all scorers whowere assigned to an STL or for certain scorers only. Each read-behind response was scored blindly by the STL; that is, each scorer's response score was revealed only to the STL after the STL had submitted his or her score to the system. The STL would then have an opportunity to compare his or her score against the score assigned by the scorer. If the scores were discrepant (more than one score point apart) or if there were a considerable number of adjacent scores (one score point apart) between the scorer and the STL, scoring leadership then counseled and retrained the scorer. The STL entered his or her score into iScore before being allowed to see the scorer's score. The STL then compared the two scores, and the score-of-record (i.e., the reported score) was determined as follows:

- If there was exact agreement between the scorer and the STL scores, no action was taken—the scorer's original score remained.
- If scores were adjacent (a difference of one score point), the STL's score became the score of record.
- If the scores were discrepant (i.e., differed by more than one point), the STL's score became the score-of-record.

The STLs were tasked with conducting read behinds on 5% of the total student responses, with targets to distribute the read-behinds across all the scorers to which they were assigned. Scorers who hovered at the threshold of acceptable accuracy would have been targeted with more read-behinds than scorers who were consistently demonstrating high levels of accuracy.

Double-Blind Scoring

All student responses were 100% double-blind scored by the AI engine. In double-blind scoring, the situation might arise that the score assigned by the human scorer and the AI engine did not match. If there was a discrepancy (a difference greater than one score point) between two scores assigned to the same student response, it was placed into an arbitration queue. Arbitration responses were reviewed by scoring leadership (Scoring Team Leader or Scoring Supervisor) who assigned the final score. If the human score and the AI score were adjacent (a difference of one score point), then the first (human) score became the score of record.

Recalibration Sets

To determine whether scorers were still calibrated to the scoring standard, they were required to take an online recalibration set starting on the second day of scoring and on every subsequent day of scoring that item throughout the scoring project. Each recalibration set consisted of five responses representing a range of possible scores. Any scorer who demonstrated difficulty was retrained before being allowed by the Scoring Supervisor to continue scoring. Once the scorer was allowed to resume scoring, scoring leadership carefully monitored these scorers by increasing the number of read-behinds.

Scoring Reports

iScore generated multiple reports that were used by scoring leadership to measure and monitor scorers for scoring accuracy, consistency, and productivity. Samples of these reports are provided in Appendix I.

5.3.5 Interrater Consistency

Interrater consistency information is presented as evidence for the reliability of the scoring results for ELA grades 5 and 8. Specifically, these results demonstrate the agreement between scores assigned by the human rater and the AI engine serving as the second rater.

Various statistics are employed to evaluate interrater consistency or reliability, such as the number of included scores, percentage of exact agreement, percentage of adjacent agreement, and Cohen's weighted kappa (κ). The percentage of responses that required a third score is also included to quantify the discrepancy resolution between human rater and the AI engine when their scores are not adjacent. The correlation describes the degree of consistency between human rater and AI engine with a correlation of 1.0 being perfect agreement. Cohen's weighted kappa is a commonly used descriptor of interrater agreement, especially in cases where ratings are ordinal in nature, which describes interrater reliability while also accounting for agreement by chance. As with the correlation statistic presented, kappa achieves its maximum value of 1.0 only when all pairs of ratings are in exact agreement. Table 5-2 presents a summary of interrater consistency statistics for the items in grades 5 and 8.

Table 5-2. Summary of Interrater Consistency Statistics for Grades 5 and 8 Writing

Grade	Item Number	Score Categories	Included Scores	Exact	Adjacent	% of Third Score	Weighted Kappa
5	761899	4	4-1	67.30	30.50	19.00	0.50
8	761992	4	4-1	69.60	29.30	16.80	0.58

On average, the human rater and the AI engine for the item in grade 5 agreed exactly (i.e., both modes of scoring independently rated the responses with the same score) 67.3% of the time and in grade 8 69.6% of the time. The Weighted Kappa statistic for both grades is within the range of substantial agreement. In the few instances of disagreement of more than one score point between the AI score and the human score, the responses were automatically routed to a third rater to resolve the discrepancy and mitigate the impact of the disparity.

5.4 Scoring of Constructed-Response Items

5.4.1 Scope of Work

The OSTP test administration for ELA also consisted of two operational constructed-response items and four field-test constructed response items each in grades 3, 4, 6, and 7.

5.4.2 Benchmarking Meetings

Benchmarking meetings were held between the Scoring Content Specialist, the Content Development Specialist, and the SDE Content Specialist to discuss the way the students engaged with each item and to review the suggested scores assigned to the benchmarked materials. Other SDE members were also present at the benchmarking meetings. Each of the 16 field-test items across grades 3, 4, 6, and 7 was reviewed to determine their scorability and to set the scoring standards using exemplar student responses. As per standard protocol and best practice, SDE representatives officially approved the responses and their respective scores for their use in scorer training.

5.4.3 Quality Control Tools and Interrater Consistency

The scoring of the constructed-response (CR) questions mostly followed the same scoring specifications and parameters as the grade 5 and 8 writing prompts. Compared to the qualification threshold set at 70% exact and 90% adjacent agreement for the writing prompts in grades 5 and 8, the scorer qualification threshold for the CR items in grades 3, 4, 6, and 7 was 80% exact and 98% adjacent. The double-blind rate for the two operational items per grade was 100% with the second score provided by the AI engine. The double-blind rate for the four field-test items per grade was 50% with the second score provided by a human rater. The same quality control tools were used for the CR items as for the writing items in grades 5 and 8 and as described in section 5.3.4.

Table 5-3 shows a summary of interrater consistency statistics for the CR items in grades 3, 4, 6, and 7. Please note that the weighted kappa coefficient is not calculated for items scored on a scale of 0-2.

Table 5-3. Summary of Interrater Consistency Statistics for Grades 3, 4, 6, and 7 CR Items

Grade	Administration	Item Number	Score Categories	Included Scores	Exact	Adjacent	% of Third Score
3	FT	01020	3	2-0	70.2	28.9	0.9
	FT	01043	3	2-0	89.2	10.8	0.0
	FT	02020	3	2-0	96.6	8.4	0.0
	FT	02043	3	2-0	85.7	14.2	0.2
	OP	CC027	3	2-0	83.7	16.3	0.0
	OP	CC051	3	2-0	83.1	16.9	0.0
4	FT	01019	3	2-0	86.8	12.9	0.3
	FT	01051	3	2-0	81.0	17.5	1.6
	FT	02019	3	2-0	75.6	22.3	2.0
	FT	02051	3	2-0	91.1	7.6	0.3
	OP	CC024	3	2-0	77.3	22.4	0.3
	OP	CC041	3	2-0	76.7	23.3	0.0
6	FT	01011	3	2-0	65.7	34.1	0.2
	FT	01053	3	2-0	77.8	21.8	0.4
	FT	02011	3	2-0	77.8	22.1	0.1
	FT	02053	3	2-0	78.0	21.6	0.5
	OP	CC006	3	2-0	86.8	13.1	0.0
	OP	CC043	3	2-0	95.7	4.3	0.0
7	FT	01018	3	2-0	93.7	6.1	0.2
	FT	01055	3	2-0	79.6	19.7	0.7
	FT	02018	3	2-0	71.2	28.3	0.6
	FT	02055	3	2-0	92.9	6.7	0.3
	OP	CC013	3	2-0	96.6	3.4	0.0
	OP	CC036	3	2-0	87.0	13.0	0.0

The degree of interrater agreement between all items and grades was influenced by the level of difficulty that students experienced in answering the CR question. Questions that addressed concepts with which students were more familiar resulted in student work that clearly fell within the parameters of a particular score point whereas less clear responses often fell between two adjacent score points, as notable in the interrater consistency statistics.

5.5 Relating Evidence Regarding Scoring to the Validity Arguments

Chapter 5 provides evidence in support of Claim 1.2, specifically relating the following evidence regarding scoring to the validity arguments:

1.2 ***Argument:*** Each test form, an organized sampling of assessment tasks, results in an observed score that reflects a student's knowledge and abilities in the content area being assessed through appropriate test assembly, administration, and scoring procedures. (Evaluation Inference)

1.2.3 ***Claim:*** The scoring procedures and models produce scores accurately reflective of targeted knowledge and abilities.

Evidence: Chapter 5 has detailed sections describing the scoring process for the OSTP and CCRA assessments, including processes for machine scoring multiple-choice responses on paper-based tests, online scoring of computer-based tests, scoring of writing prompts, field-testing procedures for constructed-response items, and methodology for scoring polytomous items.

CHAPTER 6. CLASSICAL ITEM ANALYSIS

As noted in the *Principles of Educational and Psychological Testing* (Brown, 1983), “A test is only as good as the items it contains.” A complete evaluation of a test’s quality must include an evaluation of each item. Both *Standards for Educational and Psychological Testing* (AERA et al., 2014) and *Code of Fair Testing Practices in Education* (Joint Committee on Testing Practices, 2004) include standards for identifying quality items. Items should assess only knowledge or skills that are identified as part of the domain being tested and should avoid assessing irrelevant factors. Items should also be unambiguous and free of grammatical errors, potentially insensitive content or language, and other confounding characteristics. In addition, items must not unfairly disadvantage students, particularly racial, ethnic, or gender groups.

Both qualitative and quantitative analyses have been conducted to ensure that OSTP and CCRA items meet these standards. Qualitative analyses are described in earlier chapters of this report; this chapter focuses on quantitative evaluations. Statistical evaluations are presented in four parts: (1) difficulty indices, (2) item-test correlations, (3) differential item functioning (DIF) statistics, and (4) dimensionality analyses. The item analyses presented here are based on the statewide administration of the OSTP and CCRA in spring 2023. Note that the information presented in this chapter is based on operational items (the items on which student scores are calculated). Item analyses were also performed for field-test items; the statistics were used during the item review process and form assembly for future administrations.

6.1 Classical Difficulty and Discrimination Indices

All multiple-choice items were evaluated in terms of item difficulty according to standard classical test theory practices. Difficulty is defined as the average proportion of points achieved on an item and is measured by obtaining the average score on an item and dividing it by the maximum possible score for the item. Multiple-choice items are scored dichotomously (correct vs. incorrect); for these items, the difficulty index is simply the proportion of students who correctly answered the item. Although this index is traditionally described as a measure of difficulty, it is properly interpreted as an *easiness* index, because larger values indicate easier items. An index of 0.0 indicates that all students received no credit for the item, and an index of 1.0 indicates that all students received full credit for the item.

Items that are answered correctly by almost all students provide little information about differences in student abilities, but they do indicate knowledge or skills that have been mastered by most students. Similarly, items that are correctly answered by very few students provide little information about differences in student abilities, but they may indicate knowledge or skills that have not yet been mastered by most students. In general, to provide the best measurement, difficulty indices should range from near-chance performance (0.25 for four-option multiple-choice items) to 0.90, with most items generally falling between around 0.4 to 0.7. However, on a standards-referenced assessment such as the OSTP and CCRA, it may be appropriate to include some items with very low or very high item difficulty values to ensure sufficient content coverage.

A desirable characteristic of an item is for higher-ability students to perform better on the item than lower-ability students do. The correlation between student performance on a single item and total test score is a commonly used measure of this characteristic of the item. Within classical test theory, the item-test correlation is referred to as the item's discrimination because it indicates the extent to which successful performance on an item discriminates between high and low scores on the test. The theoretical range of these statistics is –1.0 to +1.0, with a typical observed range from 0.2 to 0.6.

Discrimination indices can be thought of as measures of how closely an item assesses the same knowledge and skills assessed by other items contributing to the criterion total score. That is, the discrimination index can be thought of as a measure of construct consistency.

A summary of the item difficulty and item discrimination statistics for each content area and grade combination is presented in Table 6-1. Note that the statistics are presented for all multiple-choice items. The mean difficulty and discrimination values shown in the table are within the generally acceptable and expected ranges, with mean difficulties (*p*-values) between 0.41 and 0.68 and mean discriminations between 0.37 and 0.45.

Table 6-1. Summary of Item Difficulty and Discrimination Statistics of Multiple-Choice Items by Content Area and Grade

Content Area	Grade	Number of Items	*p*-Value				Discrimination			
			Mean	Standard Deviation	Min	Max	Mean	Standard Deviation	Min	Max
ELA	3	52	0.54	0.15	0.27	0.83	0.44	0.12	0.13	0.66
	4	51	0.60	0.15	0.25	0.91	0.44	0.11	0.11	0.58
	5	51	0.68	0.14	0.31	0.95	0.44	0.07	0.19	0.62
	6	50	0.57	0.15	0.21	0.82	0.42	0.09	0.19	0.60
	7	52	0.55	0.13	0.28	0.81	0.42	0.09	0.16	0.58
	8	51	0.60	0.17	0.22	0.93	0.38	0.11	0.11	0.58
Mathematics	3	50	0.66	0.16	0.27	0.96	0.45	0.10	0.16	0.64
	4	50	0.63	0.16	0.26	0.87	0.45	0.08	0.22	0.62
	5	51	0.61	0.18	0.21	0.92	0.44	0.08	0.23	0.59
	6	56	0.52	0.20	0.16	0.90	0.42	0.09	0.20	0.60
	7	56	0.41	0.17	0.15	0.80	0.42	0.10	0.15	0.57
	8	55	0.44	0.15	0.20	0.72	0.40	0.10	0.19	0.60
Science	5	45	0.57	0.16	0.33	0.86	0.39	0.08	0.22	0.55
	8	46	0.52	0.14	0.25	0.76	0.39	0.08	0.19	0.50
	11	60	0.43	0.11	0.23	0.70	0.37	0.10	0.14	0.62
U.S. History	11	50	0.51	0.13	0.26	0.83	0.41	0.10	0.15	0.56

A comparison of indices across grade levels is complicated because these indices are population-dependent. Direct comparisons would require that either the items or the students were common across groups. Since that is not the case, it cannot be determined whether differences in performance across grade levels are due to differences in student abilities, differences in item difficulties, or both. With this caveat in mind, it appears generally that for mathematics and science, students in higher grades found their items more difficult than did students in lower grades, while in ELA difficulty values are more constant across grades.

In addition to the item difficulty and discrimination summaries presented above, item level classical statistics and item level score distributions were also calculated. Item level classical statistics are provided in Appendix J with item difficulty and discrimination values listed for each item. The item difficulty and discrimination indices are within generally desirable ranges. Very few items were answered correctly at near-chance or near-perfect rates. Similarly, the positive discrimination indices indicate that students who performed well on individual items tended to perform well overall. There were a small number of items that had near-zero discrimination indices.

6.2 Differential Item Functioning (DIF) Analysis

Code of Fair Testing Practices in Education (2004) explicitly states that subgroup differences in performance should be examined when sample sizes permit, and that actions should be taken to ensure that differences in performance are due to construct-relevant, rather than irrelevant, factors. *Standards for Educational and Psychological Testing* (AERA et al., 2014) includes similar guidelines. As part of the effort to identify such problems, all 2022–23 OSTP and CCRA assessment items (operational and field-test items) were evaluated in terms of differential item functioning (DIF) statistics.

Following the classical item analyses, the DIF analyses were performed. One goal of test development is to assemble a set of items that provides an estimate of student ability that is as fair and accurate as possible for all groups within the population. DIF statistics are used to identify items in which focal groups (e.g., Females, African Americans, Hispanics) of students with the same underlying level of ability have different probabilities than those of reference groups (e.g., Males, Whites) of answering correctly. If the item is more difficult or easier for an identifiable focal subgroup, the item may be measuring something different from the intended construct.

For the 2022–23 OSTP and CCRA, 10 demographic subgroup comparisons were evaluated for DIF:

- Male versus Female
- White versus Hispanic or Latino
- White versus Black/African American
- White versus American Indian/Alaskan Native
- White versus Pacific Islander

- White versus two or more races
- Non-EL versus EL (English Learner)
- Non-IEP versus IEP (Individualized Education Program)
- Non-Economically Disadvantaged versus Economically Disadvantaged

For the OSTP and CCRA, the standardization DIF procedure (Dorans & Kulick, 1986) was employed to evaluate subgroup differences. The standardization DIF procedure is designed to identify items for which subgroups of interest perform differently, beyond the impact of differences in overall achievement. The DIF procedure calculates the difference in item performance for two groups of students (at a time) matched for achievement on the total test. Specifically, average item performance is calculated for students at every total score. Then an overall average is calculated, weighting the total score distribution so that it is the same for the two groups.

When differential performance between two groups occurs on an item (i.e., a DIF index in the “low” or “high” categories, explained below), it may or may not be indicative of item bias. Course-taking patterns or differences in school curricula can lead to DIF, but for construct-relevant reasons. On the other hand, if subgroup differences in performance could be traced to differential experience (such as geographical living conditions or access to technology), the inclusion of such items should be reconsidered.

Computed DIF indices have a theoretical range from –1.0 to 1.0 for multiple-choice items. Dorans and Holland (1993) suggested that index values between –0.05 and 0.05 should be considered negligible. Dorans and Holland further stated that items with values between –0.10 and –0.05 or between 0.05 and 0.10 (i.e., “low” DIF) should be inspected to ensure that no possible effect is overlooked and that items with values outside the [–0.10, 0.10] range (i.e., “high” DIF) are more unusual and should be examined very carefully.[8]

Generally, the number of high DIF items was low for most tests. Most tests had zero items flagged for any of the subgroup comparisons, with the remaining tests having three or fewer items flagged. These differences typically result from subgroup comparisons with small focal groups (e.g., White versus Pacific Islander). Notably, no items were flagged for high DIF based on Economic Disadvantage. With so few items flagged, no other patterns are evident. The tables in Appendix K present the number of items classified as either “low” or “high” DIF, overall and by group favored.

[8] *It should be pointed out here that DIF for items is evaluated initially at the time of field-testing. If an item displays high DIF, it is flagged for review by a Cognia content specialist. The content specialist consults with the SDE to determine whether to include the flagged item in a future operational test administration.*

6.3 Dimensionality Analysis

Because tests are constructed with multiple content area subcategories and their associated knowledge and skills, the potential exists for many dimensions to be invoked beyond the common primary dimension. Generally, the subcategories are highly correlated with each other; therefore, the primary dimension they share typically explains an overwhelming majority of variance in test scores (Roussos & Ozbek, 2006). In fact, the presence of just such a dominant primary dimension is the psychometric assumption that provides the foundation for the unidimensional item response theory (IRT) models that are used for calibrating, linking, scaling, and equating the 2022–23 OSTP and CCRA test forms.

The purpose of dimensionality analyses is to investigate whether violation of the assumption of test unidimensionality is statistically detectable and, if so, (1) the degree to which unidimensionality is violated and (2) the nature of the multidimensionality. Findings from dimensionality analyses performed on the 2022–23 OSTP and CCRA common items for mathematics, ELA, science, and U.S. history are reported in Table 6-2. (Note: Only common and operational items were analyzed because they are used for score reporting.)

The dimensionality analyses were conducted using the nonparametric IRT-based methods DIMTEST (Stout, 1987; Stout, Froelich, & Gao, 2001) and DETECT (Zhang & Stout, 1999). Both methods use as their basic statistical building block the estimated average conditional covariances for item pairs. A conditional covariance is the covariance between two items conditioned on total score for the rest of the test, and the average conditional covariance is obtained by averaging overall possible conditioning scores. When a test is strictly unidimensional, all conditional covariances are expected to take on values within random noise of zero, indicating statistically independent item responses for examinees with equal expected scores. Nonzero conditional covariances are essentially violations of the principle of local independence, and local dependence implies multidimensionality. Thus, nonrandom patterns of positive and negative conditional covariances are indicative of multidimensionality.

DIMTEST is a hypothesis-testing procedure for detecting violations of local independence. The data are first randomly divided into a training sample and a cross-validation sample. Then an exploratory analysis of the conditional covariances is conducted on the training sample data to find the cluster of items that displays the greatest evidence of local dependence. The cross-validation sample is then used to test whether the conditional covariances of the selected cluster of items displays local dependence, conditioning on total score on the non-clustered items. The DIMTEST statistic follows a standard normal distribution under the null hypothesis of unidimensionality.

DETECT is an effect-size measure of multidimensionality. As with DIMTEST, the data are first randomly divided into a training sample and a cross-validation sample (these samples are drawn independently of those used with DIMTEST). The training sample is used to find a set of mutually exclusive and collectively exhaustive clusters of items that best fit a systematic pattern of positive conditional covariances for pairs of items from the same cluster and negative conditional covariances from different clusters. Next, the clusters from the training sample are used with the cross-validation sample data to average the conditional covariances: within-cluster conditional covariances are summed; from this sum the between-cluster conditional covariances are subtracted; this difference is divided by the total number of item pairs, and this average is multiplied by 100 to yield an index of the average violation of local independence for an item pair. DETECT values less than 0.2 indicate very weak multidimensionality (or near unidimensionality), values of 0.2 to 0.4 indicate weak to moderate multidimensionality, values of 0.4 to 1.0 indicate moderate to strong multidimensionality, and values greater than 1.0 signify very strong multidimensionality (Roussos & Ozbek, 2006).

DIMTEST and DETECT were applied to the 2022–23 OSTP and CCRA, which consisted of 16 different combinations of grade levels and content areas (six in mathematics, six in ELA, three in science, and one in U.S. history). Because DIMTEST software has an upper limit of 24,000 students, the training and cross-validation samples for all test forms were limited to 12,000 each and were randomly sampled from the total sample. DETECT, on the other hand, has an upper limit of 500,000 students, so every training sample and cross-validation sample used all the available data. After randomly splitting the data into training and cross-validation samples, DIMTEST was applied to each dataset to see if the null hypothesis of unidimensionality would be rejected. Next, DETECT was applied to each dataset for which the DIMTEST null hypothesis was rejected, in order to estimate the effect size of the multidimensionality.

Because of the large sample sizes, DIMTEST would be sensitive even to quite small violations of unidimensionality, and the null hypothesis was strongly rejected for nearly every dataset with most *p*-values being less than 0.01 (see Table 6-2). Strong rejection of the null hypothesis of unidimensionality is not surprising because strict unidimensionality is an idealization that almost never holds exactly for a given dataset. Thus, it was important to use DETECT to estimate the effect size of the violations of local independence found by DIMTEST. Table 6-2 shows the multidimensional effect-size estimates from DETECT.

Table 6-2. Multidimensionality Effect Sizes by Content Area and Grade

Content Area	Grade	DIMTEST *p*-value	DETECT Effect Size
ELA	3	<.001	0.16
	4	<.001	0.10
	5	<.001	0.10
	6	<.001	0.11
	7	0.001	0.12
	8	<.001	0.11
Mathematics	3	0.027	0.12
	4	<.001	0.17
	5	<.001	0.20
	6	0.97	0.16
	7	<.001	0.19
	8	<.001	0.20
Science	5	<.001	0.17
	8	<.001	0.15
	11	<.001	0.30
U.S. History	11	0.037	0.20

All the DETECT values for 2022–23 indicated very weak to weak multidimensionality. The average DETECT values for three of the four content areas were 0.12 for ELA, 0.19 for mathematics, and 0.21 for science. In addition, the calculated DETECT value for U.S. history was 0.20. The violations of local independence, as evidenced by the DETECT effect sizes, were very weak (DETECT Effect Size < 0.20), with three exceptions (grades 5 and 8 in mathematics, and grade 11 U.S. history), which were still weak (DETECT Effect Size = 0.20), and do not suggest deviations from unidimensionality, which would warrant changes in test design or scoring.

6.4 Relating Evidence Regarding Classical Item Analysis to the Validity Arguments

Chapter 6 provides evidence in support of Claim 1.2, specifically relating the following evidence regarding classical item analysis to the validity arguments:

1.2 ***Argument:*** Each test form, an organized sampling of assessment tasks, results in an observed score that reflects a student's knowledge and abilities in the content area being assessed through appropriate test assembly, administration, and scoring procedures. (Evaluation Inference)

1.2.4 ***Claim:*** Items on the assessment demonstrate appropriate statistical quality.

Evidence: Chapter 6 describes the classical item analysis procedures conducted to ensure that all items meet the standards of quality outlined by the *Standards for Educational and Psychological Testing* (AERA et al., 2014) and *Code of Fair Testing Practices in Education* (Joint Committee on Testing Practices, 2004).

CHAPTER 7. ITEM RESPONSE THEORY SCALING AND EQUATING

In addition to the classical test theory item analyses previously described, the 2022–23 OSTP and CCRA were analyzed according to item response theory (IRT) models. IRT analyses were used to place all 2022–23 forms on the same scale; details on the IRT calibration and equating procedures for the assessment are described in this chapter. IRT calibration and equating results are provided in the *OSTP and CCRA 2022–23 Equating Reports* (provided as Appendix L), which was shared with members of the SDE and reviewed with Cognia psychometricians on May 9, 2023, for CCRA and May 30, 2023, for OSTP. The Equating Report presents information about the psychometric activities and results in support of calibration and equating for all 2022–23 OSTP assessments in grades 3–8 and grade 11 CCRA science and U.S. history.

7.1 Item Response Theory Calibration

All 2022–23 OSTP and CCRA items were calibrated using IRT, which uses mathematical models to define a relationship between an unobserved measure of student performance, usually referred to as theta (θ), and the probability (p) of getting a dichotomous item correct or of getting a particular score on a polytomous item. In IRT, it is assumed that all items are independent measures of the same construct (i.e., of the same θ). Another way to think of θ is as a mathematical representation of the latent trait of interest. Several common IRT models are used to specify the relationship between θ and p (Hambleton & van der Linden, 1997; Hambleton & Swaminathan, 1985). The process of determining the specific mathematical relationship between θ and p is called item calibration. After items are calibrated, they are defined by a set of parameters that specify a nonlinear, monotonically increasing relationship between θ and p. Once the item parameters are known, an estimate of θ for each student can be calculated. This estimate, $\hat{\theta}$, is an estimate of the student's true score or a general representation of student performance. It has characteristics that are preferable to those of raw scores for equating purposes.

For the 2022–23 OSTP and CCRA tests, the three-parameter logistic (3PL) model was used for dichotomous items. The graded response model (GRM) was used for polytomous items (Nering & Ostini, 2010), including polytomously scored multipart items and open-response items.

The 3PL model for dichotomous items can be defined as follows:

$$P_i(\theta_j) = c_i + (1 - c_i)\frac{\exp[Da_i(\theta_j - b_i)]}{1 + \exp[Da_i(\theta_j - b_i)]}, \quad \text{(Equation 1)}$$

where
i indexes the items,
j indexes students,
a represents item discrimination,
b represents item difficulty,
c is the pseudo-guessing parameter, and
D is a normalizing constant equal to 1.701.

In the GRM for polytomous items, an item is scored in k + 1 graded categories that can be viewed as a set of k dichotomies. At each point of dichotomization (i.e., at each threshold), a two-parameter model can be used to model the probability that a student's response falls at or above a particular ordered category, given θ. This implies that a polytomous item with k + 1 categories can be characterized by k item category threshold curves (ICTCs) of the two-parameter logistic form:

$$P_{ik}^{*}(\theta_j) = P(U_i \geq k|\theta_j) = \frac{\exp[Da_i(\theta_j - b_i + d_{ik})]}{1 + \exp[Da_i(\theta_j - b_i + d_{ik})]}, \quad \text{(Equation 2)}$$

where
U indexes the scored response on an item,
i indexes the items,
j indexes students,
k indexes threshold,
θ is the student ability,
a represents item discrimination,
b represents item difficulty,
d represents threshold, and
D is a normalizing constant equal to 1.701.

After computing *k* ICTCs in the GRM, *k* + 1 item category characteristic curves (ICCCs), which indicate the probability of responding to a particular category given θ, are derived by subtracting adjacent ICTCs:

$$P_{ik}(\theta_j) = P(U_i = \mathrm{k}|\theta_j) = P_{ik}^{*}(\theta_j) - P_{i(k+1)}^{*}(\theta_j), \quad \text{(Equation 3)}$$

where
i indexes the items,
j indexes students,
k indexes threshold,
θ is the student ability,
P_{ik} represents the probability that the score on item *i* falls in category k, and
P_{ik}^{*} represents the probability that the score on item *i* falls at or above the threshold k
($P_{i0}^{*} = 1$ and $P_{i(m+1)}^{*} = 0$).

The GRM is also commonly expressed as follows:

$$P_{ik}(\theta_j) = \frac{\exp[Da_i(\theta_j - b_i + d_k)]}{1+\exp[Da_i(\theta_j - b_i + d_k)]} - \frac{\exp[Da_i(\theta_j - b_i + d_{k+1})]}{1+\exp[Da_i(\theta_j - b_i + d_{k+1})]} \qquad \text{(Equation 4)}$$

Test characteristic curves (TCCs) display the expected (average) raw score associated with each θ_j value between -3.0 and 3.0. Mathematically, the TCC is computed by summing the item characteristic curves (ICCs) of all items that contribute to the raw score. The expected raw score at a given value of θ_j is as follows:

$$E(X|\theta_j) = \sum_{i=1}^{n} P_i(1|\theta_j), \qquad \text{(Equation 5)}$$

where
i indexes the items (and *n* is the number of items contributing to the raw score),
j indexes students (here, θ_j runs from –4 to 4), and
$E(X|\theta_j)$ is the expected raw score for a student of ability θ_j.

The expected raw score monotonically increases with θ_j, consistent with the notion that students of high ability tend to earn higher raw scores than do students of low ability. Most TCCs are “S-shaped,” as they are flatter at the ends of the distribution and steeper in the middle.

The test information function (TIF) displays the amount of statistical information that the test provides at each value of θ_j. Information functions depict test precision across the entire latent trait continuum. There is an inverse relationship between the information of a test and its standard error of measurement (SEM). For long tests, the SEM at a given θ_j is approximately equal to the inverse of the square root of the statistical information at θ_j (Hambleton, Swaminathan, & Rogers, 1991), as follows:

$$SEM(\theta_j) = \frac{1}{\sqrt{I(\theta_j)}}. \qquad \text{(Equation 6)}$$

Compared to the tails, TIFs are often higher near the middle of the distribution, where most students are located and where most items are sensitive by design.

For more information about item calibration and determination, the reader is referred to Lord and Novick (1968), Hambleton and Swaminathan (1985), or Baker and Kim (2004).

7.1.1 IRT Results

PARSCALE v4.1 (Muraki & Bock, 2003) software was used to perform all IRT analyses for the OSTP and CCRA. Each item occupied only one block in the calibration run, and the 1.701 normalizing constant was used for three-parameter logistic (3PL) items. A default convergence criterion of 0.001 was used. Further details about calibration settings are provided in the Equating Report, Section 1.2. The number of Newton cycles required for convergence for each grade and content area during the IRT analysis can be found in Table 1.2.1 of the Equating Report. The number of cycles required fell within acceptable ranges (less than 150) for all tests.

Table 1.2.2 in the Equating Report lists items that were flagged based on the quality control checks implemented during the calibration process. Most items flagged during this step were identified because of the guessing parameter (c-parameter) being poorly estimated. Difficulty in estimating the c-parameter is not at all unusual and is well-documented in psychometric literature (for example, see Nering & Ostini, 2010), especially when the item's discrimination is below 0.50. In all cases, fixing the c-parameter resulted in reasonable and stable item parameter estimates and improved model fit. Other items were flagged because of the equating procedures; those results are described in the Equating section.

The tables in Section 2.6 of the Equating Report (see Appendix L) give the IRT item parameters of all dichotomous and polytomous items on the 2022–23 OSTP tests and the CCRA science and U.S. History tests by content area and grade. Section 2.1 of the Equating Report provides the test characteristic curves (TCCs) and test information functions (TIFs) for the 2022–23 OSTP and CCRA science and U.S. History tests by content area and grade.

7.2 Equating

The purpose of equating is to ensure that scores obtained from different forms of a test are equivalent to each other. Equating may be used if multiple test forms are administered in the same year, as well as to equate one year's forms to those given in the previous year. Equating ensures that students are not given an unfair advantage or disadvantage because the test form they took is easier or harder than those taken by other students.

The 2022–23 administration of the OSTP and CCRA tests used a raw score-to-theta equating procedure in which test forms were equated to the theta scale established on the reference form (i.e., the form used in the most recent standard setting). This is accomplished through the chained linking design, in which every new form is equated back to the theta scale of the previous year's test form. It can therefore be assumed that the theta scale of every new test form is the same as the theta scale of the reference form since this is where the chain originated.

The groups of students who took the equating items on the 2022–23 OSTP and CCRA tests are not equivalent to the groups who took them in the reference year. IRT is particularly useful for equating scenarios that involve nonequivalent groups (Allen & Yen, 1979). Equating for OSTP and CCRA uses the anchor-test-nonequivalent-groups design described by Petersen, Kolen, and Hoover (1989). In this equating design, no assumption is made about the equivalence of the examinee groups taking different test forms (that is, naturally occurring groups are assumed). Comparability is instead evaluated by utilizing a set of anchor items (also called equating items). However, the equating items are designed to mirror the operational test in terms of item types and distribution of emphasis. In the OSTP and CCRA tests, every operational item is treated as an equating item.

Item parameter estimates for the 2022–23 OSTP tests were placed on the 2017–18 scale by using the method of Stocking and Lord (1983), which is based on the IRT principle of item parameter invariance.

According to this principle, the equating items for both the 2017–18 and 2022–23 OSTP tests should have the same item parameters. After the item parameters for each 2022–23 test were estimated using PARSCALE (Muraki & Bock, 2003), the Stocking and Lord method was employed to find the linear transformation (slope and intercept) that adjusted the equating items' parameter estimates such that the 2022–23 OSTP tests' TCC for the equating items was as close as possible to that of the 2017–18 OSTP tests.

Note the method described above was also used to place the item parameter estimates for 2022–23 CCRA science grade 11 test on the 2018-19 scale, as standard setting for CCRA science grade 11 took place in the summer of 2019.

7.2.1 Equating Results

Prior to calculating the Stocking and Lord transformation constants, a variety of evaluations of the equating items were conducted. Equating items that were flagged for evaluation as a result of these procedures are listed in Table 1.3.2 of the Equating Report (Appendix L). These items were scrutinized, and a decision was made as to whether to include the item as an equating item or to exclude it. The procedures used to evaluate the equating items are described below. In total, 33 items were excluded from equating for the 2022-23 OSTP tests; five items were excluded in grade 5 science while one to three items were excluded from equating for all other tests. In addition, 5 items were excluded from equating for the 2022-23 CCRA tests; three items were excluded from CCRA science and two items were excluded from U.S. History.

Delta analysis results are provided graphically in Section 2.1 of the Equating Report and tabled in Section 2.4 of the report. The delta procedure was used to evaluate adequacy of equating items; the discard status presented in the appendix indicates whether the item was flagged as potentially inappropriate for use in equating. Finally, *a-a* plots and *b-b* plots, which show the IRT parameters for 2022–23 equating items plotted against their previous values are presented in Section 2.1 of the Equating Report. Any items that appeared as outliers in the plots were evaluated in terms of suitability for use as equating items.

Once all evaluations of the equating items were complete, the Stocking and Lord method of equating was used to place the item parameters onto the previous year's scale, as described above. The Stocking and Lord transformation constants are presented in Table 7-1. Note that no constants are provided for the grade 8 OSTP science assessment as a standard setting occurred during June 2023.

Table 7-1. Stocking and Lord Constants

Content area	Grade	Slope	Intercept
ELA	3	1.14	-0.32
	4	1.11	-0.40
	5	0.94	-0.13
	6	1.10	-0.45
	7	1.11	-0.43
	8	1.01	-0.26
Mathematics	3	1.04	-0.18
	4	1.04	0.04
	5	1.06	-0.07
	6	1.06	-0.16
	7	0.98	-0.12
	8	0.98	-0.14
Science	5	1.02	-0.09
	8	--	--
	11	1.01	0.01
U.S. History	11	1.02	-0.02

7.3 Performance Standards

The OSTP standards to establish performance level cut scores in ELA, mathematics, and science for grades 3–8 were established in the summer of 2017. Details of these standard-setting procedures can be found in the *Oklahoma School Testing Program: Standard Setting Report* (Measured Progress, 2017) provided as Appendix M. The CCRA standards were set in the summer of 2019 for science grade 11 (Appendix N), and in the summer of 2022 for U.S. history grade 11 (Appendix O). Note also that standards were reset in the summer of 2023 for OSTP science grade 8 and details of these standard-setting procedures can be found in the *OSTP Science Grade 8 Standard Setting Report* provided as Appendix P.

The cuts on the theta scale that were established via standard setting are presented in Table 7-2. Also shown in the table are the cut points on the reporting score scale (described below). These cut points will remain fixed throughout the assessment program unless standards are reset for any reason.

The tables in Appendix Q show performance level distributions for 2022–23 by content area and grade.

Table 7-2. Cut Scores on the Theta Metric and Reporting Scale by Content Area and Grade

Content Area	Grade	Theta			Scaled Score				
		Cut 1	Cut 2	Cut 3	Min	Cut 1	Cut 2	Cut 3	Max
ELA	RSA	-0.9224	*	*	*	*	*	*	
	3	-0.5314	0.3409	1.3956	200	277	300	329	399
	4	-0.5272	0.3861	1.4987	200	275	300	331	399
	5	-0.7832	0.3253	1.1723	200	271	300	323	399
	6	-0.9086	0.2852	1.3917	200	269	300	330	399
	7	-0.4977	0.4666	1.2589	200	273	300	323	399
	8	-0.6951	0.4507	1.2080	200	269	300	322	399
Mathematics	3	-0.8405	0.1866	0.9875	200	274	300	321	399
	4	-0.7709	0.2699	1.0620	200	273	300	322	399
	5	-0.8290	0.4269	1.1699	200	266	300	321	399
	6	-0.7590	0.4405	1.5112	200	267	300	330	399
	7	-0.3356	0.4473	1.4715	200	279	300	329	399
	8	-0.0270	0.7559	1.2675	200	277	300	316	399
Science	5	-0.9136	0.1757	1.3221	200	272	300	330	399
	8	-0.7754	0.0873	1.2695	200	279	300	330	399
	11	0.1684	0.8021	1.5289	200	278	300	327	399
U.S. History	11	-0.2558	0.1396	1.2955	200	292	300	337	399

** Note that only a single cut point was set for grade 3 RSA and no scaled scores were reported.*

7.4 Oklahoma Performance Index Scores

Because the θ scale used in IRT calibrations is not readily understood by most stakeholders. Reporting scales were developed for the OSTP and CCRA, and the reporting scales are known as Oklahoma Performance Index scores. The reporting scales are simple linear transformations of the underlying θ scale, which were developed to range from 200 through 399. The lowest scaled score required to achieve Proficient is fixed at 300 for each content area and grade level. Students' total test scores were reported as OPI scale scores derived using item response theory (as described in previous sections of this chapter) and pattern scoring procedures.

There are essentially two ways of scoring a test: number-correct or item-pattern scoring. Number-correct scoring considers how many test items a student answered correctly in determining that student's total raw score. In contrast, the item-pattern scoring method is based on an IRT model. Item-pattern scoring considers not only a student's total raw responses, but also the psychometric characteristics of test items.

Two students with exactly the same total raw scores will get the same test scores in number-correct scoring. It is highly likely, however, that even though they have the same total raw scores, the actual items they answered correctly were different, and their different sets of correctly answered items could have different item characteristics. In such a case, the students will very likely get different reported test scores in item-pattern scoring. With item-pattern scoring, a student who correctly answers a number of more difficult items will get a higher score than one who answers the same number of easier items. This would be applicable to both total test scores and subscore category scores reported using item-pattern scoring.

Item-pattern scoring has been found to produce smaller standard errors of measurement (SEM) than number-correct scoring. The smaller the SEM, the more confidence we have about the precision of the test results. In addition, test reliability is higher with item-pattern scoring than with number-correct scoring (Yen & Candell, 1991), which means that fewer questions are needed in item-pattern scoring than in number-correct scoring for equivalent scoring accuracy. For these reasons, both total scores and the reported performance levels in the subcategories of the OSTP and CCRA tests are based on item-pattern scoring procedures and reported as OPI scaled scores.

By providing information that is more specific about the position of a student's results, scaled scores supplement performance-level scores. Student scores on the 2022–23 OSTP and CCRA were translated to scaled scores using a data analysis process called scaling. Scaling simply converts data from one scale to another.

Scaled scores offer the advantage of simplifying result reporting across content areas and subsequent years. Because the standard-setting process typically results in different cut scores across content areas on a raw score basis, it is useful to transform these raw cut scores to a scale that is more easily interpretable and consistent. For the OSTP and CCRA, a score of 300 is the cut score determining proficiency in ELA, mathematics, science, and U.S. history. Using scaled scores greatly simplifies the task of understanding how a student performed. The psychometric advantage of scaled scores over raw scores is that they are linear transformations of θ. Since the θ scale is used for equating, scaled scores are comparable from one year to the next. Raw scores are not.

The scaled scores are obtained by a simple translation of ability estimates ($\hat{\theta}$) using the linear relationship between threshold values on the θ metric and their equivalent values on the scaled-score metric. Scaled scores are calculated using the linear equation as follows:

$$SS = m\hat{\theta} + b, \qquad \text{(Equation 7)}$$

where
m is the slope, and
b is the intercept.

A separate linear transformation is used for each grade and content area combination. Table 7-3 shows the slope and intercept terms used to calculate the scaled scores for each grade, content area, and performance level. Note that the values in Table 7-3 will not change unless the standards are reset.

Table 7-3. Scaled Score Slope and Intercept by Content Area and Grade

Content Area	Grade	*m*-Slope	*b*-Intercept
ELA	3	27.0560	290.7761
	4	27.3941	289.4237
	5	26.9412	291.2352
	6	26.6499	292.4005
	7	28.0183	286.9266
	8	27.8928	287.4287
Mathematics	3	25.9611	295.1557
	4	26.5406	292.8378
	5	27.7068	288.1728
	6	27.8127	287.7494
	7	27.8663	287.5349
	8	30.5173	276.9307
Science	5	25.8871	295.4516
	8	24.8000	297.8339
	11	35.8776	271.2213
U.S. History	11	25.9553	296.3760

Graphs of the scaled score cumulative frequency distributions for 2022–23 are presented in the Equating Report Section 2.1.

7.5 Relating Evidence Regarding IRT Scaling and Equating to the Validity Arguments

Chapter 7 provides evidence in support of Claims 1.2, 1.3, and 1.4, specifically relating the following evidence regarding IRT scaling and equating to the validity arguments:

1.2 ***Argument:*** Each test form, an organized sampling of assessment tasks, results in an observed score that reflects a student's knowledge and abilities in the content area being assessed through appropriate test assembly, administration, and scoring procedures. (Evaluation Inference)

1.2.3 ***Claim:*** The scoring procedures and models produce scores accurately reflective of targeted knowledge and abilities.

Evidence: Section 7.1 describes the scoring models used for dichotomous and polytomous items, describing the models used in detail and citing the references that establish the appropriateness of these models for placing student performances on a common scale for scoring purposes.

1.2.4 ***Claim:*** Items on the assessments demonstrate appropriate statistical quality.

Evidence: Subsection 7.1.1 describes IRT results referring to tables within the equating report (Appendix L) that describe quality control checks on items and procedures for making interventions based on items being flagged during these checks.

1.3 ***Argument:*** The observed score on any specific test form for a given grade and content area is reflective of the expected score on any form of the test for that grade and content area. (Generalization Inference)

1.3.4 ***Claim:*** Equating and scaling methods accurately place scores from different forms onto a common scale.

Evidence: Section 7.2 describes equating procedures in detail, Section 7.3 summarizes equating results, and Appendix L provides a full report of equating results. These sections demonstrate a high level of rigor in selection, application, and interpretation of equating results.

1.4 Argument: Expected scores are attributable to proficiency in the target knowledge and abilities. (Explanation Inference)

1.4.1 ***Claim:*** Cut scores are established through defensible standard-setting methods.

Evidence: Section 7.4 summarizes standard-setting procedures and results, and Appendices M, N, O, and P provide a full report of standard-setting procedures and results. These demonstrate rigorous adherence to well-accepted standard-setting procedures.

1.5 ***Argument:*** OSTP scores, classification decisions, and attributed knowledge and abilities are reflected in contexts outside of the assessment environment through correlation to external criteria. (Extrapolation Inference)

1.5.1 ***Claim:*** Test scores correlate with scores on other assessments or proficiency metrics measuring similar knowledge and abilities.

Evidence: Section 7.4 indicates that standard-setting activities for the OSTP are conducted with the intention of setting cuts in alignment to NAEP and ACT scores.

1.5.2 ***Claim:*** Test classifications associated with college- and career-readiness correspond to other college- and career-readiness assessment results.

Evidence: Section 7.4 indicates that standard-setting activities for the OSTP are conducted with the intention of setting cuts in alignment to NAEP and ACT scores.

1.5.3 ***Claim:*** Test classifications correspond to other known metrics of knowledge and ability measured by the OSTP.

Evidence: Section 7.4 indicates that standard-setting activities for the OSTP are conducted with the intention of setting cuts in alignment to NAEP and ACT scores. As such, test classifications are intended to correspond to these other known metrics by design.

CHAPTER 8. RELIABILITY

Although an individual item's performance is an important focus for evaluation, a complete evaluation of an assessment must also address the way items function together and complement one another. Tests that function well provide a dependable assessment of the student's level of ability. Unfortunately, no test can do this perfectly. A variety of factors can contribute to a given student's score being either higher or lower than his or her true ability. For example, a student may misread an item or mistakenly fill in the wrong bubble when he or she knew the answer. Collectively, extraneous factors that impact a student's score are referred to as measurement error. Any assessment includes some amount of measurement error; that is, no measurement is perfect. This is true of all academic assessments—some students will receive scores that underestimate their true ability, and other students will receive scores that overestimate their true ability.

When tests have a high amount of measurement error, student scores are very unstable. Students with high ability may get low scores or vice versa. Consequently, one cannot reliably measure a student's true level of ability with such a test. Assessments that have less measurement error (i.e., errors made are small on average and student scores on such a test will consistently represent his or her ability) are described as more reliable.

There are several ways to estimate an assessment's reliability. One possible approach is to give the same test to the same students at two time points that are close to each other. If students receive the same scores on each test, then the extraneous factors affecting performance are small and the test is reliable. This is referred to as "test-retest reliability." A potential problem with this approach is that students may remember items from the first administration or may have gained (or lost) knowledge or skills in the interim between the two administrations. A solution to the "remembering items" problem is to give a different but parallel test at the second administration. If student scores on each test correlate highly, the test is considered reliable. This is known as "alternate-forms reliability," because an alternate form of the test is used in each administration. This approach, however, does not address the problem that students may have gained (or lost) knowledge or skills in the interim between the two administrations. In addition, the practical challenges of developing and administering parallel forms generally preclude the use of parallel forms reliability indices.

One way to address the latter problem is to split the test in half and then correlate students' scores on the two half-tests; this in effect treats each half-test as a complete test. By doing this, the problems associated with an intervening time interval and of creating and administering two parallel forms of the test are alleviated. This estimate is known as a "split-half reliability." If the two half-test scores correlate highly, items on the two half-tests must be measuring very similar knowledge or skills. This is evidence that the items complement one another and function well as a group. This also suggests that measurement error will be minimal.

The split-half method requires psychometricians to select items that contribute to each half-test score. This decision may have an impact on the resulting correlation since each different possible split of the test halves will result in a different correlation. Another problem with the split-half method of calculating reliability is that it underestimates reliability, because test length is cut in half. All else being equal, a shorter test is less reliable than a longer test. Cronbach (1951) provided a statistic, α (alpha), that eliminates the problem of the split-half method by comparing individual item variances to total test variance. Cronbach's α was used to assess the reliability of the 2022–23 OSTP and CCRA as follows:

$$\alpha \equiv \frac{n}{n-1}\left[1-\frac{\sum_{i=1}^{n}\sigma_{(Y_i)}^{2}}{\sigma_x^2}\right], \qquad \text{(Equation 8)}$$

where
i indexes the item,
n is the total number of items,
$\sigma_{(Y_i)}^{2}$ represents individual item variance, and
σ_x^2 represents the total test variance.

8.1 Reliability and Standard Errors of Measurement

All reliability calculations (i.e., Cronbach's alpha and SEM) were based on the final sets of common and unique items that passed data review and were retained for operational scoring. Average values and ranges of Cronbach's α coefficient and raw score standard errors of measurement (SEMs) for each content area and grade based on the overall population of students who took the 2022–23 OSTP and CCRA tests are presented in Table 8-1. Additionally, Appendix R presents descriptive statistics for raw scores and reliability results.

Table 8-1. Summary of Reliability and SEM Results by Content Area and Grade

Content area	Grade	Number of Students	Raw Score			Alpha	Standard Error
			Max	Mean	Stand Deviation		
ELA	3	49,619	51	27.81	10.30	0.91	3.11
	4	49,055	52	30.88	10.23	0.91	3.05
	5	41,946	55	36.60	10.15	0.91	3.06
	6	48,753	52	29.22	10.08	0.91	3.11
	7	49,860	52	28.56	10.16	0.90	3.16
	8	46,294	57	33.77	9.19	0.87	3.27
Mathematics	3	41,307	50	33.14	10.00	0.92	2.83
	4	40,334	50	31.70	10.15	0.92	2.90
	5	40,334	50	30.84	10.08	0.92	2.91
	6	41,305	50	27.51	9.35	0.90	3.02
	7	42,749	50	21.92	9.60	0.90	3.08
	8	44,323	50	22.56	9.56	0.89	3.11
Science	5	40,658	45	25.53	8.25	0.87	2.93
	8	44,741	48	25.44	8.74	0.87	3.14
	11	46,302	62	26.64	10.97	0.89	3.60
U.S. History	11	46,355	50	25.55	9.89	0.90	3.16

Appendix R also presents reliabilities for various subgroups of interest. Subgroup Cronbach's α's were calculated using the formula defined on the preceding page, based only on the members of the subgroup in question in the computations. Values are calculated only for subgroups with 10 or more students. For several reasons, these results should be interpreted with caution. First, inherent differences between grades and content areas preclude making valid inferences about the quality of a test based on statistical comparisons with other tests. Second, reliabilities are dependent not only on the measurement properties of a test but also on the statistical distribution of the studied subgroup. For example, it can be readily seen that the subgroup sample sizes vary considerably, which results in natural variation in reliability coefficients. Additionally, Cronbach's α, a type of correlation coefficient, may be artificially depressed for subgroups with little variability (Draper & Smith, 1998). Third, there is no industry standard to interpret the strength of a reliability coefficient, and this is particularly true when the population of interest is a single subgroup.

Of more interest are reliabilities for the reporting categories within OSTP and CCRA content areas as described in Chapter 3. Cronbach's α coefficients for reporting categories were calculated with the same formula defined previously using just the items of a given subcategory in the computations. Again, these results are presented in Appendix R. Because results are based on a subset of items rather than the full test, computed reporting category reliabilities were lower (sometimes substantially so) than overall test reliabilities approximately to the degree one would expect based on classical test theory; interpretations should take this into account. Of specific note is grades 5 and 8 ELA Reporting Category 6 (Writing): having only one item (a writing prompt), values for Cronbach's α could not be calculated. Qualitative differences between grades and content areas once again preclude valid inferences about the quality of the full test based on statistical comparisons among reporting categories.

8.2 Reliability of Performance Level Categorization

While related to reliability, the accuracy and consistency of classifying students into performance categories are even more important statistics in a standards-based reporting framework (Livingston and Lewis, 1995). After the performance levels were specified and students were classified into those levels, empirical analyses were conducted to determine the statistical accuracy and consistency of the classifications. For the OSTP and CCRA, students are classified into one of four performance levels: Below Basic, Basic, Proficient, or Advanced. This section of the report explains the methodologies used to assess the reliability of classification decisions.

Accuracy refers to the extent to which decisions based on test scores match decisions that would have been made if the scores did not contain any measurement error. Accuracy must be estimated because errorless test scores do not exist. Consistency measures the extent to which classification decisions based on test scores match the decisions based on scores from a second, parallel form of the same test. Consistency can be evaluated directly from actual responses to test items if two complete and parallel forms of the test are given to the same group of students. In operational test programs, however, such a design is usually impractical.

However, techniques have been developed to estimate both the accuracy and consistency of classification decisions based on a single administration of a test. The Rudner (2001, 2005) technique can easily be applied to data that are scored on the IRT theta metric or any linear transformation of this metric, such as scale scores. The applicability of the Rudner technique to IRT-based metrics distinguishes this method from methods based on observed scores, such as the Lewis and Livingston (1995) method.

The Rudner (2001, 2005) technique was utilized for the 2022-23 OSTP and CCRA as a method to estimate the decision accuracy and consistency of classification decisions with respect to scale scores. Using an examinee’s estimated scale score and standard error, assuming a normal probability distribution, the method first calculates for all examinees at a fixed value of true scale score, the expected proportion whose observed scale score is in an interval [a,b]. Then, by summing over all examinees whose true scale scores are in an interval [c,d], the method yields the expected proportion of all examinees whose true scale score is in [c,d] and whose observed scale score is in [a,b]. By setting [a,b] and [c,d] to correspond to the true score intervals defined by the cut scores yields the elements of a classification table that shows the expected proportion of all examinees with observed and true scale scores in each cell. These proportions can then be used to calculate both classification accuracy and classification consistency estimates.

For the classification accuracy tables, cell [*i, j*] represents the estimated proportion of students whose true scale score fell into classification *i* (where *i* = 1 to 4, for the four achievement levels) and whose observed scale score fell into classification *j* (where *j* = 1 to 4). The sum of the diagonal entries (i.e., the proportion of students whose true and observed classifications matched) signified overall accuracy.

Another way to measure consistency is to use Cohen's (1960) coefficient κ (kappa), which assesses the proportion of consistent classifications after removing the proportion of consistent classifications that would be expected by chance. It is calculated using the following formula:

$$\kappa = \frac{(\text{Observed agreement}) - (\text{Chance agreement})}{1 - (\text{Chance agreement})} = \frac{\sum_i C_{ii} - \sum_i C_{i.}C_{.i}}{1 - \sum_i C_{i.}C_{.i}}, \qquad \text{(Equation 9)}$$

where
$C_{i.}$ Is the proportion of students whose observed performance level would be Level I (where I = 1–4) on the first hypothetical parallel form of the test;
$C_{.i}$ is the proportion of students whose observed performance level would be Level I (where I = 1–4) on the second hypothetical parallel form of the test; and
C_{ii} is the proportion of students whose observed performance level would be Level I (where I = 1–4) on both hypothetical parallel forms of the test.

Because κ is corrected for chance, its values are lower than are those of other consistency estimates.

8.3 Accuracy and Consistency Results

The results based on the accuracy and consistency analyses described above are provided in Table 8-2. The table includes overall accuracy and consistency indices, including kappa. Accuracy and consistency values conditional on performance level are also given. For these calculations, the denominator is the proportion of students associated with a given performance level. For example, the conditional accuracy value is 0.75 for the Basic level in grade 3 ELA. This value indicates that among the students whose true scores placed them in this classification, 75% would be expected to be in this classification when categorized according to their observed scores. Similarly, again for grade 3 ELA, a consistency value of 0.66 indicates that 66% of students with observed scores in the Basic level would be expected to score in this classification again if a second, parallel test forms were used.

Table 8-2. Summary of Decision Accuracy (and Consistency) Results by Content Area and Grade, Overall and Conditional on Performance Level

Content Area	Grade	Overall	Kappa	Conditional on Performance Level: Below Basic	Basic	Proficient	Advanced
ELA	3	0.82 (0.75)	0.64	0.92 (0.88)	0.75 (0.66)	0.77 (0.69)	0.74 (0.57)
	4	0.83 (0.76)	0.64	0.92 (0.88)	0.77 (0.69)	0.76 (0.68)	0.69 (0.46)
	5	0.83 (0.76)	0.64	0.91 (0.87)	0.83 (0.77)	0.72 (0.62)	0.73 (0.58)
	6	0.83 (0.76)	0.65	0.89 (0.84)	0.82 (0.76)	0.78 (0.70)	0.72 (0.54)
	7	0.82 (0.75)	0.61	0.92 (0.88)	0.77 (0.68)	0.68 (0.57)	0.73 (0.56)
	8	0.82 (0.75)	0.61	0.90 (0.85)	0.8 (0.74)	0.67 (0.56)	0.73 (0.55)
Mathematics	3	0.82 (0.75)	0.65	0.92 (0.88)	0.81 (0.74)	0.72 (0.62)	0.78 (0.67)
	4	0.82 (0.75)	0.65	0.90 (0.86)	0.81 (0.73)	0.74 (0.64)	0.81 (0.72)
	5	0.83 (0.76)	0.65	0.88 (0.83)	0.84 (0.77)	0.72 (0.62)	0.81 (0.71)
	6	0.84 (0.77)	0.66	0.89 (0.84)	0.82 (0.75)	0.80 (0.70)	0.79 (0.66)
	7	0.83 (0.75)	0.63	0.88 (0.85)	0.74 (0.61)	0.84 (0.75)	0.82 (0.71)
	8	0.86 (0.80)	0.65	0.92 (0.91)	0.77 (0.66)	0.69 (0.56)	0.84 (0.75)
Science	5	0.80 (0.72)	0.61	0.85 (0.79)	0.78 (0.69)	0.80 (0.72)	0.78 (0.65)
	11	0.78 (0.69)	0.57	0.83 (0.77)	0.70 (0.59)	0.81 (0.72)	0.80 (0.67)
U.S. History	11	0.84 (0.78)	0.64	0.92 (0.90)	0.69 (0.57)	0.77 (0.67)	0.85 (0.75)

For some testing situations, the greatest concern may be making decisions around level thresholds. For example, if a college gave credit to students who achieved an Advanced Placement test score of 4 or 5 but not to students with scores of 1, 2, or 3, one might be interested in the accuracy of the dichotomous decision below 4 versus 4 or above. For the 2022–23 OSTP and CCRA, Appendix S provides accuracy and consistency estimates at each cut point, as well as false positive and false negative decision rates. (A false positive is the proportion of students whose observed scores were above the cut and whose true scores were below the cut. A false negative is the proportion of students whose observed scores were below the cut and whose true scores were above the cut). Accuracy and consistency estimates at each cut point were 0.85 or higher across all content areas and grades for 2022–23 OSTP and CCRA. Further, false positive and false negative rates were at the nominal level (0.05) or lower, indicating that student classification according to true scores is in agreement with observed score classification.

8.4 Relating Evidence of Reliability to the Validity Arguments

Chapter 8 provides evidence in support of Claims 1.3 and 1.4, specifically relating the following evidence regarding IRT scaling and equating to the validity arguments:

1.3 Argument: The observed score on any specific test form for a given grade and content area is reflective of the expected score on any form of the test for that grade and content area. (Generalization Inference)

1.3.3 ***Claim:*** Statistical analyses of observed scores on specific forms show that they are good predictors of expected scores on other forms.

Evidence: Section 8.1 describes the process for analyzing the reliability of OSTP forms and the results of these analyses. These analyses establish the reliability of each form. Subject to the accuracy of equating and scaling methods, adequate reliability of individual forms establishes them as good predictors of expected scores.

1.4 Argument: Expected scores are attributable to proficiency in the target knowledge and abilities. (Explanation Inference)

1.4.2 ***Claim:*** Tests are assembled with adequate precision near cut points.

Evidence: Section 8.2 describes decision consistency analysis procedures and results. Appendix S describes the results in further detail. Accuracy and consistency rates were reported as being adequately high while false positive and negatives demonstrated strong agreement between true score and observed score classification decisions.

CHAPTER 9. SCORE REPORTING

The OSTP and CCRA are designed to measure student performance against Oklahoma's content standards. Consistent with this purpose, results for the OSTP and CCRA are reported in terms of four performance levels that describe student performance in relation to these established state standards: Below Basic, Basic, Proficient, and Advanced. Students receive a separate performance-level classification (based on overall scaled score) for each content area assessed in the student's grade. All OSTP and CCRA tests were primarily administered online, with paper forms provided as an accommodation.

Results were generated at the student, school, and district levels. The student reports and student results labels were printed and mailed to the districts for distribution to the schools. In addition to the paper reports, an online reporting tool was provided for school, district, and state users to dynamically generate their own reports and review the student and summary results of each test. The details of each report are presented in the sections that follow. Samples of the reports are included in Appendix T. As part of the reporting tools, the Parent Portal provides families with an online portal to access their student's results.

9.1 Business Requirements

To ensure that reported results for the OSTP and CCRA are accurate relative to collected data and other pertinent information, the Reporting Business Requirements document is prepared prior to each reporting year. The document describes the requirements used in the analyses of OSTP and CCRA test data and in reporting content area results. These requirements also guide data analysts in identifying students to be excluded from school-, district-, and state-level summary computations where applicable. A copy of the Reporting Business Requirements document is included in Appendix U. Each year, edits are made to the requirements document based on SDE changes to the programs or reports. The document is approved by SDE. Any changes or additions after approval are documented in the Addenda of the document.

9.2 Static Reports

The following reporting deliverables were produced for the operational tests:

- Student Report
- Student Results Label

The student reports and student results labels (for all tested grades) were printed and shipped to the districts for distribution to the schools. In addition, the school, district, and state users also had access to the eMetric Data Interaction reporting tool. Printed and online materials are available in both English and Spanish. Each of these reporting deliverables is described in the following sections.

9.2.1 Student Report

The student report created for each student in grades 3–8 is a double-sided color folio report printed on 11 x 17-inch paper. The report provides scaled score, performance level, and reporting category results for each tested content area, as well as a state level breakdown of student performance by performance level for each content area. (See Appendix T for an example.) Students receive a report with information on each content area tested at that grade. One copy of the report is produced for schools to send home to parents/guardians. Schools were provided with instruction on how to pull information from the eMetric portal if paper copies were needed for the student's file.

The CCRA student report is a double-sided color folio report printed on 8 ½ x 11-inch paper. A resource page is printed for all students and provides resources for parents and students. The report provides results for science and U.S. history. In 2023, U.S. history standards setting was conducted. After approval of the U.S. history cuts, the new scales were used to report scaled scores and performance levels on the student report.

The front page of each report begins by providing the following identifying demographics about the student:

- Student name
- Local ID
- State ID
- Date of birth
- Grade
- School name
- District name
- Code (district and school code)

In 2023, Class name was removed from the report by request of SDE. The top section of the front page presents a letter from the State Superintendent of Public Instruction. Following the letter is a graphical display of the student's scaled score and the earned performance level for each content area tested. Below that information there is a graphical display of the student's test results in that content area over the last three years if that information is available. Historical scores are only available for ELA and mathematics. For 2023, results for 2022 are reported with 2021 marked as "Score not available." For grade 3 ELA tests, there is also a statement about whether a student did or did not meet the RSA Criteria based upon Standard 2 (Reading and Writing Process) and Standard 4 (Vocabulary).

The middle section of the folio provides detailed information on how families can support students in each content area. The top sections provide the performance level descriptor information pertaining to the performance level achieved by the student in each performance level. Next, each content area is broken down into reporting categories and shows an indication of how many points the student earned in each category out of the total points possible. Alongside each reporting category are the normative performance comparisons for that category and ways in which families can support their student's continued growth. In CCRA student reports, the Ways to Support text is not included. In 2023, the writing composite score and performance level were reported on the OSTP student reports. Beneath that section, the student results in each content area tested are compared to the school and district performance in a bar graph. Finally, beneath ELA and mathematics score information, Lexile measures (for reading) and Quantile measures (for mathematics) are displayed, respectively.

The back page of the report provides additional information for families looking to gather more information about the report or their student's performance in school. There is a section to assist families with using the report when meeting with the student's teacher or school. There is also a list of resources and links to family guides to further support student growth and achievement, as well as a short Glossary of Terms.

9.2.2 Student Results Label

A student results label was generated for each student. Each student label is two by four inches and provides the following student information:

- Student name
- State Student ID
- Date of birth
- Gender
- Grade
- School name
- District name

The label provides the student's scaled score and performance level for each content area tested at the grade level. If a student did not earn a scaled score, the score column contains the abbreviation of the not tested reason and the performance level column contains the expanded not tested reason text. The label also indicates if the student was administered the read-aloud accommodation. In the content-area column of the label, there is an indication of whether the student took a Braille or Equivalent Form in that content area.

9.3 Interactive Reports

Data Interaction, eMetric's web-based reporting solution, features a range of report types that allow analysis across years from the group level to the individual student level. Each report type may be customized to include or exclude fields and attributes to meet the SDE's specific needs. Report types include the following:

- Roster Report

- Group Summary Report
- Graphical Summary Report
- Longitudinal Roster Report
- Quick Reports
- Individual Student Report

9.3.1 Roster Report

The Roster Report includes individual student scores and demographics for each content area and single administration. Users can select to view, search, and filter by organization (school, district, or entire state, depending on the user's access level) and a variety of demographic data and score data. Drill-down features allow users to directly access individual student results.

9.3.2 Group Summary Report (Performance Levels)

The Group Summary Report provides a comparison of school, district, and state group performance over various summary statistics. Statistics include the number of students tested, mean scaled score, and number and percentage of students at each performance level. Users can customize the display by selecting different content areas, statistics, multiple administrations, demographic variables, and report views, resulting in powerful and flexible ways to create dynamic reports. Drill-down features allow users to disaggregate by subgroup or directly access individual student results for a selected subgroup.

9.3.3 Group Summary Report (Standards and Objectives)

The Group Summary Report for Standards and Objectives creates reports by school or district with results of standards and objectives by content area for one administration. The data can be filtered and disaggregated by score and demographic data. Drill-down features allow users to disaggregate by subgroup or to directly access individual student results. This is a report any school can run out of the eMetric platform. It is important to note that this is a legacy report that is only available when viewing data from the former OCCT assessment for the years 2015 and 2016.

9.3.4 Graphical Summary Report (Performance Levels)

The Graphical Summary Report provides a visual alternative to analyze group data through the use of graphs and other visualization tools. Summary statistics include percentage of students in each performance level, percentage of students at or above Proficient, percentage of students below Proficient, and RSA status level. Graphs include bar charts, pie charts, and histograms. Users can customize their graphs by selecting different content areas, statistics, multiple administrations, demographic variables, and views. Drill-down features allow users to disaggregate by subgroup or to directly access individual student results. This too is a report any school can run out of the eMetric platform. It is also a legacy report that is only available when viewing data from the former OCCT assessment for the years 2015 and 2016.

9.3.5 Longitudinal Roster Report

The Longitudinal Roster Report displays results of individual student scores and demographics by content area in multiple administrations. Users can select to view, search, and filter by organization (school, district, or entire state, depending on the user's access level) and a variety of demographic data and score data. Drill-down features allow users to directly access individual student results.

9.3.6 Quick Reports

Six quick reports are provided. These are the same summary or roster reports outlined above with specific preselected filters requested by the client that provide the most commonly used report data. Quick Reports provided are as follows:

- Summary Report of Total Tested (by organization, administration, and subject)
- Roster: All Selections (with all scores preselected)
- Group Summary PL: All Selections (with all scores and disaggregate variables preselected)
- Longitudinal Roster: All Selections (with all scores preselected)

9.3.7 Parent Portal

Families have been provided with an online portal to access individual student reports. The Oklahoma Parent Portal is designed to provide students and parents/guardians with online access to a student's state assessment scores. This portal will assist students and parents/guardians with tracking assessment information throughout the student's academic career.

The portal provides scores from the OSTP 2021–22 and 2022–23 assessments.

9.4 Quality Assurance

The Software Quality Assurance (SQA) team worked together with the data processing and data analysis teams to ensure quality data was captured and delivered accurately. Using multiple software tools, quality control checks were performed by the data processors and data analysts as the data was handed off.

These quality checks initialized the accuracy of the data being ingested into the database and subsequent tables and columns.

The SQA team developed a test plan that included previously agreed upon report designs and the Reporting Business Requirements document. Test cases housed in an internal test cases repository software were then executed, including, but not limited to, the following:

- testing data counts of data imported;

- testing data quality of individual fields for valid values, such as gender, ethnicity, etc.;
- validating scripts developed by the software developers to ensure they match business requirements and technical specifications.

Included in this testing effort to ensure the quality of the data, the SQA team used a sample of schools and districts which were selected based on multiple criteria. A few criteria are identified below:

- students' unique testing records
- students' complete testing
- invalidated student tests

Working closely with the data processing and data analysis teams allowed a timely and precise turnaround if any data anomalies were found. Test cases were tied to tickets outlining required work to allow for full transparency and cohesive teamwork in validation of the data.

Later, the SQA team executed test cases validating student printed reports and student labels to ensure that they met the specifications.

When all the test cases were passed, the SQA team notified the Cognia State Services department for final sign off.

9.5 Additional Resources

In addition to the resources provided within the reports, the OSDE provides many supplemental materials to assist students, families, teachers, administrators, and other stakeholders to interpret the meanings of test scores and apply their interpretations toward appropriate and valid uses of the test results. Most of these resources are available through stakeholder-specific web pages within the Oklahoma SDE website, the list below provides a good starting point.

Oklahoma State Department of Education Website

SDE Assessment Guidance

Supplemental Materials for Families

Parent Portal Toolkit provides not only access information, but also information regarding how schools use test scores, how families can apply test scores to support student learning, and some basic information for interpreting the score information provided within the portal.

Family Guides

SDE Quantile Measures

About Lexile Measures

SDE Educator's Page provides a wide range of educator resources, including links to several assessment-specific tools and guides.

SDE Assessment Materials includes links to test blueprints, test and item specifications, Depth of Knowledge definitions, and performance level descriptor definitions.

SDE - Office of Assessments

Using Data in the OSTP Data Portal to Monitor COVID Recovery—Key Questions for Educators

Using Data in the OSTP Data Portal to Monitor COVID Recovery—Key Questions for Administrators

Using Data in the OSTP Data Portal to Monitor COVID Recovery webinar—Considerations for Educators (YouTube)

Using Data in the OSTP Data Portal to Monitor COVID Recovery webinar—Considerations for School Leaders (YouTube)

Using Data in the OSTP Data Portal to Monitor COVID Recovery. Considerations for Educators. Slide deck that provides important information regarding interpretation of data within the OSTP portal, specific guidance for monitoring COVID recovery, and key questions that may be of interest to educators for determining how well their students are performing relative to the standards in the content areas being assessed.

Using OSTP Data in Accountability Reporting to Monitor COVID Recovery. Considerations for School Leaders—Slide Deck

Interpreting Assessment Scores to Inform Next Steps, Connect with Families and Support Students provides general guidance for interpretation of assessment scores and specific guidance for next steps educators can take based on these interpretations, including providing support to families and students.

Maintaining Equity in the Classroom

Oklahoma's Equitable Access to Excellent Educators Plan

Oklahoma School Report Card Resources Information for administrators relating to accountability-based decisions.

Oklahoma School Report Card Overview

Oklahoma School Report Card Guide Measures, Indicators and Actions A more detailed guide of the measures and indicators found within those report cards and available actions based on those measures and indicators.

9.6 Relating Evidence Regarding Score Reporting to the Validity Arguments.

Chapter 9 provides evidence in support of Claims 1.6, 1.7, and 1.8, specifically relating the following evidence regarding Score Reporting to the validity arguments:

1.6 ***Argument:*** OSTP and CCRA score reports provide educators with classification and score information that is useful, fair, and appropriate for making decisions regarding student subgroups. It should be noted that the state assessment data should be used in conjunction with district and classroom assessments to monitor progress and overall achievement.

1.6.1 ***Claim:*** Educators understand the meaning of scores and classifications, appropriate uses and interpretations of those scores and classifications, and any limits on their interpretability, as applied to curricular planning and identification of instructional needs.

Evidence: Subsection 9.5.2 describes resources available to educators that provide explanations of scores and classifications, underlying interpretations in terms of knowledge and ability based on those classifications, and applications of those interpretations within the classroom.

1.6.2 ***Claim:*** Interpretations of scores and classifications are genuinely useful to educators for the purposes of curricular planning and identification of instructional needs.

Evidence: Subsection 9.5.2 describes resources available to educators that provide specific guidance to educators for applying test scores and interpretations based on those scores to their instruction.

1.6.3 ***Claim:*** Curricular planning and instructional decisions that educators make based on scores are fair and just to students and classes.

Evidence: Subsection 9.5.2 describes resources available to educators that provide tools for maintaining equity in the classroom. The resources, in combination with a test designed to produce scores in a fair and just way, allow educators to make fair and just decisions in the classroom.

1.7 ***Argument:*** OSTP score reports provide students and their families with classification and score information that is useful, fair, and appropriate for monitoring academic achievement and progress toward college- and career-readiness. (Utilization Inference)

1.7.1 ***Claim:*** Students and their families understand the meaning of scores and classifications, appropriate uses and interpretations of those scores and classifications, and any limits on their interpretability, as applied to monitoring academic achievement and progress toward college- and career-readiness.

Evidence: Chapter 9, which describes score reporting efforts, and Appendix T, which provides a sample of the report provided to parents and students, demonstrates the effort to present information within the report in an understandable way.

Subsection 9.5.1 describes resources available to students and their families that provide instructions for accessing the Parent Portal and explanations of scores and classifications, how to interpret those scores and classifications, and application of those interpretations when discussing test results with educators.

1.7.2 ***Claim:*** Interpretations of scores and classifications are genuinely useful to parents and students for the purposes of monitoring academic achievement and progress toward college- and career-readiness.

Evidence: Subsection 9.2.1 refers to sections of the score reports that parents and students receive that include “detailed information on how families can support students,” and “ways in which families can support their student’s continued growth,” assistance “using the report when meeting with the student’s teacher or school,” and “a list of resources and links to family guides to further support student growth and achievement.” This demonstrates considerable effort in providing courses of action to parents and students based on scores and classifications.

Subsection 9.5.1 describes resources available to students and their families that explain ways that they can use score reporting information to take positive actions toward furthering students’ education and college- and career-readiness.

1.7.3 ***Claim:*** Courses of action parents and students may take based on knowledge of students’ academic achievement and college- and career-readiness are made available to parents and students in a fair and just way.

Evidence: Chapter 9 describes different modes of availability (e.g., paper and online) and in both Spanish and English, which speaks to an effort to making the reports available to parents and students with different access to these modes and of different backgrounds.

1.8 Argument: OSTP score reports provide state and district administrators with classification and score information that usefully, fairly, and appropriately supports evaluation and enhancement of curricula and programs. (Utilization Inference)

1.8.1 Claim: State and district administrators understand the meaning of scores and classifications, appropriate uses and interpretations of those scores and classifications, and any limitations on their interpretability, as applied in support of evaluation and enhancement of curricula and programs.

Evidence: Chapter 9, which describes score reporting efforts, demonstrates the effort to present information to state and district administrators in an understandable way.

Subsection 9.5.3 describes resources available to administrators that provide explanations of scores and classifications, underlying interpretations in terms of knowledge and ability based on those classifications, and applications of those interpretations to support evaluation and enhancement of curricula and programs.

1.8.2 Claim: Interpretations of scores and classifications are genuinely useful to state and district administrators for evaluating and enhancing curricula and programs.

Evidence: Section 9.3 describes the interactive reporting tools made available to state and district administrators. Types of information available within the tool and quality assurance efforts are further described.

Subsection 9.5.3 describes resources available to administrators that explain ways that administrators may apply interpretations of test scores to support evaluation and enhancement of curricula and programs.

1.8.3 ***Claim:*** Curriculum and program evaluation and enhancement decisions made based on OSTP score and classification information are fair and just.

Evidence: Subsection 9.5.3 describes resources available to administrators that provide guidance for making fair and equitable decisions regarding their educational programs, including application of appropriate metrics for making those decisions.

1.10 ***Argument:*** OSTP score reports provide federal and state administrators, agencies, and legislators with classification and score information that is useful, fair, and appropriate for making accountability decisions. (Utilization Inference)

1.10.1 ***Claim:*** State administrators, agencies, and legislators understand the meaning of scores and classifications, appropriate uses and interpretations of those scores and classifications, and any limitations on their interpretability, as applied to accountability decisions.

Evidence: Chapter 9, which describes score reporting efforts, demonstrates the effort to present information to state and district administrators in an understandable way.

Subsection 9.5.3 describes resources available to administrators that provide explanations of scores and classifications, underlying interpretations in terms of knowledge and ability based on those classifications, and applications of those interpretations to support evaluation and enhancement of curricula and programs.

1.10.2 ***Claim:*** Interpretations of scores and classifications are genuinely useful to state administrators, agencies, and legislators for making accountability decisions.

Evidence:

Section 9.3 describes the interactive reporting tools made available to state and district administrators. Types of information available within the tool and quality assurance efforts are further described.

Subsection 9.5.3 describes resources available to administrators that explain ways that administrators may apply interpretations of test scores to support accountability decisions.

1.10.3 ***Claim:*** Accountability decisions based on OSTP score and classification information are fair and just.

Evidence:

Subsection 9.5.3 describes resources available to administrators that provide guidance for making fair and equitable decisions regarding their educational programs, including application of appropriate metrics for making those decisions.

CHAPTER 10. VALIDITY ARGUMENTS TO SUPPORT INTENDED SCORE INTERPRETATIONS AND USES

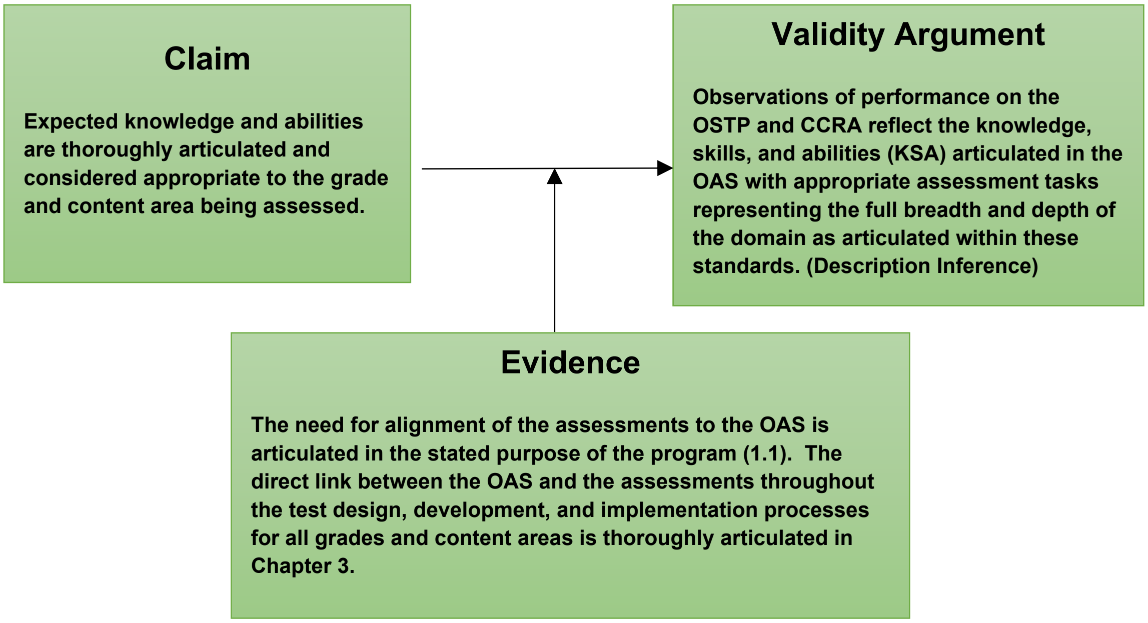
10.1 Rationale for Validity Argument Technical Report

Chapter 10 presents the primary intended score interpretations and uses for the OSTP and CCRA. This chapter presents the assumptions that underlie these score interpretations and uses and the evidence that supports the assumptions. A validity argument logic model is introduced and applied to develop validity arguments to support all intended score interpretations and uses.

The Standards for Educational and Psychological Testing (2014) defines validity as “the degree to which evidence and theory support the interpretations of test scores for proposed uses of tests” (p. 11). Elaborating on that definition, the Standards assert that “it is the interpretations of test scores for proposed uses that are evaluated, not the test itself” (p. 11) and that “validation logically begins with an explicit statement of the proposed interpretation of test scores, along with a rationale for the relevance of the interpretation to the proposed use” (p. 11). This definition applies specifically to intended interpretations and uses of test scores, rather than to the broader program of curriculum and instruction in which a testing program is embedded or to the surrounding education and school improvement policies and aspirations for student learning.

The Standards further state that “a sound validity argument integrates various strands of evidence into a coherent account of the degree to which existing evidence and theory support the intended interpretations of test scores for specific uses” (p. 21; emphasis added). An emerging common practice in state assessment programs is to construct validity arguments based on Toulmin’s model of argumentation (Toulmin, 1958). A model for validity arguments and an applied example, derived from the Toulmin model, is shown in Figure 10-1.

Figure 10-1. OSTP and CCRA Validity Argument Model



Adapted from Chapelle (2021) Figures 2.1-2.3, Kane (2013) Figure 1, and Toulmin (1958).

10.2 The OSTP and CCRA Validity Argument Logic Model

In the OSTP and CCRA validity argument logic models, the overall validity argument is that the existing design, procedural, and psychometric evidence supports all intended score interpretations and uses. Each of the interpretations and uses represents a claim that requires supporting evidence and “warrants” (Toulmin’s term; here, an assumption) that connect the evidence to the claim. This line of reasoning and argumentation leads to supported conclusions, which are the OSTP and CCRA validity arguments. Subsections 10.2.1 and 10.2.2 describe, respectively, the primary intended score interpretation of the OSTP and CCRA and the primary intended score uses of the OSTP and CCRA. Claims related to Arguments 1.1 to 1.5 provide the chain of inference necessary to support intended score interpretation while claims related to Arguments 1.6 to 1.10 each provides the inferential step to get from interpretation to a specific intended score use. Each score interpretation and use, assumption, and element in the table is presented following the table, with descriptions and summaries of the supporting evidence.

10.2.1 Claims Supporting Intended Interpretations of OSTP and CCRA Assessments

The primary intended interpretation of OSTP scores is that they provide reliable and valid information about student knowledge and ability relative to the Oklahoma Academic Standards (OAS) in mathematics and ELA for grades 3–8 and in science for grades 5 and 8. The primary intended interpretation of CCRA scores is that they provide reliable and valid information about student knowledge relative to the OAS in U.S. history and science for grade 11. These interpretations are supported by the same series of claims. Where different evidence is required for the different assessments, this will be noted within the evidence for the relevant claim.

1.1 ***Argument:*** Observations of performance on the OSTP and CCRA reflect the knowledge, skills and abilities (KSA) articulated in the OAS with appropriate assessment tasks representing the full breadth and depth of the domain as articulated within these standards. (Description Inference)

1.1.1 ***Claim:*** Expected knowledge and abilities are thoroughly articulated and considered appropriate to the grade and content area being assessed.

Evidence: The need for alignment of the assessments to the OAS is articulated in the stated purpose of the program (1.1). The direct link between the OAS and the assessments throughout the test design, development, and implementation processes for all grades and content areas is thoroughly articulated in Chapter 3.

1.1.2 ***Claim:*** Assessment tasks are developed to provide evidence of the expected knowledge and abilities for each grade and content area being assessed.

Evidence: Subsections within each section of Chapter 3 (each section representing a different content area on the OSTP or CCRA) all explicitly state that items in the content area and grades being assessed “were developed specifically for Oklahoma and are directly aligned to the OAS.” Subsection 3.1.3 describes passage development for ELA specifically in terms of how reading passages are selected for alignment to the OAS. Subsections 3.1.4, 3.2.3, 3.3.2 and 3.4.2 describe item development for specific content areas.

1.2 ***Argument:*** Each test form, an organized sampling of assessment tasks, results in an observed score that reflects a student’s knowledge and abilities in the content area being assessed through appropriate test assembly, administration, and scoring procedures. (Evaluation Inference)

1.2.1 ***Claim:*** Each form is constructed to draw from available items such that the underlying domain of knowledge and abilities is adequately sampled.

Evidence: Subsections within Chapter 3 describe blueprints for identifying the amount of content covered on the test forms for all content areas, specifically stating that test blueprints “are based on the importance and coverage of [the OAS] in Oklahoma schools.” Ideal blueprints are included in Appendix C. For existing assessments, tables are provided showing that content and Depth of Knowledge distributions on test forms are within the target blueprint ranges for all assessments.

1.2.2 ***Claim:*** The assessment is administered under appropriate conditions.

Evidence: Chapter 4 describes the administration process for the OSTP and CCRA assessments. This includes administration modes, procedures, requirements and documentation, training, accommodations, test security, documentation of irregularities, and support provided by the OSTP/CCRA Service Center. The administration process is described in greater detail in the OSTP and CCRA administration manuals. Details of accommodations are provided in Appendix E.

1.2.3 ***Claim:*** The scoring procedures and models produce scores accurately reflective of targeted knowledge and abilities.

Evidence: Chapter 5 has detailed sections describing the scoring process for the OSTP and CCRA assessments, including processes for machine scoring multiple-choice responses on paper-based tests, online scoring of computer-based tests, scoring of writing prompts, field-testing procedures for constructed-response items, and methodology for scoring polytomous items. Section 7.1 describes the scoring models used for dichotomous and polytomous items, describing the models used in detail and citing the references that establish the appropriateness of these models for placing student performances on a common scale for scoring purposes.

1.2.4 ***Claim:*** Items on the assessment demonstrate appropriate statistical quality.

Evidence: Chapter 6 describes the classical item analysis procedures conducted to ensure that all items meet the standards of quality outlined by the *Standards for Educational and Psychological Testing* (AERA et al., 2014) and *Code of Fair Testing Practices in Education* (Joint Committee on Testing Practices, 2004). Subsections 3.1.8, 3.2.5, 3.3.4, and 3.4.4 describe the review process for evaluating items flagged by these analyses. Subsection 7.1.1 describes IRT results referring to tables within the Equating Report (Appendix L) that describe quality control checks on items and procedures for making interventions based on items being flagged during these checks.

1.3 ***Argument:*** The observed score on any specific test form for a given grade and content area is reflective of the expected score on any form of the test for that grade and content area. (Generalization Inference)

1.3.1 ***Claim:*** Task specifications adequately inform production or selection of items with similar content and statistical characteristics.

Evidence: Subsections 3.1.2 and 3.2.2 contain some information about item specification for ELA and mathematics assessments, respectively. It is stated that “each item was designed to measure a specific standard and objective” in the OAS.

1.3.2 ***Claim:*** Test specifications result in forms of similar length and task distribution.

Evidence: Section 3.5 describes the test development process in detail, specifically outlining item selection, test assembly, and review to ensure the equivalency of forms based on a robust set of criteria. Within Chapter 3, the section for each OSTP and CCRA content area has a subsection on Test Design and Development for the current year’s assessments. These demonstrate the common structure of forms within a given grade and content area. The first subsection within each section of Chapter 3 describes blueprint distributions and adherence to those blueprints, providing further evidence that the selection of tasks considers and meets content coverage requirements across all forms.

1.3.3 ***Claim:*** Statistical analyses of observed scores on specific forms show that they are good predictors of expected scores on other forms.

Evidence: Section 8.1 describes the process for analyzing the reliability of OSTP and CCRA forms and the results of these analyses. These analyses establish the reliability of each form. Subject to the accuracy of equating and scaling methods, adequate reliability of individual forms establishes them as good predictors of expected scores.

1.3.4 ***Claim:*** Equating and scaling methods accurately place scores from different forms onto a common scale.

Evidence: Section 7.2 describes equating procedures in detail, Section 7.3 summarizes equating results, and Appendix L provides a full report of equating results. These sections demonstrate a high level of rigor in selection, application, and interpretation of equating results.

1.4 ***Argument:*** Expected scores are attributable to proficiency in the target knowledge and abilities. (Explanation Inference)

1.4.1 ***Claim:*** Cut scores are established through defensible standard setting methods.

Evidence: Section 7.4 summarizes standard-setting procedures and results, and Appendices M, N, O, and P provide a full report of standard-setting procedures and results. These demonstrate rigorous adherence to well-accepted standard-setting procedures.

1.4.2 ***Claim:*** Tests are assembled with adequate precision near cut points.

Evidence: Section 8.2 describes decision consistency analysis procedures and results. Appendix S describes the results in further detail. Accuracy and consistency rates were reported as being adequately high while false positive and negatives demonstrated strong agreement between true score and observed score classification decisions.

1.4.3 ***Claim:*** Characteristics of knowledge expected to affect task difficulty correlate with empirical item difficulty.

Evidence: Subsections 3.1.1, 3.2.1, 3.3.1 contain Depth of Knowledge distributions for ELA, mathematics, and science, respectively. Subsections 3.3.7 and 3.4.7 describe how cognitive complexity is captured within the science and history exams. These are attributes that are incorporated within item development approaches that correlate with expected item difficulty.

1.5 ***Argument:*** OSTP and CCRA scores, classification decisions, and attributed knowledge and abilities are reflected in contexts outside of the assessment environment through correlation to external criteria. (Extrapolation Inference)

1.5.1 ***Claim:*** Test scores correlate with scores on other assessments or proficiency metrics measuring similar knowledge and abilities.

Evidence: Section 7.4 indicates that standard-setting activities are conducted with the intention of setting cuts in alignment to NAEP and ACT scores. Resulting correlations of these scores are not established within the technical report.

1.5.2 ***Claim:*** Test classifications associated with college- and career-readiness correspond to other college- and career-readiness assessment results.

Evidence: Section 7.4 indicates that standard-setting activities are conducted with the intention of setting cuts in alignment to NAEP and ACT scores.

1.5.3 ***Claim:*** Test classifications correspond to other known metrics of knowledge and ability measured by the OSTP.

Evidence: Section 7.4 indicates that standard-setting activities are conducted with the intention of setting cuts in alignment to NAEP and ACT scores. As such, test classifications are intended to correspond to these other known metrics by design.

10.2.2 Claims Supporting Intended Uses of OSTP and CCRA Assessments

With evidence provided in support of intended interpretations of the OSTP and CCRA scores, validation of the primary intended uses of these scores only requires evidence that these interpretations can be applied to each use in an appropriate, fair, and just way. Evidence for each use, except the participation requirement for graduation, should show that the intended audience (i.e., those using the scores):

- understand the meaning of scores and classifications, appropriate uses and interpretations of those scores and classifications, and any limits on their interpretability, as applied to the intended use;
- find the scores and classifications genuinely useful for that intended use;
- make decisions, when using the scores and classifications as intended, that are fair and just to those affected by the decisions being made; and
- support for each intended use will provide evidence that each of these three claims is met within the argument for that specific intended use.

1.6 ***Argument:*** OSTP and CCRA score reports provide educators with classification and score information that is useful, fair, and appropriate for making decisions regarding student subgroups. It should be noted that the state assessment data should be used in conjunction with district and classroom assessments to monitor progress and overall achievement.

1.6.1 ***Claim:*** Educators understand the meaning of scores and classifications, appropriate uses and interpretations of those scores and classifications, and any limits on their interpretability, as applied to curricular planning and identification of instructional needs.

Evidence: Subsection 9.5.2 describes resources available to educators that provide explanations of scores and classifications, underlying interpretations in terms of knowledge and ability based on those classifications, and applications of those interpretations within the classroom.

1.6.2 ***Claim:*** Interpretations of scores and classifications are genuinely useful to educators for the purposes of curricular planning and identification of instructional needs.

Evidence: Subsection 9.5.2 describes resources available to educators that provide specific guidance to educators for applying test scores and interpretations based on those scores to their instruction.

1.6.3 ***Claim:*** Curricular planning and instructional decisions that educators make based on scores are fair and just to students and classes.

Evidence: Subsection 9.5.2 describes resources available to educators that provide tools for maintaining equity in the classroom. These resources, in combination with a test designed to produce scores in a fair and just way, allow educators to make fair and just decisions in the classroom.

1.7 ***Argument:*** OSTP and CCRA score reports provide students and their families with classification and score information that is useful, fair, and appropriate for monitoring academic achievement and progress toward college- and career-readiness. (Utilization Inference)

1.7.1 ***Claim:*** Students and their families understand the meaning of scores and classifications, appropriate uses and interpretations of those scores and classifications, and any limits on their interpretability, as applied to monitoring academic achievement and progress toward college and career readiness.

Evidence: Chapter 9, which describes score reporting efforts, and Appendix T, which provides a sample of the report provided to parents and students, demonstrates the effort to present information within the report in an understandable way.

Subsection 9.5.1 describes resources available to students and their families that provide instructions for accessing the Parent Portal and explanations of scores and classifications, how to interpret those scores and classifications, and application of those interpretations when discussing test results with educators.

1.7.2 ***Claim:*** Interpretations of scores and classifications are genuinely useful to parents and students for the purposes of monitoring academic achievement and progress toward college- and career-readiness.

Evidence: Subsection 9.2.1 refers to sections of the score reports that parents and students receive that include “detailed information on how families can support students,” and “ways in which families can support their student’s continued growth,” assistance “using the report when meeting with the student’s teacher or school,” and “a list of resources and links to family guides to further support student growth and achievement.” This demonstrates considerable effort in providing courses of action to parents and students based on scores and classifications.

Subsection 9.5.1 describes resources available to students and their families that explain ways that they can use score reporting information to take positive actions toward furthering students' education and college- and career-readiness.

1.7.3 ***Claim:*** Courses of action parents and students may take based on knowledge of students' academic achievement and college- and career-readiness are made available to parents and students in a fair and just way.

Evidence: Chapter 9 describes different modes of availability (e.g., paper and online) and in both Spanish and English, which speaks to an effort to making the reports available to parents and students with different access to these modes and of different backgrounds.

1.8 ***Argument:*** OSTP and CCRA score reports provide state and district administrators with classification and score information that usefully, fairly, and appropriately supports evaluation and enhancement of curricula and programs. (Utilization Inference)

1.8.1 Claim: State and district administrators understand the meaning of scores and classifications, appropriate uses and interpretations of those scores and classifications, and any limitations on their interpretability, as applied in support of evaluation and enhancement of curricula and programs.

Evidence: Chapter 9, which describes score reporting efforts, demonstrates the effort to present information to state and district administrators in an understandable way.

Subsection 9.5.3 describes resources available to administrators that provide explanations of scores and classifications, underlying interpretations in terms of knowledge and ability based on those classifications, and applications of those interpretations to support evaluation and enhancement of curricula and programs.

1.8.2 Claim: Interpretations of scores and classifications are genuinely useful to state and district administrators for evaluating and enhancing curricula and programs.

Evidence: Section 9.3 describes the interactive reporting tools made available to state and district administrators. Types of information available within the tool and quality assurance efforts are further described.

Subsection 9.5.3 describes resources available to administrators that explain ways that administrators may apply interpretations of test scores to support evaluation and enhancement of curricula and programs.

1.8.3 ***Claim:*** Curriculum and program evaluation and enhancement decisions made based on OSTP score and classification information are fair and just.

Evidence: Subsection 9.5.3 describes resources available to administrators that provide guidance for making fair and equitable decisions regarding their educational programs, including application of appropriate metrics for making those decisions.

1.9 ***Argument:*** OSTP and CCRA score reports provide state administrators with classification and score information that is useful, fair, and appropriate for comparing academic achievement of Oklahoma students to academic achievement of students in other states. (Utilization Inference)

1.9.1 ***Claim:*** State administrators understand the meaning of scores and classifications, appropriate uses and interpretations of those scores and classifications, and any limitations on their interpretability, as applied to comparisons of academic achievement of Oklahoma students to academic achievement of students in other states.

Evidence: Section 7.4 describes how standards are set, including alignment of cuts to NAEP and ACT scores. This alignment allows for some comparability between states.

1.10 ***Argument:*** OSTP and CCRA score reports provide federal and state administrators, agencies, and legislators with classification and score information that is useful, fair, and appropriate for making accountability decisions. (Utilization Inference)

1.10.1 ***Claim:*** State administrators, agencies, and legislators understand the meaning of scores and classifications, appropriate uses and interpretations of those scores and classifications, and any limitations on their interpretability, as applied to accountability decisions.

Evidence: Chapter 9, which describes score reporting efforts, demonstrates the effort to present information to state and district administrators in an understandable way.

Subsection 9.5.3 describes resources available to administrators that provide explanations of scores and classifications, underlying interpretations in terms of knowledge and ability based on those classifications, and applications of those interpretations to support evaluation and enhancement of curricula and programs.

1.10.2 ***Claim:*** Interpretations of scores and classifications are genuinely useful to state administrators, agencies, and legislators for making accountability decisions.

Evidence: Section 9.3 describes the interactive reporting tools made available to state and district administrators. Types of information available within the tool and quality assurance efforts are further described.

Subsection 9.5.3 describes resources available to administrators that explain ways that administrators may apply interpretations of test scores to support accountability decisions. Claim***:*** Accountability decisions based on OSTP score and classification information are fair and just.

Evidence: Subsection 9.5.3 describes resources available to administrators that provide guidance for making fair and equitable decisions regarding their educational programs, including application of appropriate metrics for making those decisions.

10.3 CONCLUSION

Validity arguments for the OSTP and CCRA are crafted to not just provide evidence that all steps in the test design, development, and implementation process are taken correctly, but that they are working together to ensure that the resulting scores validly support intended interpretations and uses. The arguments and the logical inferential steps they provide can be summarized as follows:

- 1.1 Description Inference: Items are sampled from domain appropriately such that high-quality forms can be produced. (Domain to Item)
- 1.2 Evaluation Inference: Forms are sampled from the domain appropriately such that observed scores reflective of the domain can be produced. (Item to Form)
- 1.3 Generalization Inference: Observed scores from individual forms are reliable such that they are reflective of expected scores across forms. (Form to Score)*
- 1.4 Explanation Inference: Expected scores are associated with classification cuts such that classification decisions are interpretable. (Score to Classification)
- 1.5 Extrapolation Inference: Classification decisions are accurate such that intended interpretations correspond to other valid metrics of knowledge and ability. (Classification to Interpretation)
- 1.6–1.10 Utilization Inferences: Interpretations of scores and classifications are used as intended and only in ways considered appropriate and fair. (Interpretation to Use)

*It is important for the gathering of information in support of the Generalization Inference (1.3) to define what is meant by the term "form" in this context. A test form is not just the set of items on which the score is based, but the structure of the exam in terms of all elements that can affect an individual's performance. This can include, among other things, the raters scoring an exam, the occasion on which the exam is administered, and the setting in which it is administered. Generalization from observed to expected score is optimized when all sources of potential variability of test scores are identified and accounted for such that observed scores maximally reflect a student's ability and not the influence of unwanted sources of variance.

Evidence for these claims ranges from complete to unprovided within this report. For the most part, evidence quite strongly supports interpretability of scores. In this report, based on information available from a non-validity-enhanced technical report, some claims supporting interpretability and many claims supporting use are not sufficiently supported by evidence. This is not meant to suggest that such evidence is unavailable but rather offers insight into sources of evidence that should be considered for inclusion in validity-enhanced technical reports going forward.

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APPENDICES

APPENDIX A
CONTENT STANDARDS

OKLAHOMA ACADEMIC STANDARDS

ENGLISH LANGUAGE ARTS

OKLAHOMA STATE DEPARTMENT OF EDUCATION
CHAMPION EXCELLENCE

Table of Contents: Oklahoma Academic Standards for English Language Arts

OKLAHOMA ENGLISH LANGUAGE ARTS STANDARDS GUIDING PRINCIPLES

Teachers use standards as guides for developing curriculum and instruction that is appropriately engaging, challenging, and sequenced for the students in their care. By nature, acquiring language arts knowledge and skills is a recursive learning endeavor: students revisit concepts again and again as they use language at increasingly sophisticated levels. Because of this recursive learning process, language arts learning will not progress for students in the strictly linear way it may in other content areas. Nonetheless, it is important for any set of standards to provide "concise, written descriptions of what students are expected to know and be able to do at a specific stage of their education" (Great Schools Partnership, 2014). In order to make this document a clear, coherent description of what students are expected to know and be able to do at specific stages, the writers have adopted some guidelines for design and organization.

Clarity

★ Standard statements are written with verbs that indicate specifically what learning students must demonstrate and at what depth. When students *defend, compare, estimate, paraphrase, predict,* or *summarize,* they are able to show a broader range of mastery of a concept than when they are expected to *identify, recognize,* or *recall*. However, the writers also have given full consideration to the complexity of the content itself. For example, it is more challenging to identify the implied theme of an extended essay than to identify the subject of a sentence. The progression of language arts learning from pre-kindergarten through high school should reflect a grade-level appropriate relationship between the level of critical thinking students use and the actual listening, speaking, reading, and writing experiences students have.

★ Content to be emphasized and assessed at specific grade levels (e.g., modes of writing or particular elements of grammar) is clearly identified.

★ Definitions for terms used in the standards document are compiled in an updated, expanded glossary.

Coherence

★ Eight overarching standards, the College- and Career- Ready English Language Arts standards, identify the knowledge and skills of the discipline that PK-12 students are to learn; each standard for every grade is delineated at the appropriate level.

★ A PK-12 vertical progression of standards, organized by the eight overarching standards, allows for educators to recognize how all the standards are intertwined to develop the total literacy of a student. When a skill is no longer present, mastery is implied; however, teachers must support previous grade level skills according to the mastery level of their students. This grade-to-grade, standard-by-standard progression can be viewed in a horizontal format, organized into overlapping grade bands.

★ Users must examine all of the standards for each grade level as a whole to have a coherent understanding of what is required of learners.

★ Because of the interconnectedness of language arts concepts and skills, various aspects of what students know and can do may be described in more than one standard. For example, learners conducting research (Standard 6) should use speaking and listening (Standard 1), the reading and writing processes (Standard 2), academic vocabulary (Standard 4), critical reading and writing (Standard 3), formal grammar and usage (Standard

5), and more than likely, they will access research and complete their research products because they are competent in multimodal literacies (Standard 7).

- ★ As students progress through grade levels, expectations encompass the content of the previous grades. Specifically in connection to reading assignments, the complexity of texts increases as students advance to later grades; however, simpler texts can be used effectively in order for learners to develop a deeper understanding of content (as examples – theme, figurative language, genre, structure).

Purpose

In addition to a commitment to clear and coherent standards, the writers were guided by four fundamental purposes of English language arts education.

- ★ All learners must hear the voices of their own heritage in the literature they encounter. They must be given the opportunity to speak with the voices they choose for themselves in the writing they create. The language arts classroom is a place that is inclusive of race, ethnicity, culture, and all perspectives that reflect the richness of human experience.
- ★ All learners are supported to become independent readers in a range of disciplines. The ability to interpret literature as well as informative, highly technical, and often lengthy reading passages on one's own is paramount in achieving academic and career success. Furthermore, learners who possess the skills required to read independently have the power to choose both what they *need* and what they *want* to read.
- ★ All learners are supported to become independent writers for a variety of audiences and a range of purposes. Four- and five-year-olds begin writing by verbally telling their ideas and stories to others, but their status as independent writers is not earned with mastery of the five-paragraph essay form in high school. Independent writers are able to access multiple strategies and formats to communicate and craft the message so that it resonates with any readers they want to reach.
- ★ A literate citizenry possesses the skills required to analyze, evaluate, act upon, and compose a wide range of communications. An ultimate goal of language arts education is the development of informed citizens who can contribute to the common good.

OKLAHOMA COLLEGE- AND CAREER-READY ENGLISH LANGUAGE ARTS STUDENTS

The following eight standards encompass the content and competencies of English language arts. Each standard reflects both reading and writing applications, as these processes are bound together in the literate world.

The order of the standards is meant to suggest that students learn to read and write by speaking and listening on their way to the ultimate goal of becoming independent, critical readers and writers. At the same time, speaking and listening skills will continue to be developed as students progress through the grade levels, and concepts of independent reading and writing will be introduced even in the earliest grades.

Independent reading and writing is a natural outgrowth of strong standards implementation through rigorous curriculum. Standard 8 addresses the integrated nature of English language arts and acknowledges students' need to grow increasingly independent for college and career readiness. Being able to work independently and seek out opportunities to read and write is a significant part of life-long learning. These skills easily transfer to test taking, civic engagement, and citizen participation.

Standard 1: Speaking and Listening
Students will speak and listen effectively in a variety of situations including, but not limited to, responses to reading and writing.

Standard 2: Reading Foundations/Reading Process and Writing Process
Students will develop foundational skills for future reading success by working with sounds, letters, and text. Students will use recursive processes when reading and writing.

Standard 3: Critical Reading and Writing
Students will apply critical thinking skills to reading and writing.

Standard 4: Vocabulary
Students will expand their working vocabularies to effectively communicate and understand texts.

Standard 5: Language
Students will apply knowledge of grammar and rhetorical style to reading and writing.

Standard 6: Research
Students will engage in inquiry to acquire, refine, and share knowledge.

Standard 7: Multimodal Literacies
Students will acquire, refine, and share knowledge through a variety of written, oral, visual, digital, non-verbal, and interactive texts.

Standard 8: Independent Reading and Writing
Students will read and write for a variety of purposes including, but not limited to, academic and personal, for extended periods of time.

OKLAHOMA ENGLISH LANGUAGE ARTS STANDARDS GUIDING RESEARCH

Well-recognized guiding research in language arts upholds Oklahoma's Eight CCR Standards as a whole, especially the standards' emphasis on the reciprocal relationship between reading and writing: we read what others have written and write to create reading for audiences beyond ourselves. This guiding research deserves expanded commentary.

READING FOUNDATIONS

The International Literacy Association (ILA) and the Report of the Subgroups of the National Reading Panel have identified important components of reading. Foundational reading skills are included within Standard 2: Reading Process.

PRINT CONCEPTS - the ability to understand distinguishing features of print, including knowing that the print on the page contains a message, that print contains words that can be read aloud, that print has a distinct "right side up," and that words are read from left to right.

PHONOLOGICAL/PHONEMIC AWARENESS - the understanding that words and syllables can be broken down into smaller units or phonemes is a strong predictor of later reading success.

PHONICS/DECODING - instruction that provides students with a consistent strategy to apply knowledge of sound-symbol relationships to assist them in identifying unfamiliar words.

VOCABULARY – a comprehension that a reader's understanding of text is inextricably linked to his or her vocabulary base that can be developed through reading, direct instruction, and student-centered activities.

READING FLUENCY – a recognition that fluent reading is characterized by reading words with automaticity and expression and recognizing words with speed, accuracy, and prosody; such automatic word recognition frees a student's attention to comprehend the text.

COMPREHENSION/CRITICAL LITERACY – a recognition that the goal of reading is understanding text by establishing a purpose for reading and determining what is literal and what is implied in the text. Critical literacy involves the reader being able to make connections between parts of a text and between texts. In addition to these foundational components, skilled reading is influenced by the development of motivation and engagement, attitude, and stance toward reading and writing and the process of interacting with text before, during and after reading.

MOTIVATION and ENGAGEMENT - readers' desire to interact with a text, influenced by their own self-efficacy as well as the genre, text level, author, illustrator, or topic of a text. The reader's engagement with text may be influenced by motivation to interact with a specific text.

ATTITUDE - a reader's attitude toward reading for academic or leisure purposes influences the probability that he/she will choose to become engaged in the reading process.

STANCE - whether a reader is approaching a text for pleasure or for information.

READING PROCESS - the importance of a reader being involved with the text before (setting a purpose for reading), during (reading, monitoring comprehension, investigating terms he/she does not understand), and after (referring back to the text to strengthen one's understanding, answer questions, engage in discussions and complete projects) reading.

WRITING PROCESS

The National Council of Teachers of English (NCTE) has identified a process, confirmed by research, that skilled writers use to create text. Because writing is recursive, the stages of the process may not occur in a linear sequence, but the writer may revert to an activity characteristic of an earlier stage. The stages of the writing process include –

PREWRITING - preparing to write by gathering and organizing ideas, generating a topic, and clarifying purpose, audience, and form.

DRAFTING - putting ideas down on paper with a focus on content while using notes or ideas generated during prewriting, without over-concern about adherence to grammatical rules, spelling, or mechanics.

REVISING - refining of content, not mechanics. Revision begins during the prewriting activity and continues through the final draft, as writers think again about the choices made for content and add, delete, or rearrange the material. Skilled writers may revise a draft several times, accepting suggestions for improvement from peers and teachers in addition to self-critique.

EDITING – making writing suitable for publication, including the correction of errors in punctuation, capitalization, spelling, usage, sentence structure, and legibility so that errors in conventions do not interfere with an audience's ability to understand the message.

PUBLISHING - sharing the writer's product with and/or being evaluated by the intended audience, or readers in general. An authentic audience, one with whom the students want to communicate, is necessary for effective writing. It is important to note that not every piece that a writer begins will be carried through the entire writing process and polished for publication. However, each student should be expected to develop some pieces of writing thoroughly enough to be published. Publishing reinforces the knowledge that writing is an act of communication.

MULTIMODAL LITERACIES

The Multimodal Literacies advanced from the Oklahoma *Priority Academic Student Skills'* Visual Literacy standard.

Text in the twenty-first century is not limited to print. Increasingly, texts are composites of print, images, sound, video, charts, and interactive links. Students need to know how to interpret and produce these kinds of texts for college, career, and informed citizenship. A statement by the NCTE Executive Committee (February 2013) confirms,

> ... the 21st century demands that a literate person possess a wide range of abilities and competencies, many literacies. These literacies are multiple, dynamic, and malleable. As in the past, they are inextricably linked with particular histories, life possibilities, and social trajectories of individuals and groups. Active, successful participants in this 21st century global society must be able to
>
> - develop proficiency and fluency with the tools of technology;
> - build intentional cross-cultural connections and relationships with others so as to pose and solve problems collaboratively and strengthen independent thought;
> - design and share information for global communities to meet a variety of purposes;
> - manage, analyze, and synthesize multiple streams of simultaneous information; create, critique, analyze, and evaluate multimedia texts; and
> - attend to the ethical responsibilities required by these complex environments.

The committee asserts,

> The use of multimodal literacies has expanded the ways we acquire information and understand concepts. Ever since the days of illustrated books and maps texts have included visual elements for the purpose of imparting information. The contemporary difference is the ease with which we can combine words, images, sound, color, animation, video, and styles of print in projects so that they are part of our everyday lives and, at least by our youngest generation, often taken for granted.

What this means for teaching

The techniques of acquiring, organizing, evaluating, and creatively using multimodal information should become an increasingly important component of the English language arts classroom (November 2005).

Further Support

A large body of research has been consulted for each of Oklahoma's Eight College- and Career- Ready Standards; these sources are provided in a complete bibliography which can be accessed on the Oklahoma Department of Education's English Language Arts Standards webpage.

OKLAHOMA ENGLISH LANGUAGE ARTS EIGHT OVERARCHING STANDARDS IN READING AND WRITING

Academic standards establish objective performance criteria. They are used as guides for developing curriculum and instruction that is appropriately engaging, challenging, and sequenced for students. Acquiring language arts knowledge and skills is a recursive learning endeavor. Students need to revisit concepts as they develop language arts acumen at increasingly higher levels of complexity.

The eight overarching standards reinforce the recursive nature of the language arts, a non-linear process that involves the continuous and thoughtful refinement of concepts and skills. In each of the eight overarching English language arts standards, concepts and skills are expressed in terms of both reading and writing, intended to support integrated, rather than isolated, reading/writing instruction. Research supports this integrated model of English language arts, where students read to understand the meaning and composition of a text and write with readers' expectations and assumptions in mind.

ENGLISH LANGUAGE ARTS COLLEGE- AND CAREER- STANDARDS

Standard 1: Speaking and Listening Students will speak and listen effectively in a variety of situations including, but not limited to, responses to reading and writing.

Reading	Writing
Students will develop and apply effective communication skills through speaking and active listening.	Students will develop and apply effective communication skills through speaking and active listening to create individual and group projects and presentations.

Standard 2: Reading Foundations/Reading and Writing Process Students will develop foundational skills for future reading success by working with sounds, letters, and text. Students will use a variety of recursive reading and writing processes.

Reading	Writing
Students will read and comprehend increasingly complex literary and informational texts.	Students will develop and strengthen writing by engaging in a recursive process that includes prewriting, drafting, revising, editing, and publishing.

Standard 3: Critical Reading and Critical Writing Students will apply critical thinking skills to reading and writing.

Reading	Writing
Students will comprehend, interpret, evaluate, and respond to a variety of complex texts of all literary and informational genres from a variety of historical, cultural, ethnic, and global perspectives.	Students will write for varied purposes and audiences in all modes, using fully developed ideas, strong organization, well-chosen words, fluent sentences, and appropriate voice.

Standard 4: Vocabulary Students will expand their working vocabularies to effectively communicate and understand texts.

Reading	Writing
Students will expand academic, domain-appropriate, grade-level vocabularies through reading, word study, and class discussion.	Students will apply knowledge of vocabularies to communicate by using descriptive, academic, and domain-appropriate abstract and concrete words in their writing.

Standard 5: Language Students will apply knowledge of grammar and rhetorical style to reading and writing.

Reading	Writing
Students will apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts.	Students will demonstrate command of Standard English grammar, mechanics, and usage through writing and other modes of communication.

Standard 6: Research Students will engage in inquiry to acquire, refine, and share knowledge.

Reading	Writing
Students will comprehend, evaluate, and synthesize resources to acquire and refine knowledge.	Students will summarize and paraphrase, integrate evidence, and cite sources to create reports, projects, papers, texts, and presentations for multiple purposes.

Standard 7: Multimodal Literacies Students will acquire, refine, and share knowledge through a variety of written, oral, visual, digital, non verbal, and interactive texts.

Reading	Writing
Students will evaluate written, oral, visual, and digital texts in order to draw conclusions and analyze arguments.	Students will create multimodal texts to communicate knowledge and develop arguments.

Standard 8: Independent Reading and Writing Students will read and write for a variety of purposes including, but not limited to, academic and personal, for extended periods of time.

Reading	Writing
Students will read independently for a variety of purposes and for extended periods of time. Students will select appropriate texts for specific purposes.	Students will write independently for extended periods of time. Students will vary their modes of expression to suit audience and task.

Navigating the Vertical Alignment

Overarching Oklahoma College- and Career- Ready Standard for English Language Arts

Vertical Grade-level Progressions

Recursive Reading and Writing Strands

with Guiding Principles

Standard Objectives

delineated for each grade and vertically aligned

1: Speaking and Listening - Students will speak and listen effectively in a variety of situations including, but not limited to, responses to reading and writing.

	5th Grade	6th Grade	7th Grade
Reading Students will develop and apply effective communication skills through speaking and active listening.	**5.1.R.1** Students will actively listen and speak clearly using appropriate discussion rules with awareness of verbal and nonverbal cues.	**6.1.R.1** Students will actively listen and speak clearly using appropriate discussion rules with awareness of verbal and nonverbal cues.	**7.1.R.1** Students will actively listen and speak clearly using appropriate discussion rules with awareness and control of verbal and nonverbal cues.
	5.1.R.2 Students will ask and answer questions to seek help, get information, or clarify about information presented orally through text or other media to confirm understanding.	**6.1.R.2** Students will actively listen and interpret a speaker's messages (both verbal and nonverbal) and ask questions to clarify the speaker's purpose and perspective.	**7.1.R.2** Students will actively listen and interpret a speaker's messages (both verbal and nonverbal) and ask questions to clarify the speaker's purpose and perspective.
	5.1.R.3 Students will engage in collaborative discussions about appropriate topics and texts, expressing their own ideas clearly while building on the ideas of others in pairs, diverse groups, and whole class settings.	**6.1.R.3** Students will engage in collaborative discussions about appropriate topics and texts, expressing their own ideas clearly while building on the ideas of others in pairs, diverse groups, and whole class settings.	**7.1.R.3** Students will engage in collaborative discussions about appropriate topics and texts, expressing their own ideas clearly while building on the ideas of others in pairs, diverse groups, and whole class settings.
Writing Students will develop and apply effective communication skills through speaking and active listening to create individual and group projects and presentations.	**5.1.W.1** Students will give formal and informal presentations in a group or individually, organizing information and determining appropriate content for audience.	**6.1.W.1** Students will give formal and informal presentations in a group or individually, organizing information and determining appropriate content and purpose for audience.	**7.1.W.1** Students will give formal and informal presentations in a group or individually, providing evidence to support a main idea.
	5.1.W.2 Students will work effectively and respectfully within diverse groups, share responsibility for collaborative work, and value individual contributions made by each group member.	**6.1.W.2** Students will work effectively and respectfully within diverse groups, share responsibility for collaborative work, and value individual contributions made by each group member.	**7.1.W.2** Students will work effectively and respectfully within diverse groups, show willingness to make necessary compromises to accomplish a goal, share responsibility for collaborative work, and value individual contributions made by each group member.

Standard Code

Grade . Standard Number . Strand . Objective

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Instructional Design Considerations

EIGHT CONSISTENT STANDARDS

The standards were developed with consideration to teachers and curriculum designers. **Rich units of study can be designed by incorporating each of the eight overarching standards.** Further grade-specific guidance is provided in the Reading and Writing strands.

READING and WRITING STRANDS

The standards were designed to develop the total literacy of students by intentionally taking into consideration what they do when reading and writing. **Every standard includes a reading and writing strand with standard objectives delineated by grade-level.**

Reading instruction supports the development and refinement of writing skills. Writing instruction supports the development and refinement of reading skills.

RECURSIVE TEACHING and LEARNING

Teaching and learning language arts is a recursive endeavor: students will revisit concepts again and again as they use language at increasingly sophisticated levels. **Skills are repeated with an implied expectation that they are attributed to increasingly more complex texts.**

Because of this recursive learning process, language arts learning does not progress for students in a strictly linear way.

Oklahoma ELA standards are not taught in isolation. Standards can be bundled for educators to develop grade-appropriate lessons, tasks, and assessments.

Standard 1

Speaking and Listening

Students will speak and listen effectively in a variety of situations including, but not limited to, responses to reading and writing.

Reading
Students will develop and apply effective communication skills through speaking and active listening.

Writing
Students will develop and apply effective communication skills through speaking and active listening to create individual and group projects and presentations.

1: Speaking and Listening Students will speak and listen effectively in a variety of situations including, but not limited to, responses to reading and writing.

	Pre-Kindergarten	Kindergarten	1st Grade
Reading Students will develop and apply effective communication skills through speaking and active listening.	**PK.1.R.1** Students will actively listen and speak using agreed-upon rules with guidance and support. **PK.1.R.2.** Students will begin to ask and answer questions about information presented orally or through text or other media with guidance and support. **PK.1.R.3** Students will begin to engage in collaborative discussions about appropriate topics and texts with peers and adults in small and large groups with guidance and support. **PK.1.R.4** Students will follow simple oral directions.	**K.1.R.1** Students will actively listen and speak using agreed-upon rules for discussion with guidance and support. **K.1.R.2** Students will ask and answer questions to seek help, get information, or clarify about information presented orally or through text or other media with guidance and support. **K.1.R.3** Students will engage in collaborative discussions about appropriate topics and texts with peers and adults in small and large groups with guidance and support. **K.1.R.4** Students will follow one and two step directions.	**1.1.R.1** Students will actively listen and speak using agreed-upon rules for discussion. **1.1.R.2** Students will ask and answer questions to seek help, get information, or clarify about information presented orally through text or other media, to confirm understanding. **1.1.R.3** Students will engage in collaborative discussions about appropriate topics and texts with peers and adults in small and large groups. **1.1.R.4** Students will restate and follow simple two-step directions.
Writing Students will develop and apply effective communication skills through speaking and active listening to create individual and group projects and presentations.	**PK.1.W.1** Students will begin to orally describe personal interests or tell stories to classmates with guidance and support. **PK.1.W.2** Students will work respectfully with others with guidance and support.	**K.1.W.1** Students will orally describe personal interests or tell stories, facing the audience and speaking clearly in complete sentences and following implicit rules for conversation, including taking turns and staying on topic. **K.1.W.2** Students will work respectfully with others with guidance and support.	**1.1.W.1** Students will orally describe people, places, things, and events with relevant details expressing their ideas. **1.1.W.2** Students will work respectfully in groups.

1: Speaking and Listening Students will speak and listen effectively in a variety of situations including, but not limited to, responses to reading and writing.

	2nd Grade	3rd Grade	4th Grade
Reading Students will develop and apply effective communication skills through speaking and active listening.	**2.1.R.1** Students will actively listen and speak using appropriate discussion rules. **2.1.R.2** Students will ask and answer questions to seek help, get information, or clarify about information presented orally, through text or other media to confirm understanding. **2.1.R.3** Students will engage in collaborative discussions about appropriate topics and texts with peers and adults in small and large groups. **2.1.R.4** Students will restate and follow multi-step directions.	**3.1.R.1** Students will actively listen and speak clearly using appropriate discussion rules. **3.1.R.2** Students will ask and answer questions to seek help, get information, or clarify about information presented orally through text or other media to confirm understanding. **3.1.R.3** Students will engage in collaborative discussions about appropriate topics and texts, expressing their own ideas clearly in pairs, diverse groups, and whole class settings.	**4.1.R.1** Students will actively listen and speak clearly using appropriate discussion rules. **4.1.R.2** Students will ask and answer questions to seek help, get information, or clarify information presented orally through text or other media to confirm understanding. **4.1.R.3** Students will engage in collaborative discussions about appropriate topics and texts, expressing their own ideas clearly while building on the ideas of others in pairs, diverse groups, and whole class settings.
Writing Students will develop and apply effective communication skills through speaking and active listening to create individual and group projects and presentations.	**2.1.W.1** Students will report on a topic or text, tell a story or recount an experience with appropriate facts and relevant, descriptive details, speaking audibly in coherent sentences. **2.1.W.2** Students will work respectfully within groups, share responsibility for collaborative work, and value individual contributions made by each group member.	**3.1.W.1** Students will report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking audibly in coherent sentences at an appropriate pace. **3.1.W.2** Students will work respectfully within diverse groups, share responsibility for collaborative work, and value individual contributions made by each group member.	**4.1.W.1** Students will report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking audibly in coherent sentences at an appropriate pace. **4.1.W.2** Students will work effectively and respectfully within diverse groups, share responsibility for collaborative work, and value individual contributions made by each group member.

1: Speaking and Listening Students will speak and listen effectively in a variety of situations including, but not limited to, responses to reading and writing.

	5th Grade	6th Grade	7th Grade
Reading Students will develop and apply effective communication skills through speaking and active listening.	**5.1.R.1** Students will actively listen and speak clearly using appropriate discussion rules with awareness of verbal and nonverbal cues. **5.1.R.2** Students will ask and answer questions to seek help, get information, or clarify about information presented orally through text or other media to confirm understanding. **5.1.R.3** Students will engage in collaborative discussions about appropriate topics and texts, expressing their own ideas clearly while building on the ideas of others in pairs, diverse groups, and whole class settings.	**6.1.R.1** Students will actively listen and speak clearly using appropriate discussion rules with awareness of verbal and nonverbal cues. **6.1.R.2** Students will actively listen and interpret a speaker's messages (both verbal and nonverbal) and ask questions to clarify the speaker's purpose and perspective. **6.1.R.3** Students will engage in collaborative discussions about appropriate topics and texts, expressing their own ideas clearly while building on the ideas of others in pairs, diverse groups, and whole class settings.	**7.1.R.1** Students will actively listen and speak clearly using appropriate discussion rules with awareness and control of verbal and nonverbal cues. **7.1.R.2** Students will actively listen and interpret a speaker's messages (both verbal and nonverbal) and ask questions to clarify the speaker's purpose and perspective. **7.1.R.3** Students will engage in collaborative discussions about appropriate topics and texts, expressing their own ideas clearly while building on the ideas of others in pairs, diverse groups, and whole class settings.
Writing Students will develop and apply effective communication skills through speaking and active listening to create individual and group projects and presentations.	**5.1.W.1** Students will give formal and informal presentations in a group or individually, organizing information and determining appropriate content for audience. **5.1.W.2** Students will work effectively and respectfully within diverse groups, share responsibility for collaborative work, and value individual contributions made by each group member.	**6.1.W.1** Students will give formal and informal presentations in a group or individually, organizing information and determining appropriate content and purpose for audience. **6.1.W.2** Students will work effectively and respectfully within diverse groups, share responsibility for collaborative work, and value individual contributions made by each group member.	**7.1.W.1** Students will give formal and informal presentations in a group or individually, providing evidence to support a main idea. **7.1.W.2** Students will work effectively and respectfully within diverse groups, show willingness to make necessary compromises to accomplish a goal, share responsibility for collaborative work, and value individual contributions made by each group member.

1: Speaking and Listening Students will speak and listen effectively in a variety of situations including, but not limited to, responses to reading and writing.

	8th Grade	9th Grade - English I	10th Grade - English II
Reading Students will develop and apply effective communication skills through speaking and active listening.	**8.1.R.1** Students will actively listen and speak clearly using appropriate discussion rules with control of verbal and nonverbal cues. **8.1.R.2** Students will actively listen and interpret a speaker's messages (both verbal and nonverbal) and ask questions to clarify the speaker's purpose and perspective. **8.1.R.3** Students will engage in collaborative discussions about appropriate topics and texts, expressing their own ideas clearly while building on the ideas of others in pairs, diverse groups, and whole class settings.	**9.1.R.1** Students will actively listen and speak clearly using appropriate discussion rules with control of verbal and nonverbal cues. **9.1.R.2** Students will actively listen and interpret a speaker's messages (both verbal and nonverbal) and ask questions to clarify the speaker's purpose and perspective. **9.1.R.3** Students will engage in collaborative discussions about appropriate topics and texts, expressing their own ideas clearly while building on the ideas of others in pairs, diverse groups, and whole class settings.	**10.1.R.1** Students will actively listen and speak clearly using appropriate discussion rules with control of verbal and nonverbal cues. **10.1.R.2** Students will actively listen and evaluate, analyze, and synthesize a speaker's messages (both verbal and nonverbal) and ask questions to clarify the speaker's purpose and perspective. **10.1.R.3** Students will engage in collaborative discussions about appropriate topics and texts, expressing their own ideas clearly while building on the ideas of others in pairs, diverse groups, and whole class settings.
Writing Students will develop and apply effective communication skills through speaking and active listening to create individual and group projects and presentations.	**8.1.W.1** Students will give formal and informal presentations in a group or individually, providing textual and visual evidence to support a main idea. **8.1.W.2** Students will work effectively and respectfully within diverse groups, show willingness to make necessary compromises to accomplish a goal, share responsibility for collaborative work, and value individual contributions made by each group member.	**9.1.W.1** Students will give formal and informal presentations in a group or individually, providing textual and visual evidence to support a main idea. **9.1.W.2** Students will work effectively and respectfully within diverse groups, show willingness to make necessary compromises to accomplish a goal, share responsibility for collaborative work, and value individual contributions made by each group member.	**10.1.W.1** Students will give formal and informal presentations in a group or individually, providing textual and visual evidence to support a main idea. **10.1.W.2** Students will work effectively and respectfully within diverse groups, show willingness to make necessary compromises to accomplish a goal, share responsibility for collaborative work, and value individual contributions made by each group member.

1: Speaking and Listening Students will speak and listen effectively in a variety of situations including, but not limited to, responses to reading and writing.

	11th Grade - English III	12th Grade - English IV
Reading Students will develop and apply effective communication skills through speaking and active listening.	**11.1.R.1** Students will actively listen and speak clearly using appropriate discussion rules with control of verbal and nonverbal cues. **11.1.R.2** Students will actively listen and evaluate, analyze, and synthesize a speaker's messages (both verbal and nonverbal) and ask questions to clarify the speaker's purpose and perspective. **11.1.R.3** Students will engage in collaborative discussions about appropriate topics and texts, expressing their own ideas by contributing to, building on, and questioning the ideas of others in pairs, diverse groups, and whole class settings.	**12.1.R.1** Students will actively listen and speak clearly using appropriate discussion rules with control of verbal and nonverbal cues. **12.1.R.2** Students will actively listen and evaluate, analyze, and synthesize a speaker's messages (both verbal and nonverbal) and ask questions to clarify the speaker's purpose and perspective. **12.1.R.3** Students will engage in collaborative discussions about appropriate topics and texts, expressing their own ideas by contributing to, building on, and questioning the ideas of others in pairs, diverse groups, and whole class settings.
Writing Students will develop and apply effective communication skills through speaking and active listening to create individual and group projects and presentations.	**11.1.W.1** Students will give formal and informal presentations in a group or individually, providing textual and visual evidence to support a main idea. **11.1.W.2** Students will work effectively and respectfully within diverse groups, demonstrate willingness to make necessary compromises to accomplish a goal, share responsibility for collaborative work, and value individual contributions made by each group member.	**12.1.W.1** Students will give formal and informal presentations in a group or individually, providing textual and visual evidence to support a main idea. **12.1.W.2** Students will work effectively and respectfully within diverse groups, demonstrate willingness to make necessary compromises to accomplish a goal, share responsibility for collaborative work, and value individual contributions made by each group member.

Standard 2:

Reading Foundations

Students will develop foundational skills for future reading success by working with sounds, letters, and text.

Phonological Awareness
Phonological awareness is the ability to recognize, think about, and manipulate sounds in spoken language without using text.
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Print Concepts
Students will demonstrate their understanding of the organization and basic features of print, including book handling skills and the understanding that printed materials provide information and tell stories.
pg. 22

Phonics and Word Study
Students will decode and read words in context and isolation by applying phonics and word analysis skills.
pg. 24

Fluency
Students will recognize high-frequency words and read grade-level text smoothly and accurately, with expression that connotes comprehension.
pg. 26

2: Reading Foundations Students will develop foundational skills for future reading success by working with sounds, letters, and text.

	Pre-Kindergarten	Kindergarten	1st Grade
Phonological Awareness Phonological awareness is the ability to recognize, think about, and manipulate sounds in spoken language without using text.	**PK.2.PA.1** Students will distinguish spoken words in a sentence with guidance and support. **PK.2.PA.2** Students will recognize spoken words that rhyme. **PK.2.PA.3** Students will begin to recognize syllables in spoken words *(e.g., sunshine= sun + shine).* **PK.2.PA.4** Students will begin to isolate initial and final sounds in spoken words. **PK.2.PA.5** Students will begin to recognize initial sounds in a set of spoken words (*i.e., alliteration*). **PK.2.PA.6** Students will combine onsets and rimes to form familiar one syllable spoken words with pictorial support (*e.g., /c/ + at = cat).*	**K.2.PA.1** Students will distinguish spoken words in a sentence. **K.2.PA.2** Students will recognize and produce pairs of rhyming words, and distinguish them from non-rhyming pairs. **K.2.PA.3** Students will isolate and pronounce the same initial sounds in a set of spoken words *(i.e., alliteration*) (*e.g., "the puppy pounces"*). **K.2. PA.4** Students will recognize the short or long vowel sound in one syllable words. **K.2.PA.5** Students will count, pronounce, blend, segment, and delete syllables in spoken words. **K.2.PA.6** Students will blend and segment onset and rime in one syllable spoken words *(e.g., Blending: /ch/ + at = chat; segmenting: cat = /c/+ at).* **K.2.PA.7** Students will blend phonemes to form one syllable spoken words with 3 to 5 phonemes *(e.g., /f/ /a/ /s/ /t/= fast)* **K.2.PA.8** Students will segment phonemes in one syllable spoken words with 3 to 5 phonemes *(e.g., "fast" = /f/ /a/ /s/ /t/).* **K.2.PA.9** Students will add, delete, and substitute phonemes in one syllable spoken words *(e.g., "add /c/ to the beginning of "at" to say "cat;" "remove the /p/ from "pin," to say "in;" "change the /d/ in "dog" to /f/ /r/ to say "frog").*	**1.2.PA.1** Students will blend and segment onset and rime in spoken words *(e.g., /ch/+ /at/ = chat).* **1.2.PA.2** Students will differentiate short from long vowel sounds in one syllable words. **1.2.PA.3** Students will isolate and pronounce initial, medial, and final sounds in spoken words. **1.2.PA.4** Students will blend phonemes to form spoken words with 4 to 6 phonemes*)* including consonant blends *(e.g., /s/ /t/ /r/ /i/ /ng/=string).* **1.2.PA.5** Students will segment phonemes in spoken words with 4 to 6 phonemes into individual phonemes *(e.g. string= /s/ /t/ /r/ /i/ /ng/).* **1.2.PA.6** Students will add, delete, and substitute phonemes in spoken words *(e.g., "add /g/ to the beginning of low to say 'glow;' "remove the /idge/ from 'bridge,' to say 'br;' "change the /ar/ in 'charm' to /u/ to say 'chum').*

	2nd Grade	3rd Grade	4th Grade
Phonological Awareness Phonological awareness is the ability to recognize, think about, and manipulate sounds in spoken language without using text.	***Students will continue to review and apply earlier grade level expectations for this standard. If phonological awareness skills are not mastered, students will address skills from previous grades.***		

2: Reading Foundations

Students will develop foundational skills for future reading success by working with sounds, letters, and text.

	Pre-Kindergarten	Kindergarten	1st Grade
Print Concepts Students will demonstrate their understanding of the organization and basic features of print, including book handling skills and the understanding that printed materials provide information and tell stories.	**PK.2.PC.1** Students will write the majority of the letters in their first name and some uppercase and lowercase letters with guidance and support.	**K.2.PC.1** Students will correctly form letters to write their first and last name and most uppercase and lowercase letters correctly.	**1.2.PC.1** Students will correctly form letters and use appropriate spacing for letters, words, and sentences using left-to-right and top-to-bottom progression.
	PK.2.PC.2 Students will understand that print carries a message by recognizing labels, signs, and other print in the environment with guidance and support.	**K.2.PC.2** Students will demonstrate their understanding that print carries a message by recognizing labels, signs, and other print in the environment.	**1.2.PC.2** Students will recognize the distinguishing features of a sentence *(e.g., capitalization of the first word, ending punctuation,comma, quotation marks)*.
	PK.2.PC.3 Students will begin to demonstrate correct book orientation and identify the front and back covers of a book.	**K.2.PC.3** Students will demonstrate correct book orientation and identify the title, title page, and the front and back covers of a book.	***Students will continue to review and apply earlier grade level expectations for this standard.***
	PK.2.PC.4 Students will recognize that written words are made up of letters and are separated by spaces with guidance and support.	**K.2.PC.4** Students will recognize that written words are made up of letters and are separated by spaces.	***If print concepts skills are not mastered, students will address skills from previous grades.***
	PK.2.PC.5 Students will begin to understand that print moves from top to bottom, left to right, and front to back.	**K.2.PC.5** Students will recognize that print moves from top to bottom, left to right, and front to back (does not have to be matched to voice).	
	PK.2.PC.6 Students will recognize ending punctuation marks in print during shared reading or other text experiences with guidance and support.	**K.2.PC.6** Students will recognize the distinguishing features of a sentence. *(e.g., capitalization of the first word, ending punctuation: period, exclamation mark, question mark)* with guidance and support.	

2: Reading Foundations Students will develop foundational skills for future reading success by working with sounds, letters, and text.

	2nd Grade	3rd Grade	4th Grade
Print Concepts Students will demonstrate their understanding of the organization and basic features of print, including book handling skills and the understanding that printed materials provide information and tell stories.	**2.2.PC** Students will correctly form letters in print and use appropriate spacing for letters, words, and sentences.	**3.2.PC** Students will correctly form letters in print and cursive and use appropriate spacing for letters, words, and sentences.	**4.2.PC** Students will correctly form letters in print and cursive and use appropriate spacing for letters, words, and sentences.
	Students will continue to review and apply earlier grade level expectations for this standard. ***If print concepts skills are not mastered, students will address skills from previous grades.***		

2: Reading Foundations Students will develop foundational skills for future reading success by working with sounds, letters, and text.

	Pre-Kindergarten	Kindergarten	1st Grade

Phonics and Word Study
Students will decode and read words in context and isolation by applying phonics and word analysis skills.
	PK.2.PWS.1 Students will name the majority of the letters in their first name and many uppercase and lowercase letters with guidance and support.	**K.2.PWS.1** Students will name all uppercase and lowercase letters.	**1.2.PWS.1** Students will decode phonetically regular words by using their knowledge of:
			• single consonants *(e.g., c = /k/, c = /s/, s = /s/, s = /z/, x = /ks/, x = /z/)*
			• consonant blends *(e.g., bl, br, cr)*
			• consonant digraphs and trigraphs *(e.g., sh-, -tch)*
			• vowel sounds:
			  ○ long
			  ○ short
			• r-controlled vowels *(e.g., ar, er, ir or, ur)*
			• vowel spelling patterns:
			  ○ vowel digraphs *(e.g., ea, oa, ee)*
			  ○ vowel-consonant-silent-e *(e.g., lake)*

	PK.2.PWS.2 Students will produce some sounds represented by letters with guidance and support.	**K.2.PWS.2** Students will sequence the letters of the alphabet.	**1.2.PWS.2** Students will decode words by applying knowledge of structural analysis: • most major syllable patterns *(e.g., closed, open, vowel team, vowel silent e, r-controlled)* • inflectional endings *(e.g., -s, -ed, -ing)* • compound words • contractions
		K.2.PWS.3 Students will produce the primary or most common sound for each consonant, short and long vowel sounds *(e.g., c = /k/, c = /s/, s = /s/, s = /z/, x = /ks/, x = /z/).*	**1.2.PWS.3** Students will read words in common word families *(e.g., -at, -ab, -am, -in).*
		K.2.PWS.4 Students will blend letter sounds to decode simple *Vowel / Consonant (VC)* and *Consonant / Vowel / Consonant (CVC)* words *(e.g., VC words= at, in, up; CVC words = pat, hen, lot).*	

2: Reading Foundations Students will develop foundational skills for future reading success by working with sounds, letters, and text.

	2nd Grade	3rd Grade	4th Grade

Phonics and Word Study
Students will decode and read words in context and isolation by applying phonics and word analysis skills.
	2.2.PWS.1 Students will decode one- and two- syllable words by using their knowledge of:
	• single consonants, including those with two different sounds *(e.g., soft and hard c [cent, cat] and g [gem,goat])*
	• consonant blends *(e.g., bl, br, cr)*
	• consonant digraphs and trigraphs *(e.g., sh-, -tch)*
	• vowel sounds:
	  ○ long
	  ○ short
	  ○ "r" controlled vowels *(e.g., ar, er, ir or, ur)*
	• vowel spelling patterns:
	  ○ vowel digraphs *(e.g., ea, oa, ee)*
	  ○ vowel-consonant-silent-e *(e.g., lake)*
	  ○ vowel diphthongs *(vowel combinations having two vowel sounds e.g., oi as in boil, oy as in boy]*
		3.2.PWS.1 Students will decode multisyllabic words using their knowledge of:
		• "r" controlled vowels (*e.g., ar, er, ir or, ur)*
		• vowel diphthongs *(vowel combinations having two vowel sounds e.g., oi as in boil, oy as in boy]*
			4.2.PWS.1 Students will use their combined knowledge of letter-sound correspondences, syllable patterns, morphology and semantics to accurately read unfamiliar words, including multisyllabic words.

	2.2.PWS.2 Students will decode words by applying knowledge of structural analysis: • all major syllable patterns *(e.g., closed, consonant +le, open, vowel team, vowel silent e, r-controlled)* • inflectional endings *(e.g., -s, -ed, -ing)* • compound words • contractions • abbreviations • common roots and related prefixes and suffixes	**3.2.PWS.2** Students will decode multisyllabic words by applying knowledge of structural analysis: • all major syllable patterns • contractions • abbreviations • common roots and related prefixes and suffixes	
	2.2.PWS.3 Students will read words in common word families *(e.g., -ight, -ink, -ine, ow)***.**	**3.2.PWS.3** Students will use decoding skills and semantics in context when reading new words in a text, including multisyllabic words.	
	Students will continue to review and apply earlier grade level expectations for this standard. If these decoding skills are not mastered, students will address skills from previous grades.		

2: Reading Foundations Students will develop foundational skills for future reading success by working with sounds, letters, and text.

	Pre-Kindergarten	Kindergarten	1st Grade
Fluency Students will recognize high-frequency words and read grade-level text smoothly and accurately, with expression that connotes comprehension.	**PK.2.F.1** Students will read first name in print.	**K.2.F.1** Students will read first and last name in print. **K.2.F.2** Students will read common high frequency grade-level words by sight *(e.g., not, was, to, have, you, he, is, with, are).*	**1.2.F.1** Students will read high frequency and/or common irregularly spelled grade-level words with automaticity in text. **1.2.F.2** Students will orally read grade-level text at an appropriate rate, smoothly and accurately, with expression that connotes comprehension.

2: Reading Foundations Students will develop foundational skills for future reading success by working with sounds, letters, and text.

	2nd Grade	3rd Grade	4th Grade
Fluency Students will recognize high-frequency words and read grade-level text smoothly and accurately, with expression that connotes comprehension.	**2.2.F.1** Students will read high frequency and/or common irregularly spelled grade-level words with automaticity in text. **2.2.F.2** Students will orally read grade-level text at an appropriate rate, smoothly and accurately, with expression that connotes comprehension.	**3.2.F.1** Students will read high frequency and/or irregularly spelled grade-level words with automaticity in text. **3.2.F.2** Students will orally read grade-level text at an appropriate rate, smoothly and accurately, with expression that connotes comprehension.	**4.2.F.1** Students will read high frequency and irregularly spelled grade-level words with automaticity in text. **4.2.F.2** Students will orally read grade-level text at an appropriate rate, smoothly and accurately, with expression that connotes comprehension.
	Students will continue to review and apply earlier grade level expectations for this standard. If these fluency skills are not mastered, students will address skills from previous grades.		

2: Reading Foundations Students will develop foundational skills for future reading success by working with sounds, letters, and text.

	5th Grade	6th Grade	7th Grade	8th Grade
Fluency Students will recognize high-frequency words and read grade-level text smoothly and accurately, with expression that connotes comprehension.	***Students will continue to review and apply earlier grade level expectations for this standard.*** ***If these fluency skills are not mastered, students will address skills from previous grades.***			

Standard 2

Reading and Writing Process

Students will use a variety of recursive reading and writing processes.

Reading
Students will read and comprehend increasingly complex literary and informational texts.

Writing
Students will develop and strengthen writing by engaging in a recursive process that includes prewriting, drafting, revising, editing, and publishing.

2: Reading and Writing Process Students will use a variety of recursive reading and writing processes.

	Pre-Kindergarten	Kindergarten	1st Grade
Reading Students will read and comprehend increasingly complex literary and informational texts.	**PK.2.R** Students will begin to retell or reenact major events from a read-aloud with guidance and support to recognize the main idea.	**K.2.R.1** Students will retell or reenact major events from a read-aloud with guidance and support to recognize the main idea. **K.2.R.2** Students will discriminate between fiction and nonfiction/informational text with guidance and support. **K.2.R.3** Students will sequence the events/plot *(i.e., beginning, middle, and end)* of a story or text with guidance and support.	**1.2.R.1** Students will retell or reenact major events in a text, focusing on important details to recognize the main idea. **1.2.R.2** Students will discriminate between fiction and nonfiction/informational text. **1.2.R.3** Students will sequence the events/plot *(i.e., beginning, middle, and end)* of a story or text.
Writing Students will develop and strengthen writing by engaging in a recursive process that includes prewriting, drafting, revising, editing, and publishing.	**PK.2.W** Students will begin to express themselves through drawing, dictating, and emergent writing.	**K.2.W.1** Students will begin to develop first drafts by expressing themselves through drawing and emergent writing. **K.2.W.2** Students will begin to develop first drafts by sequencing the action or details of stories/texts. **K.2.W.3** Students will begin to edit first drafts using appropriate spacing between letters and words.	**1.2.W.1** Students will develop and edit first drafts using appropriate spacing between letters, words, and sentences using left-to-right and top-to-bottom progression. **1.2.W.2** Students will develop drafts by sequencing the action or details in a story or about a topic through writing sentences with guidance and support. **1.2.W.3** Students will correctly spell grade-appropriate, highly decodable words *(e.g., cup, like, cart)* and common, irregularly spelled sight words *(e.g., the)* while editing. **1.2.W.4** Students will use resources to find correct spellings of words *(e.g., word wall, vocabulary notebook).*

2: Reading and Writing Process Students will use a variety of recursive reading and writing processes.

	2nd Grade	3rd Grade	4th Grade
Reading Students will read and comprehend increasingly complex literary and informational texts.	**2.2.R.1** Students will locate the main idea and supporting details of a text. **2.2.R.2** Students will begin to compare and contrast details *(e.g., plots or events, settings, and characters)* to discriminate genres. **2.2.R.3** Students will begin to summarize events or plots *(i.e., beginning, middle, end, and conflict)* of a story or text.	**3.2.R.1** Students will locate the main idea and key supporting details of a text or section of text. **3.2.R.2** Students will compare and contrast details *(e.g., plots or events, settings, and characters)* to discriminate genres. **3.2.R.3** Students will summarize events or plots *(i.e., beginning, middle, end, and conflict)* of a story or text.	**4.2.R.1** Students will distinguish how key details support the main idea of a passage. **4.2.R.2** Students will compare and contrast details in literary and nonfiction/informational texts to discriminate various genres. **4.2.R.3** Students will summarize events or plots *(i.e., beginning, middle, end, conflict, and climax)* of a story or text. **4.2.R.4** Students will begin to paraphrase main ideas with supporting details in a text.
Writing Students will develop and strengthen writing by engaging in a recursive process that includes prewriting, drafting, revising, editing, and publishing.	**2.2.W.1** Students will develop drafts by sequencing the action or details in a story or about a topic through writing sentences. **2.2.W.2** Students will develop and edit first drafts using appropriate spacing between letters, words, and sentences. **2.2.W.3** Students will correctly spell grade-appropriate words while editing. **2.2.W.4** Students will use resources to find correct spellings of words *(e.g., word wall, vocabulary notebook, dictionaries).*	**3.2.W.1** Students will develop drafts by categorizing ideas and organizing them into paragraphs using correct paragraph indentations. **3.2.W.2** Students will edit drafts and revise for clarity and organization. **3.2.W.3** Students will correctly spell grade-appropriate words while editing. **3.2.W.4** Students will use resources to find correct spellings of words *(e.g., word wall, vocabulary notebook, print and electronic dictionaries).*	**4.2.W.1** Students will develop drafts by categorizing ideas and organizing them into paragraphs. **4.2.W.2** Students will edit drafts and revise for clarity and organization. **4.2.W.3** Students will correctly spell grade-appropriate words while editing. **4.2.W.4** Students will use resources to find correct spellings of words *(e.g., word wall, vocabulary notebook, print and electronic dictionaries, and spell-check).*

2: Reading and Writing Process Students will use a variety of recursive reading and writing processes.

	5th Grade	6th Grade	7th Grade
Reading Students will read and comprehend increasingly complex literary and informational texts.	**5.2.R.1** Students will create an objective summary, including main idea and supporting details, while maintaining meaning and a logical sequence of events. **5.2.R.2** Students will compare and contrast details in literary and nonfiction/informational texts to distinguish genres. **5.2.R.3** Students will begin to paraphrase main ideas with supporting details in a text.	**6.2.R.1** Students will create an objective summary, including main idea and supporting details, while maintaining meaning and a logical sequence of events. **6.2.R.2** Students will analyze details in literary and nonfiction/informational texts to distinguish genres. **6.2.R.3** Students will paraphrase main ideas with supporting details in a text.	**7.2.R.1** Students will create an objective summary, including main idea and supporting details, while maintaining meaning and a logical sequence of events. **7.2.R.2** Students will analyze details in literary and nonfiction/informational texts to distinguish genres. **7.2.R.3** Students will paraphrase main ideas with supporting details in a text.
Writing Students will develop and strengthen writing by engaging in a recursive process that includes prewriting, drafting, revising, editing, and publishing.	**5.2.W.1** Students will apply components of a recursive writing process for multiple purposes to create a focused, organized, and coherent piece of writing. **5.2.W.2** Students will plan *(e.g., outline)* and prewrite a first draft as necessary. **5.2.W.3** Students will develop drafts by choosing an organizational structure *(e.g., description, compare/contrast, sequential, problem/solution, cause/effect, etc.)* and building on ideas in multi-paragraph essays. **5.2.W.4** Students will edit and revise multiple drafts for intended purpose *(e.g., staying on topic),* organization, and coherence. **5.2.W.5** Students will use resources to find correct spellings of words *(e.g., word wall, vocabulary notebook, print and electronic dictionaries, and spell-check).*	**6.2.W.1** Students will apply components of a recursive writing process for multiple purposes to create a focused, organized, and coherent piece of writing. **6.2.W.2** Students will plan *(e.g., outline)* and prewrite a first draft as necessary. **6.2.W.3** Students will develop drafts by choosing an organizational structure *(e.g., description, compare/contrast, sequential, problem/solution, cause/effect, etc.)* and building on ideas in multi-paragraph essays. **6.2.W.4** Students will edit and revise multiple drafts for intended purpose *(e.g., staying on topic),* organization, coherence, using a consistent point of view. **6.2.W.5** Students will use resources to find correct spellings of words *(e.g., word wall, vocabulary notebook, print and electronic dictionaries, and spell-check).*	**7.2.W.1** Students will apply components of a recursive writing process for multiple purposes to create a focused, organized, and coherent piece of writing. **7.2.W.2** Students will plan *(e.g., outline)* and prewrite a first draft as necessary. **7.2.W.3** Students will develop drafts by choosing an organizational structure *(e.g., description, compare/contrast, sequential, problem/solution, cause/effect, etc.)* and building on ideas in multi-paragraph essays. **7.2.W.4** Students will edit and revise multiple drafts for organization, transitions to improve coherence and meaning, using a consistent point of view. **7.2.W.5** Students will use resources to find correct spellings of words *(e.g., word wall, vocabulary notebook, print and electronic dictionaries, and spell-check).*

2: Reading and Writing Process Students will use a variety of recursive reading and writing processes.

	8th Grade	9th Grade - English I	10th Grade - English II
Reading Students will read and comprehend increasingly complex literary and informational texts.	**8.2.R.1** Students will summarize and paraphrase ideas, while maintaining meaning and a logical sequence of events, within and between texts. **8.2.R.2** Students will analyze details in literary and nonfiction/informational texts to evaluate patterns of genres. **8.2.R.3** Students will generalize main ideas with supporting details in a text.	**9.2.R.1** Students will summarize, paraphrase, and generalize ideas, while maintaining meaning and a logical sequence of events, within and between texts. **9.2.R.2** Students will analyze details in literary and nonfiction/informational texts to evaluate patterns of genres. **9.2.R.3** Students will synthesize main ideas with supporting details in texts.	**10.2.R.1** Students will summarize, paraphrase, and synthesize ideas, while maintaining meaning and a logical sequence of events, within and between texts. **10.2.R.2** Students will analyze details in literary and nonfiction/informational texts to connect how genre supports the author's purpose.
Writing Students will develop and strengthen writing by engaging in a recursive process that includes prewriting, drafting, revising, editing, and publishing.	**8.2.W.1** Students will apply components of a recursive writing process for multiple purposes to create a focused, organized, and coherent piece of writing. **8.2.W.2** Students will plan *(e.g., outline)* and prewrite a first draft as necessary. **8.2.W.3** Students will develop drafts by choosing an organizational structure *(e.g., description, compare/contrast, sequential, problem/solution, cause/effect, etc.)* and building on ideas in multi-paragraph essays. **8.2.W.4** Students will edit and revise multiple drafts for organization, transitions to improve coherence and meaning, sentence variety, and use of consistent point of view. **8.2.W.5** Students will use resources to find correct spellings of words *(e.g., word wall, vocabulary notebook, print and electronic dictionaries, and spell-check).*	**9.2.W.1** Students will apply components of a recursive writing process for multiple purposes to create a focused, organized, and coherent piece of writing. **9.2.W.2** Students will plan *(e.g., outline)* and prewrite a first draft as necessary. **9.2.W.3** Students will develop drafts by choosing an organizational structure *(e.g., description, compare/contrast, sequential, problem/solution, cause/effect, etc.)* and building on ideas in multi-paragraph essays. **9.2.W.4** Students will edit and revise multiple drafts for organization, transitions to improve coherence and meaning, sentence variety, and use of consistent tone and point of view. **9.2.W.5** Students will use resources to find correct spellings of words *(e.g., word wall, vocabulary notebook, print and electronic dictionaries, and spell-check).*	**10.2.W.1** Students will apply components of a recursive writing process for multiple purposes to create a focused, organized, and coherent piece of writing. **10.2.W.2** Students will plan *(e.g., outline)* and prewrite a first draft as necessary. **10.2.W.3** Students will develop drafts by choosing an organizational structure *(e.g., description, compare/contrast, sequential, problem/solution, cause/effect, etc.)* and building on ideas in multi-paragraph essays. **10.2.W.4** Students will edit and revise multiple drafts for organization, enhanced transitions and coherence, sentence variety, and consistency in tone and point of view to establish meaningful texts. **10.2.W.5** Students will use resources to find correct spellings of words *(e.g., word wall, vocabulary notebook, print and electronic dictionaries, and spell-check).*

2: Reading and Writing Process Students will use a variety of recursive reading and writing processes.

	11th Grade - English III	12th Grade - English IV
Reading Students will read and comprehend increasingly complex literary and informational texts.	**11.2.R.1** Students will summarize, paraphrase, and synthesize ideas, while maintaining meaning and a logical sequence of events, within and between texts. **11.2.R.2** Students will evaluate details in literary and non-fiction/informational texts to connect how genre supports the author's purpose.	**12.2.R.1** Students will summarize, paraphrase, and synthesize ideas, while maintaining meaning and a logical sequence of events, within and between texts. **12.2.R.2** Students will evaluate details in literary and non-fiction/informational texts to connect how genre supports the author's purpose.
Writing Students will develop and strengthen writing by engaging in a recursive process that includes prewriting, drafting, revising, editing, and publishing.	**11.2.W.1** Students will apply components of a recursive writing process for multiple purposes to create a focused, organized, and coherent piece of writing. **11.2.W.2** Students will plan *(e.g., outline)* and prewrite a first draft as necessary. **11.2.W.3** Students will develop drafts by choosing an organizational structure *(e.g., description, compare/contrast, sequential, problem/solution, cause/effect, etc.)* and building on ideas in multi-paragraph essays. **11.2.W.4** Students will edit and revise multiple drafts for logical organization, enhanced transitions and coherence, sentence variety, and use of tone and point of view through specific rhetorical devices to establish meaningful texts. **11.2.W.5** Students will use resources to find correct spellings of words *(e.g., word wall, vocabulary notebook, print and electronic dictionaries, and spell-check).*	**12.2.W.1** Students will apply components of a recursive writing process for multiple purposes to create a focused, organized, and coherent piece of writing. **12.2.W.2** Students will plan *(e.g., outline)* and prewrite a first draft as necessary. **12.2.W.3** Students will develop drafts by choosing an organizational structure *(e.g., description, compare/contrast, sequential, problem/solution, cause/effect, etc.)* and building on ideas in multi-paragraph essays. **12.2.W.4** Students will edit and revise multiple drafts for logical organization, enhanced transitions and coherence, sentence variety, and use of tone and point of view through specific rhetorical devices to establish meaningful texts. **12.2.W.5** Students will use resources to find correct spellings of words *(e.g., word wall, vocabulary notebook, print and electronic dictionaries, and spell-check).*

Standard 3

Critical Reading and Writing

Students will apply critical thinking skills to reading and writing.

Reading

Students will comprehend, interpret, evaluate, and respond to a variety of complex texts of all literary and informational genres from a variety of historical, cultural, ethnic, and global perspectives.

Writing

Students will write for varied purposes and audiences in all modes, using fully developed ideas, strong organization, well-chosen words, fluent sentences, and appropriate voice.

3: Critical Reading and Writing

Students will apply critical thinking skills to reading and writing.

	Pre-Kindergarten	Kindergarten	1st Grade
Reading Students will comprehend, interpret, evaluate, and respond to a variety of complex texts of all literary and informational genres from a variety of historical, cultural, ethnic, and global perspectives.	**PK.3.R.1** Students will describe the role of an author and illustrator, telling how they contribute to a story, with guidance and support.	**K.3.R.1** Students will name the author and illustrator, and explain the roles of each in a particular story.	**1.3.R.1** Students will identify the author's purpose *(i.e., tell a story, provide information)* with guidance and support.
	PK.3.R.2 Students will describe characters in a story with guidance and support.	**K.3.R.2** Students will describe characters and setting in a story with guidance and support.	**1.3.R.2** Students will describe who is telling the story *(i.e., point of view).*
	PK.3.R.3 Students will tell what is happening in a picture or illustration with guidance and support.	**K.3.R.3** Students will tell what is happening in a picture or illustration.	**1.3.R.3** Students will find textual evidence when provided with examples of literary elements and organization: • setting *(i.e., time, place)* • plot • main characters and their traits in a story
	PK.3.R.4 Students will ask and answer basic questions *(e.g., who, what, where, and when)* about texts during shared reading or other text experiences with guidance and support.	**K.3.R.4** Students will ask and answer basic questions *(e.g., who, what, where, and when)* about texts during shared reading or other text experiences with guidance and support	**1.3.R.4** Students will ask and answer basic questions *(e.g., who, what, where, why,and when)* about texts.
			1.3.R.5 Students will begin to locate facts that are clearly stated in a text.

	Pre-Kindergarten	Kindergarten	1st Grade
Writing Students will write for varied purposes and audiences in all modes, using fully developed ideas, strong organization, well-chosen words, fluent sentences, and appropriate voice.	**PK.3.W** Students will use drawing, labeling, and dictating to express thoughts and ideas with guidance and support.	**K.3.W** Students will use drawing, labeling, dictating, and writing to tell a story, share information, or express an opinion with guidance and support.	**NARRATIVE** **1.3.W.1** Students will begin to write narratives incorporating characters, plot *(i.e., beginning, middle, end)*, and a basic setting *(i.e., time, place)* with guidance and support. **INFORMATIVE** **1.3.W.2** Students will begin to write facts about a subject in response to a text read aloud to demonstrate understanding with guidance and support. **OPINION** **1.3.W.3** Students will express an opinion in writing about a topic and provide a reason to support the opinion.

3: Critical Reading and Writing Students will apply critical thinking skills to reading and writing.

	2nd Grade	3rd Grade	4th Grade
Reading Students will comprehend, interpret, evaluate, and respond to a variety of complex texts of all literary and informational genres from a variety of historical, cultural, ethnic, and global perspectives.	**2.3.R.1** Students will determine the author's purpose *(i.e., tell a story, provide information).*	**3.3.R.1** Students determine the author's stated and implied purpose *(i.e., entertain, inform, persuade)*.	**4.3.R.1** Students will determine the author's purpose *(i.e., entertain, inform, persuade)* and infer the difference between the stated and implied purpose.
	2.3.R.2 Students will infer whether a story is narrated in first or third person point of view in grade-level literary and/or informational text.	**3.3.R.2** Students will infer whether a story is narrated in first or third person point of view in grade-level literary and/or informational text.	**4.3.R.2** Students will infer whether a story is narrated in first or third person point of view in grade-level literary and/or informational text.
	2.3.R.3 Students will find textual evidence when provided with examples of literary elements and organization: • setting *(i.e., time, place)* • plot • characters • characterization	**3.3.R.3** Students will find textual evidence when provided with examples of literary elements and organization: • setting *(i.e., time, place)* • plot • characters • characterization • theme	**4.3.R.3** Students will describe key literary elements: • setting • plot • characters *(i.e., protagonist, antagonist)* • characterization • theme
	2.3.R.4 Students will find examples of literary devices: • simile • metaphor	**3.3.R.4** Students will find examples of literary devices: • simile • metaphor • personification • onomatopoeia • hyperbole	**4.3.R.4** Students will find examples of literary devices: • simile • metaphor • personification • onomatopoeia • hyperbole • imagery • symbolism* • tone* **Students will find textual evidence when provided with examples.*
	2.3.R.5 Students will locate facts that are clearly stated in a text.	**3.3.R.5** Students will distinguish fact from opinion in a text.	**4.3.R.5** Students will distinguish fact from opinion in a text and investigate facts for accuracy.

	2nd Grade	3rd Grade	4th Grade
Reading (Continued)	**2.3.R.6** Students will describe the structure of a text *(e.g., description, compare/contrast, sequential, problem/solution, cause/effect)* with guidance and support. **2.3.R.7** Students will answer inferential questions *(e.g., how and why)* with guidance and support.	**3.3 R.6** Students will describe the structure of a text *(e.g., description, compare/contrast, sequential, problem/solution, cause/effect)* with guidance and support. **3.3.R.7** Students will ask and answer inferential questions using the text to support answers with guidance and support.	**4.3.R.6** Students will describe the structure of a text *(e.g., description, compare/contrast, sequential, problem/solution, cause/effect).* **4.3.R.7** Students will ask and answer inferential questions using the text to support answers.
Writing Students will write for varied purposes and audiences in all modes, using fully developed ideas, strong organization, well-chosen words, fluent sentences, and appropriate voice.	**NARRATIVE** **2.3.W.1** Students will write narratives incorporating characters, plot *(i.e., beginning, middle, end)*, and a basic setting *(i.e., time, place)* with guidance and support. **INFORMATIVE** **2.3.W.2** Students will write facts about a subject and include a main idea with supporting details. **OPINION** **2.3.W.3** Students will express an opinion about a topic and provide reasons as support.	**NARRATIVE - Grade Level Focus** **3.3.W.1** Students will write narratives incorporating characters, plot, setting, point of view, and conflict *(i.e., solution and resolution).* **INFORMATIVE** **3.3.W.2** Students will write facts about a subject, including a main idea with supporting details, and use transitional and signal words. **OPINION** **3.3.W.3** Students will express an opinion about a topic and provide reasons as support.	**NARRATIVE** **4.3.W.1** Students will write narratives incorporating characters, plot, setting, point of view, conflict *(i.e., solution and resolution),* and dialogue. **INFORMATIVE - Grade Level Focus** **4.3.W.2** Students will write facts about a subject, including a clear main idea with supporting details, and use transitional and signal words. **OPINION** **4.3.W.3** Students will express an opinion about a topic and provide fact-based reasons as support.

	5th Grade	6th Grade	7th Grade
Reading Students will comprehend, interpret, evaluate, and respond to a variety of complex texts of all literary and informational genres from a variety of historical, cultural, ethnic, and global perspectives.	**5.3.R.1** Students will determine an author's stated or implied purpose and draw conclusions to evaluate how well the author's purpose was achieved.	**6.3.R.1** Students will compare and contrast stated or implied purposes of authors writing on the same topic in grade-level literary and/or informational texts.	**7.3.R.1** Students will compare and contrast stated or implied purposes of authors writing on the same topic in grade-level literary and/or informational texts.
	5.3.R.2 Students will determine the point of view and describe how it affects grade-level literary and/or informational text.	**6.3.R.2** Students will evaluate how the point of view and perspective affect grade-level literary and/or informational text.	**7.3.R.2** Students will evaluate how the point of view and perspective affect grade-level literary and/or informational text.
	5.3.R.3 Students will describe and find textual evidence of key literary elements: • setting • plot • characters *(i.e., protagonist, antagonist)* • characterization • theme	**6.3.R.3** Students will analyze how key literary elements contribute to the meaning of the literary work: • setting • plot • characters *(i.e., protagonist, antagonist)* • characterization • theme • conflict *(i.e., internal and external)*	**7.3.R.3** Students will analyze how key literary elements contribute to the meaning of the literary work: • setting • plot • characters *(i.e., protagonist, antagonist)* • characterization • theme • conflict *(i.e., internal and external)*
	5.3.R.4 Students will evaluate literary devices to support interpretations of literary texts: • simile • metaphor • personification • onomatopoeia • hyperbole • imagery • symbolism* • tone* **Students will find textual evidence when provided with examples.*	**6.3.R.4** Students will evaluate literary devices to support interpretations of literary texts: • simile • metaphor • personification • onomatopoeia • hyperbole • imagery • symbolism* • tone* **Students will find textual evidence when provided with examples.*	**7.3.R.4** Students will evaluate literary devices to support interpretations of literary texts: • simile • metaphor • personification • onomatopoeia • hyperbole • imagery • symbolism • tone • irony* **Students will find textual evidence when provided with examples.*

	5th Grade	6th Grade	7th Grade
Reading (Continued)	**5.3.R.5** Students will distinguish fact from opinion in non-fiction text and investigate facts for accuracy. **5.3.R.6** Students will distinguish the structures of texts *(e.g., description, compare/contrast, sequential, problem/solution, cause/effect)* and content by making inferences about texts and use textual evidence to support understanding. **5.3.R.7** Students will compare and contrast texts and ideas within and between texts.	**6.3.R.5** Students will categorize facts included in an argument as *for* or *against* an issue. **6.3.R.6** Students will analyze the structures of texts *(e.g., description, compare/contrast, sequential, problem/solution, cause/effect)* and content by making inferences about texts and use textual evidence to support understanding. **6.3.R.7** Students will analyze texts and ideas within and between texts and provide textual evidence to support their inferences.	**7.3.R.5** Students will distinguish factual claims from opinions. **7.3.R.6** Students will analyze the structures of texts *(e.g., compare/contrast, problem/solution, cause/effect, claims/evidence)* and content by making inferences about texts and use textual evidence to draw simple logical conclusions. **7.3.R.7** Students will make connections *(e.g., thematic links)* between and across multiple texts and provide textual evidence to support their inferences.
Writing Students will write for varied purposes and audiences in all modes, using fully developed ideas, strong organization, well-chosen words, fluent sentences, and appropriate voice.	**NARRATIVE** **5.3.W.1** Students will write narratives incorporating characters, plot, setting, point of view, conflict *(i.e., internal, external),* and dialogue. **INFORMATIVE - Grade Level Focus** **5.3.W.2** Students will introduce and develop a topic, incorporating evidence *(e.g., specific facts, examples, details)* and maintaining an organized structure. **OPINION** **5.3.W.3** Students will clearly state an opinion supported with facts and details. **5.3.W.4** Students will show relationships among facts, opinions, and supporting details.	**NARRATIVE** **6.3.W.1** Students will write narratives incorporating characters, plot, setting, point of view, conflict *(i.e., internal, external),* and dialogue. **INFORMATIVE** **6.3.W.2** Students will compose essays and reports about topics, incorporating evidence *(e.g., specific facts, examples, details)* and maintaining an organized structure. **OPINION - Grade Level Focus** **6.3.W.3** Students will clearly state an opinion supported with facts and details. **6.3.W.4** Students will show relationships among facts, opinions, and supporting details.	**NARRATIVE** **7.3.W.1** Students will write narratives incorporating characters, plot, setting, point of view, conflict, dialogue, and sensory details to convey experiences and events. **INFORMATIVE** **7.3.W.2** Students will compose essays and reports about topics, incorporating evidence *(e.g., specific facts, examples, details)* and maintaining an organized structure and a formal style. **ARGUMENT - Grade Level Focus** **7.3.W.3** Students will introduce a claim and organize reasons and evidence, using credible sources. **7.3.W.4** Students will show relationships among the claim, reasons, and evidence.

3: Critical Reading and Writing Students will apply critical thinking skills to reading and writing.

	8th Grade	9th Grade - English I	10th Grade - English II
Reading Students will comprehend, interpret, evaluate, and respond to a variety of complex texts of all literary and informational genres from a variety of historical, cultural, ethnic, and global perspectives.	**8.3.R.1** Students will analyze works written on the same topic and compare the methods the authors use to achieve similar or different purposes and include support using textual evidence. **8.3.R.2** Students will evaluate points of view and perspectives and describe how this affects grade-level literary and/or informational text. **8.3.R.3** Students will analyze how authors use key literary elements to contribute to the meaning of a text: • setting • plot • characters *(i.e., protagonist, antagonist)* • characterization • theme • conflict *(i.e., internal and external)*	**9.3.R.1** Students will analyze works written on the same topic and compare the methods the authors use to achieve similar or different purposes and include support using textual evidence. **9.3.R.2** Students will evaluate points of view and perspectives in more than one grade-level literary and/or informational text and explain how multiple points of view contribute to the meaning of a work. **9.3.R.3** Students will analyze how authors use key literary elements to contribute to meaning and interpret how themes are connected across texts: • setting • plot • characters *(i.e., protagonist, antagonist)* • character development • theme • conflict *(i.e., internal and external)* • archetypes	**10.3.R.1** Students will evaluate the extent to which historical, cultural, and/or global perspectives affect authors' stylistic and organizational choices in grade-level literary and informational genres. **10.3.R.2** Students will evaluate points of view and perspectives in more than one grade-level literary and/or informational text and explain how multiple points of view contribute to the meaning of a work. **10.3.R.3** Students will analyze how authors use key literary elements to contribute to meaning and interpret how themes are connected across texts: • character development • theme • conflict *(i.e., internal and external)* • archetypes

	8th Grade	9th Grade - English I	10th Grade - English II
Reading (Continued)	**8.3.R.4** Students will evaluate literary devices to support interpretations of literary texts: • simile • metaphor • personification • onomatopoeia • hyperbole • imagery • tone • symbolism • irony	**9.3.R.4** Students will evaluate literary devices to support interpretations of texts, including comparisons across texts: • simile • metaphor • personification • onomatopoeia • hyperbole • imagery • tone • symbolism • irony	**10.3.R.4** Students will evaluate literary devices to support interpretations of texts, including comparisons across texts: • figurative language • imagery • tone • symbolism • irony
	8.3.R.5 Students will evaluate textual evidence to determine whether a claim is substantiated or unsubstantiated.	**9.3.R.5** Students will evaluate textual evidence to determine whether a claim is substantiated or unsubstantiated.	**10.3.R.5** Students will distinguish among different kinds of evidence *(e.g., logical, empirical, anecdotal)* used to support conclusions and arguments in texts.
	8.3.R.6 Students will analyze the structures of texts *(e.g., compare/contrast, problem/solution, cause/effect, claims/evidence)* and content by making complex inferences about texts to draw logical conclusions from textual evidence.	**9.3.R.6** Students will comparatively analyze the structures of texts *(e.g., compare/contrast, problem/solution, cause/effect, claims/counterclaims/evidence)* and content by inferring connections among multiple texts and providing textual evidence to support their inferences.	**10.3.R.6** Students will comparatively analyze the structures of texts *(e.g., compare/contrast, problem/solution, cause/effect, claims/counterclaims/evidence)* and content by inferring connections among multiple texts and providing textual evidence to support their inferences.
	8.3.R.7 Students will make connections *(e.g., thematic links, literary analysis)* between and across multiple texts and provide textual evidence to support their inferences.	**9.3.R.7** Students will make connections *(e.g., thematic links, literary analysis)* between and across multiple texts and provide textual evidence to support their inferences.	**10.3.R.7** Students will make connections *(e.g., thematic links, literary analysis)* between and across multiple texts and provide textual evidence to support their inferences.

	8th Grade	9th Grade - English I	10th Grade - English II
Writing Students will write for varied purposes and audiences in all modes, using fully developed ideas, strong organization, well-chosen words, fluent sentences, and appropriate voice.	**NARRATIVE** **8.3.W.1** Students will write narratives incorporating characters, plot *(i.e., flashback and foreshadowing)*, setting, point of view, conflict, dialogue, and sensory details.	**NARRATIVE - Grade Level Focus** **9.3.W.1** Students will write nonfiction narratives *(e.g., memoirs, personal essays)*.	**NARRATIVE** **10.3.W.1** Students will write narratives embedded in other modes as appropriate.
	INFORMATIVE **8.3.W.2** Students will compose essays and reports about topics, incorporating evidence *(e.g., specific facts, examples, details)* and maintaining an organized structure and a formal style.	**INFORMATIVE - Grade Level Focus** **9.3.W.2** Students will compose essays and reports to objectively introduce and develop topics, incorporating evidence *(e.g., specific facts, examples, details, data)* and maintaining an organized structure and a formal style.	**INFORMATIVE - Grade Level Focus** **10.3.W.2** Students will compose essays and reports to objectively introduce and develop topics, incorporating evidence *(e.g., specific facts, examples, details, data)* and maintaining an organized structure and a formal style.
		9.3.W.3 Students will elaborate on ideas by using logical reasoning and illustrative examples to connect evidences to claim(s).	**10.3.W.3** Students will elaborate on ideas by using logical reasoning and illustrative examples to connect evidences to claim(s).
	ARGUMENT - Grade Level Focus **8.3.W.3** Students will introduce a claim, recognize at least one claim from an opposing viewpoint, and organize reasons and evidences, using credible sources.	**ARGUMENT** **9.3.W.4** Students will introduce claims, recognize and distinguish from alternate or opposing claims, and organize reasons and evidences, using credible sources.	**ARGUMENT - Grade Level Focus** **10.3.W.4** Students will introduce precise claims and distinguish them from counterclaims and provide sufficient evidences to develop balanced arguments, using credible sources.
	8.3.W.4 Students will show relationships among the claim, reasons, and evidence and include a conclusion that follows logically from the information presented.	**9.3.W.5** Students will show relationships among the claim, reasons, and evidence and include a conclusion that follows logically from the information presented and supports the argument.	**10.3.W.5** Students will use words, phrases, and clauses to connect claims, counterclaims, evidence, and commentary to create a cohesive argument and include a conclusion that follows logically from the information presented and supports the argument.
		9.3.W.6 Students will blend multiple modes of writing to produce effective argumentative essays.	**10.3.W.6** Students will blend multiple modes of writing to produce effective argumentative essays.

	11th Grade - English III	12th Grade - English IV
Reading Students will comprehend, interpret, evaluate, and respond to a variety of complex texts of all literary and informational genres from a variety of historical, cultural, ethnic, and global perspectives.	**11.3.R.1** Students will analyze the extent to which historical, cultural, and/or global perspectives affect authors' stylistic and organizational choices in grade-level literary and informational genres. **11.3.R.2** Students will evaluate points of view and perspectives in more than one grade-level literary and/or informational text and explain how multiple points of view contribute to the meaning of a work. **11.3.R.3** Students will analyze how authors use key literary elements to contribute to meaning and interpret how themes are connected across texts: • theme • archetypes **11.3.R.4** Students will evaluate literary devices to support interpretations of texts, including comparisons across texts: • imagery • tone • symbolism • irony **11.3.R.5** Students will evaluate how authors writing on the same issue reached different conclusions because of differences in assumptions, evidence, reasoning, and viewpoints. **11.3.R.6** Students will comparatively analyze the structures of texts *(e.g., compare/contrast, problem/solution, cause/effect, claims/counterclaims/evidence)* and content by inferring connections among multiple texts and providing textual evidence to support their conclusions. **11.3.R.7** Students will make connections *(e.g., thematic links, literary analysis, authors' style)* between and across multiple texts and provide textual evidence to support their inferences.	**12.3.R.1** Students will analyze the extent to which historical, cultural, and/or global perspectives affect authors' stylistic and organizational choices in grade-level literary and informational genres. **12.3.R.2** Students will evaluate points of view and perspectives in more than one grade-level literary and/or informational text and explain how multiple points of view contribute to the meaning of a work. **12.3.R.3** Students will analyze how authors use key literary elements to contribute to meaning and interpret how themes are connected across texts. **12.3.R.4** Students will evaluate literary devices to support interpretations of texts, including comparisons across texts. **12.3.R.5** Students will evaluate how authors writing on the same issue reached different conclusions because of differences in assumptions, evidence, reasoning, and viewpoints. **12.3.R.6** Students will comparatively analyze the structures of texts *(e.g., compare/contrast, problem/solution, cause/effect, claims/counterclaims/evidence)* and content by inferring connections among multiple texts and providing textual evidence to support their conclusions. **12.3.R.7** Students will make connections *(e.g., thematic links, literary analysis, authors' style)* between and across multiple texts and provide textual evidence to support their inferences.

	11th Grade - English III	12th Grade - English IV
Writing Students will write for varied purposes and audiences in all modes, using fully developed ideas, strong organization, well-chosen words, fluent sentences, and appropriate voice.	**NARRATIVE** **11.3.W.1** Students will write narratives embedded in other modes as appropriate. **INFORMATIVE** **11.3.W.2** Students will compose essays and reports to objectively introduce and develop topics, incorporating evidence *(e.g., specific facts, examples, details, data)* and maintaining an organized structure and a formal style. **11.3.W.3** Students will elaborate on ideas by using logical reasoning and illustrative examples to connect evidences to claim(s). **ARGUMENT** **11.3.W.4** Students will (1) introduce precise, informed claims, (2) distinguish them from alternate or opposing claims, (3) organize claims, counterclaims, and evidence in a way that provides a logical sequence for the entire argument, and (4) provide the most relevant evidences to develop balanced arguments, using credible sources. **11.3.W.5** Students will use words, phrases, clauses, and varied syntax to connect all parts of the argument and create cohesion and include a conclusion that follows logically from the information presented and supports the argument. **11.3.W.6** Students will blend multiple modes of writing to produce effective argumentative essays.	**NARRATIVE** **12.3.W.1** Students will write narratives embedded in other modes as appropriate. **INFORMATIVE** **12.3.W.2** Students will compose essays and reports to objectively introduce and develop topics, incorporating evidence *(e.g., specific facts, examples, details, data)* and maintaining an organized structure and a formal style. **12.3.W.3** Students will elaborate on ideas by using logical reasoning and illustrative examples to connect evidences to claim(s). **ARGUMENT** **12.3.W.4** Students will (1) introduce precise, informed claims, (2) distinguish them from alternate or opposing claims, (3) organize claims, counterclaims, and evidence in a way that provides a logical sequence for the entire argument, and (4) provide the most relevant evidences to develop balanced arguments, using credible sources. **12.3.W.5** Students will use words, phrases, clauses, and varied syntax to connect all parts of the argument and create cohesion and include a conclusion that follows logically from the information presented and supports the argument. **12.3.W.6** Students will blend multiple modes of writing to produce effective argumentative essays.

Standard 4

Vocabulary

Students will expand their working vocabularies to effectively communicate and understand texts.

Reading

Students will expand academic, domain-appropriate, grade-level vocabularies through reading, word study, and class discussion.

Writing

Students will apply knowledge of vocabularies to communicate by using descriptive, academic, and domain-appropriate abstract and concrete words in their writing.

4: Vocabulary Students will expand their working vocabularies to effectively communicate and understand texts.

	Pre-Kindergarten	Kindergarten	1st Grade
Reading Students will expand academic, domain-appropriate, grade-level vocabularies through reading, word study, and class discussion.	**PK.4.R.1** Students will acquire new academic, content-specific, grade-level vocabulary and relate new words to prior knowledge with guidance and support. **PK.4.R.2** Students will begin to develop an awareness of context clues through read-alouds and other text experiences. **PK.4.R.3** Students will name and sort familiar objects into categories based on common attributes with guidance and support.	**K.4.R.1** Students will acquire new academic, content-specific, grade-level vocabulary and relate new words to prior knowledge with guidance and support. **K.4.R.2** Students will begin to develop an awareness of context clues through read-alouds and other text experiences. **K.4.R.3** Students will name and sort pictures of objects into categories based on common attributes with guidance and support.	**1.4.R.1** Students will acquire new academic, content-specific, grade-level vocabulary, relate new words to prior knowledge, and apply vocabulary in new situations. **1.4.R.2** Students will use word parts *(e.g., affixes, roots, stems)* to define unfamiliar words with guidance and support. **1.4.R.3** Students will use context clues to determine the meaning of words with guidance and support. **1.4.R.4** Students will name and sort words into categories based on common attributes. **1.4.R.5** Students will use a dictionary *(print and/or electronic)* to find words.
Writing Students will apply knowledge of vocabularies to communicate by using descriptive, academic, and domain-appropriate abstract and concrete words in their writing.	**PK.4.W.1** Students will begin to use new vocabulary to produce and expand complete sentences in shared language activities. **PK.4.W.2** Students will begin to select appropriate language according to purpose.	**K.4.W.1** Students will use new vocabulary to produce and expand complete sentences in shared language activities with guidance and support. **K.4.W.2** Students will select appropriate language according to purpose with guidance and support.	**1.4.W.1** Students will use domain-appropriate vocabulary to communicate ideas in writing with guidance and support. **1.4.W.2** Students will select appropriate language according to purpose in writing with guidance and support.

4: Vocabulary Students will expand their working vocabularies to effectively communicate and understand texts.

	2nd Grade	3rd Grade	4th Grade
Reading Students will expand academic, domain-appropriate, grade-level vocabularies through reading, word study, and class discussion.	**2.4.R.1** Students will acquire new academic, content-specific, grade-level vocabulary, relate new words to prior knowledge, and apply vocabulary in new situations.	**3.4.R.1** Students will increase knowledge of academic, domain-appropriate, grade-level vocabulary to infer meaning of grade-level text.	**4.4.R.1** Students will increase knowledge of academic, domain-appropriate, grade-level vocabulary to infer meaning of grade-level text.
	2.4.R.2 Students will use word parts *(e.g., affixes, roots, stems)* to define and determine the meaning of new words.	**3.4.R.2** Students will use word parts *(e.g., affixes, roots, stems)* to define and determine the meaning of new words.	**4.4.R.2** Students will use word parts *(e.g., affixes, Greek and Latin roots, stems)* to define and determine the meaning of new words.
	2.4.R.3 Students will use context clues to determine the meaning of words with guidance and support.	**3.4.R.3** Students will use context clues to determine the meaning of words or distinguish among multiple-meaning words.	**4.4.R.3** Students will use context clues to determine the meaning of words or distinguish among multiple-meaning words.
	2.4.R.4 Students will infer relationships among words, including synonyms, antonyms, and simple multiple-meaning words.	**3.4.R.4** Students will infer relationships among words, including synonyms, antonyms, homographs, and homonyms.	**4.4.R.4** Students will infer relationships among words with multiple meanings, including synonyms, antonyms, and more complex homographs and homonyms.
	2.4.R.5 Students will use a dictionary or glossary *(print and/or electronic)* to determine or clarify the meanings of words or phrases.	**3.4.R.5** Students will use a dictionary or glossary *(print and/or electronic)* to determine or clarify the meanings, syllabication, and pronunciation of words.	**4.4.R.5** Students will use a dictionary or glossary *(print and/or electronic)* to determine or clarify the meanings, syllabication, and pronunciation of words.
Writing Students will apply knowledge of vocabularies to communicate by using descriptive, academic, and domain-appropriate abstract and concrete words in their writing.	**2.4.W.1** Students will use domain-appropriate vocabulary to communicate ideas in writing.	**3.4.W.1** Students will use domain-appropriate vocabulary to communicate ideas in writing.	**4.4.W.1** Students will use domain-appropriate vocabulary to communicate ideas in writing.
	2.4.W.2 Students will select appropriate language according to purpose in writing.	**3.4.W.2** Students will select appropriate language according to purpose in writing.	**4.4.W.2** Students will select appropriate language to create a specific effect according to purpose in writing.

4: Vocabulary Students will expand their working vocabularies to effectively communicate and understand texts.

	5th Grade	6th Grade	7th Grade
Reading Students will expand academic, domain-appropriate, grade-level vocabularies through reading, word study, and class discussion.	**5.4.R.1** Students will increase knowledge of academic, domain-appropriate, grade-level vocabulary to infer meaning of grade-level text. **5.4.R.2** Students will use word parts *(e.g., affixes, Greek and Latin roots, stems)* to define new words and determine the meaning of new words. **5.4.R.3** Students will use context clues to determine or clarify the meaning of words or distinguish among multiple-meaning words. **5.4.R.4** Students will infer the relationships among words with multiple meanings, including synonyms, antonyms, analogies, and more complex homographs and homonyms. **5.4.R.5** Students will use a dictionary, glossary, or a thesaurus *(print and/or electronic)* to determine or clarify the meanings, syllabication, pronunciation, synonyms, and parts of speech of words.	**6.4.R.1** Students will increase knowledge of academic, domain-appropriate, grade-level vocabulary to infer meaning of grade-level text. **6.4.R.2** Students will use word parts *(e.g., affixes, Greek and Latin roots, stems)* to define and determine the meaning of increasingly complex words. **6.4.R.3** Students will use context clues to determine or clarify the meaning of words or distinguish among multiple-meaning words. **6.4.R.4** Students will infer the relationships among words with multiple meanings, including synonyms, antonyms, analogies, and more complex homographs and homonyms. **6.4.R.5** Students will use a dictionary, glossary, or a thesaurus *(print and/or electronic)* to determine or clarify the meanings, syllabication, pronunciation, synonyms, and parts of speech of words.	**7.4.R.1** Students will increase knowledge of academic, domain-appropriate, grade-level vocabulary to infer meaning of grade-level text. **7.4.R.2** Students will use word parts *(e.g., affixes, Greek and Latin roots, stems)* to define and determine the meaning of increasingly complex words. **7.4.R.3** Students will use context clues to determine or clarify the meaning of words or distinguish among multiple-meaning words. **7.4.R.4** Students will infer the relationships among words with multiple meanings and recognize the connotation and denotation of words. **7.4.R.5** Students will use a dictionary, glossary, or a thesaurus *(print and/or electronic)* to determine or clarify the meanings, syllabication, pronunciation, synonyms, and parts of speech of words.
Writing Students will apply knowledge of vocabularies to communicate by using descriptive, academic, and domain-appropriate abstract and concrete words in their writing.	**5.4.W.1** Students will use domain-appropriate vocabulary to communicate ideas in writing clearly. **5.4.W.2** Students will select appropriate language to create a specific effect according to purpose in writing.	**6.4.W.1** Students will use domain-appropriate vocabulary to communicate ideas in writing clearly. **6.4.W.2** Students will select appropriate language to create a specific effect according to purpose in writing.	**7.4.W.1** Students will use domain-appropriate vocabulary to communicate ideas in writing clearly. **7.4.W.2** Students will select appropriate language to create a specific effect according to purpose in writing.

4: Vocabulary Students will expand their working vocabularies to effectively communicate and understand texts.

	8th Grade	9th Grade - English I	10th Grade - English II
Reading Students will expand academic, domain-appropriate, grade-level vocabularies through reading, word study, and class discussion.	**8.4.R.1** Students will increase knowledge of academic, domain-appropriate, grade-level vocabulary to infer meaning of grade-level text. **8.4.R.2** Students will use word parts *(e.g., affixes, Greek and Latin roots, stems)* to define and determine the meaning of increasingly complex words. **8.4.R.3** Students will use context clues to determine or clarify the meaning of words or distinguish among multiple-meaning words. **8.4.R.4** Students will infer the relationships among words with multiple meanings and recognize the connotation and denotation of words. **8.4.R.5** Students will use a dictionary, glossary, or a thesaurus *(print and/or electronic)* to determine or clarify the meanings, syllabication, pronunciation, synonyms, and parts of speech of words.	**9.4.R.1** Students will increase knowledge of academic, domain-appropriate, grade-level vocabulary to infer meaning of grade-level text. **9.4.R.2** Students will use word parts *(e.g., affixes, Greek and Latin roots, stems)* to define and determine the meaning of increasingly complex words. **9.4.R.3** Students will use context clues to determine or clarify the meaning of words or distinguish among multiple-meaning words. **9.4.R.4** Students will analyze the relationships among words with multiple meanings and recognize the connotation and denotation of words. **9.4.R.5** Students will use a dictionary, glossary, or a thesaurus *(print and/or electronic)* to determine or clarify the meanings, syllabication, pronunciation, synonyms, parts of speech, and etymology of words or phrases.	**10.4.R.1** Students will increase knowledge of academic, domain-appropriate, grade-level vocabulary to infer meaning of grade-level text. **10.4.R.2** Students will use word parts *(e.g., affixes, Greek and Latin roots, stems)* to define and determine the meaning of increasingly complex words. **10.4.R.3** Students will use context clues to determine or clarify the meaning of words or distinguish among multiple-meaning words. **10.4.R.4** Students will analyze the relationships among words with multiple meanings and recognize the connotation and denotation of words. **10.4.R.5** Students will use a dictionary, glossary, or a thesaurus *(print and/or electronic)* to determine or clarify the meanings, syllabication, pronunciation, synonyms, parts of speech, and etymology of words or phrases.
Writing Students will apply knowledge of vocabularies to communicate by using descriptive, academic, and domain-appropriate abstract and concrete words in their writing.	**8.4.W.1** Students will use domain-appropriate vocabulary to communicate ideas in writing clearly. **8.4.W.2** Students will select appropriate language to create a specific effect according to purpose in writing.	**9.4.W.1** Students will use domain-appropriate vocabulary to communicate complex ideas in writing clearly. **9.4.W.2** Students will select appropriate language to create a specific effect according to purpose in writing.	**10.4.W.1** Students will use domain-appropriate vocabulary to communicate complex ideas in writing clearly. **10.4.W.2** Students will select appropriate language to create a specific effect according to purpose in writing.

4: Vocabulary Students will expand their working vocabularies to effectively communicate and understand texts.

	11th Grade - English III	12th Grade - English IV
Reading Students will expand academic, domain-appropriate, grade-level vocabularies through reading, word study, and class discussion.	**11.4.R.1** Students will increase knowledge of academic, domain-appropriate, grade-level vocabulary to infer meaning of grade-level text. **11.4.R.2** Students will use word parts *(e.g., affixes, Greek and Latin roots, stems)* to define and determine the meaning of increasingly complex words. **11.4.R.3** Students will use context clues to determine or clarify the meaning of words or distinguish among multiple-meaning words. **11.4.R.4** Students will analyze and evaluate the relationships among words with multiple meanings and recognize the connotation and denotation of words. **11.4.R.5** Students will use general and specialized dictionaries, thesauri, glossaries, histories of language, books of quotations, and other related references *(print and/or electronic)* as needed.	**12.4.R.1** Students will increase knowledge of academic, domain-appropriate, grade-level vocabulary to infer meaning of grade-level text. **12.4.R.2** Students will use word parts *(e.g., affixes, Greek and Latin roots, stems)* to define and determine the meaning of increasingly complex words. **12.4.R.3** Students will use context clues to determine or clarify the meaning of words or distinguish among multiple-meaning words. **12.4.R.4** Students will analyze and evaluate the relationships among words with multiple meanings and recognize the connotation and denotation of words. **12.4.R.5** Students will use general and specialized dictionaries, thesauri, glossaries, histories of language, books of quotations, and other related references *(print and/or electronic)* as needed.
Writing Students will apply knowledge of vocabularies to communicate by using descriptive, academic, and domain-appropriate abstract and concrete words in their writing.	**11.4.W.1** Students will use domain-appropriate vocabulary to communicate complex ideas in writing clearly. **11.4.W.2** Students will select appropriate language to create a specific effect according to purpose in writing.	**12.4.W.1** Students will use domain-appropriate vocabulary to communicate complex ideas in writing clearly. **12.4.W.2** Students will select appropriate language to create a specific effect according to purpose in writing.

Standard 5

Language

Students will apply knowledge of grammar and rhetorical style to reading and writing.

Reading

Students will apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts.

Writing

Students will demonstrate command of Standard English grammar, mechanics, and usage through writing and other modes of communication.

5: Language Students will apply knowledge of grammar and rhetorical style to reading and writing.

	Pre-Kindergarten	Kindergarten	1st Grade
Reading Students will apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts.	**PK.5.R.1** Students will begin to understand the function of grammar through exposure to conversations, read-alouds, and interactive reading. **PK.5.R.2** Students will recognize concrete objects as persons, places or things *(i.e., nouns)* with guidance and support. **PK.5.R.3** Students will recognize words as actions *(i.e., verbs)* with guidance and support. **PK.5.R.4** Students will group pictures and movement, and determine spatial and time relationships such as up, down, before, and after with guidance and support.	**K.5.R.1** Students will begin to understand the function of grammar through exposure to conversations, read-alouds, and interactive reading. **K.5.R.2** Students will recognize concrete objects as persons, places or things *(i.e., nouns)* with guidance and support. **K.5.R.3** Students will recognize words as actions *(i.e., verbs)* with guidance and support. **K.5.R.4** Students will group pictures and movement, and determine spatial and time relationships such as up, down, before, and after with guidance and support.	**1.5.R.1** Students will recognize nouns as concrete objects *(i.e., people persons, places, and things)* and use the pronoun *"I."* **1.5.R.2** Students will recognize verbs as actions **1.5.R.3** Students will recognize color and number adjectives. **1.5.R.4** Students will recognize the prepositions *(e.g., The dog is on top of the doghouse)* through pictures and movement. **1.5.R.5** Students will recognize singular and plural nouns with correct verbs in simple sentences *(e.g. He sits; we sit).*
Writing Students will demonstrate command of Standard English grammar, mechanics, and usage through writing and other modes of communication.	*These standards begin in Kindergarten.*	**K.5.W.1** Students will capitalize, with guidance and support: • their first name • the pronoun *"I."* **K.5.W.2** Students will begin to compose simple sentences that begin with a capital letter and end with a period or question mark.	**1.5.W.1** Students will capitalize: • the first letter of a sentence • proper names • months and days of the week **1.5.W.2** Students will compose grammatically correct simple and compound sentences and questions (interrogatives) with appropriate end marks.

5: Language Students will apply knowledge of grammar and rhetorical style to reading and writing.

	2nd Grade	3rd Grade	4th Grade
Reading Students will apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts.	**2.5.R.1** Students will recognize nouns, pronouns, and irregular plural nouns.	**3.5.R.1** Students will recognize pronouns and possessive nouns.	**4.5.R.1** Students will recognize pronouns and irregular possessive nouns.
	2.5.R.2 Students will recognize different types and tenses of verbs.	**3.5.R.2** Students will recognize irregular and past participle verbs and verb tense to identify settings, times, and sequences in text.	**4.5.R.2** Students will recognize present perfect verbs and verb tense to identify settings, times, sequences, and conditions in text.
	2.5.R.3 Students will recognize adjectives.	**3.5.R.3** Students will recognize adjectives, articles as adjectives, and adverbs.	**4.5.R.3** Students will recognize comparative and superlative adjectives and adverbs.
	2.5.R.4 Students will recognize prepositions.	**3.5.R.4** Students will recognize prepositions and conjunctions.	**4.5.R.4** Students will recognize prepositional phrases and conjunctions.
	2.5.R.5 Students will recognize the subject and predicate of a sentence.	**3.5.R.5** Students will recognize the subject and verb agreement.	**4.5.R.5** Students will recognize the subject and verb agreement.
Writing Students will demonstrate command of Standard English grammar, mechanics, and usage through writing and other modes of communication.	**2.5.W.1** Students will capitalize and appropriately punctuate: • the first letter of a quotation • holidays • product names • initials • months and days of the week	**3.5.W.1** Students will capitalize and appropriately punctuate: • titles of respect • appropriate words in titles • geographical names	**4.5.W.1** Students will capitalize • familial relations • proper adjectives • conventions of letter writing
	2.5.W.2 Students will use simple contractions *(e.g., isn't, aren't, can't).*	**3.5.W.2** Students will use complex contractions *(e.g., should've, won't).*	**4.5.W.2** Students will compose and expand grammatically correct sentences and questions with appropriate commas, end marks, apostrophes, and quotation marks as needed for dialogue.
	2.5.W.3 Students will compose grammatically correct simple and compound declarative, interrogative, imperative, and exclamatory sentences with appropriate end marks.	**3.5.W.3** Students will compose and expand grammatically correct sentences and questions with appropriate commas, apostrophes, quotation marks, and end marks as needed for dialogue.	**4.5.W.3** Students will compose simple, compound, and complex sentences and questions, create sentences with an understood subject, and correct fragments and run-on sentences.
		3.5.W.4 Students will compose simple, compound and complex declarative, interrogative, imperative, and exclamatory sentences.	**4.5.W.4** Students will compose declarative, interrogative, imperative, and exclamatory sentences.

5: Language Students will apply knowledge of grammar and rhetorical style to reading and writing.

	5th Grade	6th Grade	7th Grade
Reading Students will apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts.	**5.5.R.1** Students will recognize conjunctions, prepositions, and interjections and explain their effect in particular sentences.	**6.5.R.1** Students will recognize simple and compound sentences to signal differing relationships among ideas.	**7.5.R.1** Students will recognize the correct use of prepositional phrases and dependent clauses.
	5.5.R.2 Students will recognize verb tense to signify various times, sequences, states, and conditions in text.	**6.5.R.2** Students will recognize verb tense to signify various times, sequences, states, and conditions in text.	**7.5.R.2** Students will recognize simple, compound, complex, and compound-complex sentences to signal differing relationships among ideas.
	5.5.R.3 Students will recognize the subject and verb agreement.	**6.5.R.3** Students will recognize the subject and verb agreement.	**7.5.R.3** Students will recognize the subject and verb agreement.
			7.5.R.4 Students will recognize and correct misplaced and dangling modifiers.
Writing Students will demonstrate command of Standard English grammar, mechanics, and usage through writing and other modes of communication.	**5.5.W.1** Students will write using correct mechanics with a focus on commas, apostrophes, and quotation marks as needed for dialogue and quoted material.	**6.5.W.1** Students will write using correct mechanics with a focus on commas, apostrophes, quotation marks, colons, and semi-colons.	**7.5.W.1** Students will write using correct mechanics with a focus on commas, apostrophes, quotation marks, colons, and semi-colons.
	5.5.W.2 Students will compose simple, compound, and complex sentences and questions, create sentences with an understood subject, and correct fragments and run-on sentences.	**6.5.W.2** Students will compose simple, compound, and complex sentences and questions to signal differing relationships among ideas.	**7.5.W.2** Students will compose simple, compound, complex, and compound-complex sentences and questions to signal differing relationships among ideas.
	5.5.W.3 Students will form and use the present and past verb tenses.	**6.5.W.3** Students will use intensive and reflexive pronouns.	**7.5.W.3** Students will use prepositional phrases and clauses *(e.g., dependent and independent)* in writing.
	5.5.W.4 Students will form and use verb tense to convey various times, sequences, states, and conditions.	**6.5.W.4** Students will recognize and correct inappropriate shifts in pronoun number and person.	
	5.5.W.5 Students will recognize and correct inappropriate shifts in verb tense.	**6.5.W.5** Students will recognize and correct vague pronouns *(i.e., ones with unclear or ambiguous antecedents).*	

5: Language Students will apply knowledge of grammar and rhetorical style to reading and writing.

	8th Grade	9th Grade - English I	10th Grade - English II
Reading Students will apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts.	**8.5.R.1** Students will recognize the use of verbals *(e.g., gerunds, participles, infinitives)* and clauses. **8.5.R.2** Students will recognize the use of active and passive voice. **8.5.R.3** Students will recognize and correct inappropriate shifts in verb tense. **8.5.R.4** Students will recognize the subject and verb agreement, and correct as necessary.	**9.5.R.1** Students will examine the function of parallel structures, various types of phrases, and clauses to convey specific meanings. **9.5.R.2** Students will recognize the use of active and passive voice. **9.5.R.3** Students will recognize and correct inappropriate shifts in verb tense. **9.5.R.4** Students will recognize the subject and verb agreement, and correct as necessary.	**10.5.R** Students will examine the function of parallel structures, various types of phrases, clauses, and active and passive voice to convey specific meanings and/or reflect specific rhetorical styles.
Writing Students will demonstrate command of Standard English grammar, mechanics, and usage through writing and other modes of communication.	**8.5.W.1** Students will write using correct mechanics with a focus on commas, apostrophes, quotation marks, colons, and semi-colons. **8.5.W.2** Students will compose simple, compound, complex, and compound-complex sentences and questions to signal differing relationships among ideas. **8.5.W.3** Students will use verbals *(e.g., gerunds, participles, infinitives)* in writing. **8.5.W.4** Students will form and use verbs in the active and passive voice. **8.5.W.5** Students will form and use verbs in the indicative, imperative, interrogative, conditional, and subjunctive mood.	**9.5.W.1** Students will write using correct mechanics with a focus on punctuation marks as needed. **9.5.W.2** Students will compose simple, compound, complex, and compound-complex sentences and questions to signal differing relationships among ideas. **9.5.W.3** Students will use parallel structure. **9.5.W.4** Students will use various types of phrases *(e.g., appositive, adjectival, adverbial, participial, prepositional)* and clauses *(e.g., independent, dependent, adverbial)* to convey specific meanings and add variety and interest to writing or presentations.	**10.5.W.1** Students will write using correct mechanics. **10.5.W.2** Students will compose simple, compound, complex, and compound-complex sentences and questions, to signal differing relationships among ideas. **10.5.W.3** Students will practice their use of Standard American English, grammar, mechanics, and usage through writing, presentations, and/or other modes of communication to convey specific meanings and interests.

5: Language Students will apply knowledge of grammar and rhetorical style to reading and writing.

	11th Grade - English III	12th Grade - English IV
Reading Students will apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts.	**11.5.R** Students will apply their knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts, understanding that usage and convention change over time and using that understanding to manipulate style when appropriate.	**12.5.R** Students will apply their knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts, understanding that usage and convention change over time and using that understanding to manipulate style when appropriate.
Writing Students will demonstrate command of Standard English grammar, mechanics, and usage through writing and other modes of communication.	**11.5.W.1** Students will write using correct mechanics. **11.5.W.2** Students will compose simple, compound, complex, and compound-complex sentences and questions, including the use of phrases and clauses, to signal differing relationships among ideas. **11.5.W.3** Students will demonstrate command of Standard American English, grammar, mechanics, and usage through writing, presentations, and/or other modes of communication to convey specific meanings and interests.	**12.5.W.1** Students will write using correct mechanics. **12.5.W.2** Students will compose simple, compound, complex, and compound-complex sentences and questions, including the use of phrases and clauses, to signal differing relationships among ideas. **12.5.W.3** Students will demonstrate command of Standard American English, grammar, mechanics, and usage through writing, presentations, and/or other modes of communication to convey specific meanings and interests.

Standard 6

Research

Students will engage in inquiry to acquire, refine, and share knowledge.

Reading

Students will comprehend, evaluate, and synthesize resources to acquire and refine knowledge.

Writing

Students will summarize and paraphrase, integrate evidence, and cite sources to create reports, projects, papers, texts, and presentations for multiple purposes.

6: Research Students will engage in inquiry to acquire, refine, and share knowledge.

	Pre-Kindergarten	Kindergarten	1st Grade
Reading Students will comprehend, evaluate, and synthesize resources to acquire and refine knowledge.	**PK.6.R** Students will begin to identify pictures, charts, grade-appropriate texts, or people as sources of information on a topic of interest.	**K.6.R.1** Students will identify relevant pictures, charts, grade-appropriate texts, or people as sources of information on a topic of interest. **K.6.R.2** Students will identify graphic features to understand a text including photos, illustrations, and titles to understand a text.	**1.6.R.1** Students will decide who can answer questions about their topic or what resources they will need to find the information. **1.6.R.2** Students will identify graphic features including photos, illustrations, titles, labels, headings, charts, and graphs to understand a text. **1.6.R.3** Students will identify the location and purpose of various visual and text reference sources.
Writing Students will summarize and paraphrase, integrate evidence, and cite sources to create reports, projects, papers, texts, and presentations for multiple purposes.	**PK.6.W** Students will generate topics of interest and decide if a friend, teacher, or expert can answer their questions with guidance and support.	**K.6.W.1** Students will generate topics of interest and decide if a friend, teacher, or expert can answer their questions with guidance and support. **K.6.W.2** Students will find information from provided sources during group research with guidance and support.	**1.6.W.1** Students will generate questions about topics of interest. **1.6.W.2** Students will organize information found during group or individual research, using graphic organizers or other aids with guidance and support. **1.6.W.3** Students will make informal presentations of information gathered.

6: Research Students will engage in inquiry to acquire, refine, and share knowledge.

	2nd Grade	3rd Grade	4th Grade
Reading Students will comprehend, evaluate, and synthesize resources to acquire and refine knowledge.	**2.6.R.1** Students will create their own questions to find information on their topic. **2.6.R.2** Students will use graphic features including photos, illustrations, titles, labels, headings, subheadings, charts, and graphs to understand a text. **2.6.R.3** Students will consult various visual and text reference sources to gather information.	**3.6.R.1** Students will use their own questions to find information on their topic. **3.6.R.2** Students will use graphic features including photos, illustrations, captions, titles, labels, headings, subheadings, italics, sidebars, charts, graphs, and legends to define a text. **3.6.R.3** Students will locate information in visual and text reference sources, electronic resources, and/or interviews. **3.6.R.4** Students will determine the relevance and reliability of the information for their specific topic of interest with guidance and support.	**4.6.R.1** Students will use their own viable research questions to find information about a specific topic. **4.6.R.2** Students will use graphic features including photos, illustrations, captions, titles, labels, headings, subheadings, italics, sidebars, charts, graphs, and legends to interpret a text. **4.6.R.3** Students will determine the relevance and reliability of the information gathered.
Writing Students will summarize and paraphrase, integrate evidence, and cite sources to create reports, projects, papers, texts, and presentations for multiple purposes.	**2.6.W.1** Students will generate a list of topics of interest and individual questions about one specific topic of interest. **2.6.W.2** Students will organize information found during group or individual research, using graphic organizers or other aids. **2.6.W.3** Students will organize and present their information in written and/or oral reports or display.	**3.6.W.1** Students will generate a list of topics of interest and individual questions about one specific topic of interest. **3.6.W.2** Students will organize information found during group or individual research, using graphic organizers or other aids. **3.6.W.3** Students will summarize and present information in a report.	**4.6.W.1** Students will generate a viable research question about a specific topic. **4.6.W.2** Students will organize information found during research, following a modified citation style *(e.g., author, title, publication date)* with guidance and support. **4.6.W.3** Students will summarize and present information in a report.

6: Research Students will engage in inquiry to acquire, refine, and share knowledge.

	5th Grade	6th Grade	7th Grade
Reading Students will comprehend, evaluate, and synthesize resources to acquire and refine knowledge.	**5.6.R.1** Students will use their own viable research questions to find information about a specific topic.	**6.6.R.1** Students will use their own viable research questions to find information about a specific topic.	**7.6.R.1** Students will use their own viable research questions and thesis statements to find information about a specific topic.
	5.6.R.2 Students will record and organize information from various print and/or digital sources.	**6.6.R.2** Students will record and organize information from various primary and secondary sources *(e.g., print and digital).*	**7.6.R.2** Students will follow ethical and legal guidelines for finding and recording information from a variety of primary and secondary sources *(e.g., print and digital).*
	5.6.R.3 Students will determine the relevance and reliability of the information gathered.	**6.6.R.3** Students will determine the relevance, reliability, and validity of the information gathered.	**7.6.R.3** Students will determine the relevance, reliability, and validity of the information gathered.
Writing Students will summarize and paraphrase, integrate evidence, and cite sources to create reports, projects, papers, texts, and presentations for multiple purposes.	**5.6.W.1** Students will write research papers and/or texts independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*.	**6.6.W.1** Students will write research papers and/or texts independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*.	**7.6.W.1** Students will write research papers and/or texts independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*.
	5.6.W.2 Students will formulate a viable research question from findings.	**6.6.W.2** Students will refine and formulate a viable research question and/or topic from initial findings.	**7.6.W.2** Students will refine and formulate a viable research question and report findings clearly and concisely, using a thesis statement.
	5.6.W.3 Students will organize information found during research, following a modified citation style *(e.g., author, title, publication date)* with guidance and support.	**6.6.W.3** Students will organize information found during research, following a citation style *(e.g., MLA, APA, etc.)* with guidance and support.	**7.6.W.3** Students will quote, paraphrase, and summarize findings following an appropriate citation style *(e.g., MLA, APA, etc.)* and avoiding plagiarism.
	5.6.W.4 Students will summarize and present information in a report.	**6.6.W.4** Students will summarize and present information in a report.	**7.6.W.4** Students will summarize and present information in a report.

6: Research Students will engage in inquiry to acquire, refine, and share knowledge.

	8th Grade	9th Grade - English I	10th Grade - English II
Reading Students will comprehend, evaluate, and synthesize resources to acquire and refine knowledge.	**8.6.R.1** Students will use their own viable research questions and well-developed thesis statements to find information about a specific topic.	**9.6.R.1** Students will use their own viable research questions and well-developed thesis statements to find information about a specific topic.	**10.6.R.1** Students will use their own viable research questions and well-developed thesis statements to find information about a specific topic.
	8.6.R.2 Students will follow ethical and legal guidelines for finding and recording information from a variety of primary and secondary sources *(e.g., print and digital).*	**9.6.R.2** Students will follow ethical and legal guidelines for finding and recording information from a variety of primary and secondary sources *(e.g., print and digital).*	**10.6.R.2** Students will synthesize the most relevant information from a variety of primary and secondary sources *(e.g., print and digital),* following ethical and legal citation guidelines.
	8.6.R.3 Students will determine the relevance, reliability, and validity of the information gathered.	**9.6.R.3** Students will evaluate the relevance, reliability, and validity of the information gathered.	**10.6.R.3** Students will evaluate the relevance, reliability, and validity of the information gathered.
Writing Students will summarize and paraphrase, integrate evidence, and cite sources to create reports, projects, papers, texts, and presentations for multiple purposes.	**8.6.W.1** Students will write research papers and/or texts independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*.	**9.6.W.1** Students will write research papers and/or texts independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*.	**10.6.W.1** Students will write research papers and/or texts independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*.
	8.6.W.2 Students will refine and formulate a viable research question and report findings clearly and concisely, using a well-developed thesis statement.	**9.6.W.2** Students will refine and formulate a viable research question, integrate findings from sources, and clearly use a well-developed thesis statement.	**10.6.W.2** Students will refine and formulate a viable research question, integrate findings from sources, and clearly use a well-developed thesis statement.
	8.6.W.3 Students will quote, paraphrase, and summarize findings following an appropriate citation style *(e.g., MLA, APA, etc.)* and avoiding plagiarism.	**9.6.W.3** Students will quote, paraphrase, and summarize findings following an appropriate citation style *(e.g., MLA, APA, etc.)* and avoiding plagiarism.	**10.6.W.3** Students will integrate into their own writing quotes, paraphrases, and summaries of findings following an appropriate citation style *(e.g., MLA, APA, etc.)* and avoiding plagiarism.
	8.6.W.4 Students will summarize and present information in a report.	**9.6.W.4** Students will summarize and present information in a report.	**10.6.W.4** Students will synthesize and present information in a report.

6: Research Students will engage in inquiry to acquire, refine, and share knowledge.

	11th Grade - English III	12th Grade - English IV
Reading Students will comprehend, evaluate, and synthesize resources to acquire and refine knowledge.	**11.6.R.1** Students will use their own viable research questions and well-developed thesis statements to find information about a specific topic. **11.6.R.2** Students will synthesize the most relevant information from a variety of primary and secondary sources *(e.g., print and digital),* following ethical and legal citation guidelines. **11.6.R.3** Students will evaluate the relevance, reliability, and validity of the information gathered.	**12.6.R.1** Students will use their own viable research questions and well-developed thesis statements to find information about a specific topic. **12.6.R.2** Students will synthesize resources to acquire and refine knowledge, following ethical and legal citation guidelines. **12.6.R.3** Students will evaluate the relevance, reliability, and validity of the information gathered.
Writing Students will summarize and paraphrase, integrate evidence, and cite sources to create reports, projects, papers, texts, and presentations for multiple purposes.	**11.6.W.1** Students will write research papers and/or texts independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*. **11.6.W.2** Students will integrate findings from sources using a well-developed thesis statement. **11.6.W.3** Students will integrate into their own writing quotes, paraphrases, and summaries of findings following an appropriate citation style *(e.g., MLA, APA, etc.)* and avoiding plagiarism. **11.6.W.4** Students will synthesize and present information in a report.	**12.6.W.1** Students will write research papers and/or texts independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*. **12.6.W.2** Students will integrate findings from sources using a well-developed thesis statement. **12.6.W.3** Students will integrate into their own writing quotes, paraphrases, and summaries of findings following an appropriate citation style *(e.g., MLA, APA, etc.)* and avoiding plagiarism. **12.6.W.4** Students will synthesize and present information in a report.

Standard 7

Multimodal Literacies

Students will acquire, refine, and share knowledge through a variety of written, oral, visual, digital, non-verbal, and interactive texts.

Reading
Students will evaluate written, oral, visual, and digital texts in order to draw conclusions and analyze arguments.

Writing
Students will create multimodal texts to communicate knowledge and develop arguments.

7: Multimodal Literacies Students will acquire, refine, and share knowledge through a variety of written, oral, visual, digital, non verbal, and interactive texts.

	Pre-Kindergarten	Kindergarten	1st Grade
Reading Students will evaluate written, oral, visual, and digital texts in order to draw conclusions and analyze arguments.	**PK.7.R** Students will recognize formats of print and digital text with guidance and support.	**K.7.R.1** Students will recognize formats of print and digital text with guidance and support. **K.7.R.2** Students will explore how ideas and topics are depicted in a variety of media and formats.	**1.7.R.1** Students will use provided print and digital resources with guidance and support. **1.7.R.2** Students will explore and compare how ideas and topics are depicted in a variety of media and formats.
Writing Students will create multimodal texts to communicate knowledge and develop arguments.	**PK.7.W** Students will use appropriate technology to communicate with others with guidance and support.	**K.7.W.1** Students will use appropriate technology to communicate with others with guidance and support. **K.7.W.2** Students will use appropriate props, images, or illustrations to support verbal communication.	**1.7.W.1** Students will select and use appropriate technology or media to communicate with others with guidance and support. **1.7.W.2** Students will use visual displays to support verbal communication and clarify ideas, thoughts, and feelings.

7: Multimodal Literacies

Students will acquire, refine, and share knowledge through a variety of written, oral, visual, digital, non verbal, and interactive texts.

	2nd Grade	3rd Grade	4th Grade
Reading Students will evaluate written, oral, visual, and digital texts in order to draw conclusions and analyze arguments.	**2.7.R.1** Students will locate and use print and digital resources with guidance and support.	**3.7.R.1** Students will locate, organize, and use information from a variety of written, oral, visual, digital, non-verbal, and interactive texts to generate and answer literal questions.	**4.7.R.1** Students will locate, organize, and analyze information from a variety of written, oral, visual, digital, non-verbal, and interactive texts to generate and answer literal and interpretive questions to create new understandings.
	2.7.R.2 Students will explain how ideas and topics are depicted in a variety of media and formats.	**3.7.R.2** Students will compare how ideas and topics are depicted in a variety of media and formats	**4.7.R.2** Students will compare and contrast how ideas and topics are depicted in a variety of media and formats.
Writing Students will create multimodal texts to communicate knowledge and develop arguments.	**2.7.W.1** Students will select and use appropriate technology or media to communicate with others with guidance and support.	**3.7.W.1** Students will create multimodal content that communicates an idea using technology or appropriate media.	**4.7.W.1** Students will create multimodal content that effectively communicates an idea using technology or appropriate media.
	2.7.W.2 Students will create a simple presentation using audio, visual, and/or multimedia tools to support communication and clarify ideas, thoughts, and feelings	**3.7.W.2** Students will create presentations using video, photos, and other multimedia elements to support communication and clarify ideas, thoughts, and feelings.	**4.7.W.2** Students will create presentations using videos, photos, and other multimedia elements to support communication and clarify ideas, thoughts, and feelings.

7: Multimodal Literacies Students will acquire, refine, and share knowledge through a variety of written, oral, visual, digital, non verbal, and interactive texts.

	5th Grade	6th Grade	7th Grade
Reading Students will evaluate written, oral, visual, and digital texts in order to draw conclusions and analyze arguments.	**5.7.R.1** Students will analyze the characteristics and effectiveness of a variety of written, oral, visual, digital, non-verbal, and interactive texts to generate and answer literal and interpretive questions to create new understandings. **5.7.R.2** Students will compare and contrast how ideas and topics are depicted in a variety of media and formats.	**6.7.R.1** Students will compare and contrast the effectiveness of a variety of written, oral, visual, digital, non-verbal, and interactive texts to generate and answer literal, interpretive, and applied questions to create new understandings. **6.7.R.2** Students will analyze the impact of selected media and formats on meaning.	**7.7.R.1** Students will compare and contrast the effectiveness of techniques used in a variety of written, oral, visual, digital, non-verbal, and interactive texts to generate and answer literal, interpretive, and applied questions to create new understandings. **7.7.R.2** Students will analyze the impact of selected media and formats on meaning.
Writing Students will create multimodal texts to communicate knowledge and develop arguments.	**5.7.W.1** Students will create multimodal content that effectively communicates an idea using technology and appropriate media. **5.7.W.2** Students will create presentations that integrate visual displays and other multimedia to enrich the presentation.	**6.7.W.1** Students will create multimodal content that effectively communicates ideas using technologies and appropriate media. **6.7.W.2** Students will create presentations that integrate visual displays and other multimedia to enrich the presentation.	**7.7.W.1** Students will select, organize, or create multimodal content to complement and extend meaning for a selected topic. **7.7.W.2** Students will utilize multimedia to clarify information and strengthen claims or evidence.

7: Multimodal Literacies Students will acquire, refine, and share knowledge through a variety of written, oral, visual, digital, non verbal, and interactive texts.

	8th Grade	9th Grade - English I	10th Grade - English II
Reading Students will evaluate written, oral, visual, and digital texts in order to draw conclusions and analyze arguments.	**8.7.R.1** Students will determine the intended purposes of techniques used for rhetorical effects in written, oral, visual, digital, non-verbal, and interactive texts to generate and answer interpretive and applied questions to create new understandings. **8.7.R.2** Students will analyze the impact of selected media and formats on meaning.	**9.7.R.1** Students will analyze and evaluate the effectiveness of techniques used in a variety of written, oral, visual, digital, non-verbal, and interactive texts with a focus on persuasion and argument to generate and answer literal, interpretive, and applied questions to create new understandings. **9.7.R.2** Students will analyze the impact of selected media and formats on meaning.	**10.7.R.1** Students will analyze techniques used to achieve the intended rhetorical purposes in written, oral, visual, digital, non-verbal, and interactive texts to generate and answer interpretive and applied questions to create new understandings. **10.7.R.2** Students will analyze the impact of selected media and formats on meaning.
Writing Students will create multimodal texts to communicate knowledge and develop arguments.	**8.7.W.1** Students will select, organize, or create multimodal content that encompasses different points of view. **8.7.W.2** Students will utilize multimedia to clarify information and emphasize salient points.	**9.7.W.1** Students will create a variety of multimodal content to engage specific audiences. **9.7.W.2** Students will create engaging visual and/or multimedia presentations, using a variety of media forms to enhance understanding of findings, reasoning, and evidence for diverse audiences.	**10.7.W.1** Students will critique the sources of multimodal content. **10.7.W.2** Students will create visual and/or multimedia presentations using a variety of media forms to enhance understanding of findings, reasoning, and evidence for diverse audiences.

7: Multimodal Literacies Students will acquire, refine, and share knowledge through a variety of written, oral, visual, digital, non verbal, and interactive texts.

	11th Grade - English III	12th Grade - English IV
Reading Students will evaluate written, oral, visual, and digital texts in order to draw conclusions and analyze arguments.	**11.7.R.1** Students will analyze and evaluate the various techniques used to construct arguments in written, oral, visual, digital, non-verbal, and interactive texts, to generate and answer applied questions, and to create new understandings. **11.7.R.2** Students will analyze the impact of selected media and formats on meaning.	**12.7.R.1** Students will analyze and evaluate written, oral, visual, digital, non-verbal, and interactive texts in order to draw conclusions and defend arguments. **12.7.R.2** Students will analyze the impact of selected media and formats on meaning.
Writing Students will create multimodal texts to communicate knowledge and develop arguments.	**11.7.W.1** Students will design and develop multimodal content for a variety of purposes. **11.7.W.2** Students will construct engaging visual and/or multimedia presentations using a variety of media forms to enhance understanding of findings, reasoning, and evidence for diverse audiences.	**12.7.W.1** Students will create multimodal content to communicate knowledge and defend arguments. **12.7.W.2** Students will construct engaging visual and/or multimedia presentations using a variety of media forms to enhance understanding of findings, reasoning, and evidence for diverse audiences.

Independent Reading and Writing

Students will read and write for a variety of purposes including, but not limited to, academic and personal, for extended periods of time.

Reading
Students will read independently for a variety of purposes and for extended periods of time. Students will select appropriate texts for specific purposes.

Writing
Students will write independently for extended periods of time. Students will vary their modes of expression to suit audience and task.

8: Independent Reading and Writing

Students will read and write for a variety of purposes including, but not limited to, academic and personal.

	Pre-Kindergarten	Kindergarten	1st Grade
Reading Students will read independently for a variety of purposes and for extended periods of time. Students will select appropriate texts for specific purposes.	**PK.8.R** Students will demonstrate interest in books during read-alouds and shared reading, and interact independently with books.	**K.8.R** Students will demonstrate interest in books during read-alouds and shared reading, and interact independently with books.	**1.8.R** Students will select appropriate texts for academic and personal purposes and read independently for extended periods of time with guidance and support.
Writing Students will write independently for extended periods of time. Students will vary their modes of expression to suit audience and task.	**PK.8.W** Students will express their ideas through a combination of drawing and emergent writing with guidance and support.	**K.8.W** Students will express their ideas through a combination of drawing and emergent writing with guidance and support.	**1.8.W** Students will write independently for extended and shorter periods of time through a combination of emergent and conventional writing with guidance and support.

8: Independent Reading and Writing

Students will read and write for a variety of purposes including, but not limited to, academic and personal.

	2nd Grade	3rd Grade	4th Grade
Reading Students will read independently for a variety of purposes and for extended periods of time. Students will select appropriate texts for specific purposes.	**2.8.R** Students will select appropriate texts for academic and personal purposes and read independently for extended periods of time.	**3.8.R** Students will select appropriate texts for specific purposes and read independently for extended periods of time.	**4.8.R** Students will select appropriate texts for specific purposes and read independently for extended periods of time.
Writing Students will write independently for extended periods of time. Students will vary their modes of expression to suit audience and task.	**2.8.W** Students will write independently over extended periods of time *(e.g., time for reflection and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*.	**3.8.W** Students will write independently over extended periods of time *(e.g., time for reflection and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)* to communicate with different audiences for a variety of purposes.	**4.8.W** Students will write independently over extended periods of time *(e.g., time for reflection and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)* to communicate with different audiences for a variety of purposes.

8: Independent Reading and Writing Students will read and write for a variety of purposes including, but not limited to, academic and personal.

	5th Grade	6th Grade	7th Grade
Reading Students will read independently for a variety of purposes and for extended periods of time. Students will select appropriate texts for specific purposes.	**5.8.R** Students will select appropriate texts for specific purposes and read independently for extended periods of time.	**6.8.R** Students will select appropriate texts for specific purposes and read independently for extended periods of time.	**7.8.R** Students will select appropriate texts for specific purposes and read independently for extended periods of time.
Writing Students will write independently for extended periods of time. Students will vary their modes of expression to suit audience and task.	**5.8.W** Students will write independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)* to communicate with different audiences for a variety of purposes.	**6.8.W** Students will write independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*, vary their modes of expression to suit audience and task, and explain how concepts relate to one another.	**7.8.W** Students will write independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*, vary their modes of expression to suit audience and task, and discover different perspectives.

8: Independent Reading and Writing Students will read and write for a variety of purposes including, but not limited to, academic and personal.

	8th Grade	9th Grade - English I	10th Grade - English II
Reading Students will read independently for a variety of purposes and for extended periods of time. Students will select appropriate texts for specific purposes.	**8.8.R** Students will select appropriate texts for specific purposes and read independently for extended periods of time.	**9.8.R** Students will select appropriate texts for specific purposes and read independently for extended periods of time.	**10.8.R** Students will select appropriate texts for specific purposes and read independently for extended periods of time.
Writing Students will write independently for extended periods of time. Students will vary their modes of expression to suit audience and task.	**8.8.W** Students will write independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*, vary their modes of expression to suit audience and task, and analyze different perspectives.	**9.8.W** Students will write independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*, vary their modes of expression to suit audience and task, and draw appropriate conclusions.	**10.8.W** Students will write independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*, vary their modes of expression to suit audience and task, and draw and justify appropriate conclusions.

8: Independent Reading and Writing Students will read and write for a variety of purposes including, but not limited to, academic and personal.

	11th Grade - English III	12th Grade - English IV
Reading Students will read independently for a variety of purposes and for extended periods of time. Students will select appropriate texts for specific purposes.	**11.8.R** Students will select appropriate texts for specific purposes and read independently for extended periods of time.	**12.8.R** Students will select appropriate texts for specific purposes and read independently for extended periods of time.
Writing Students will write independently for extended periods of time. Students will vary their modes of expression to suit audience and task.	**11.8.W** Students will write independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*, vary their modes of expression to suit audience and task, and be able to apply new understandings in an original way.	**12.8.W** Students will write independently over extended periods of time *(e.g., time for research, reflection, and revision)* and for shorter timeframes *(e.g., a single sitting or a day or two)*, vary their modes of expression to suit audience and task, synthesize information across multiple sources, and articulate new perspectives.

Glossary

A

Academic vocabulary : refers to words associated with content knowledge. Within every discipline there is a specific set of words to represent its concepts and processes.

Abbreviation : a shortened or contracted form of a word or phrase, used to represent the whole, as Dr. for Doctor, U.S. for United States, and lb. for pound.

Active listening : the active pursuit of what another person is saying and feeling, as a way to improve mutual understanding. Active listening involves hearing content, listening for tone, observing body language, paraphrasing, summarizing, questioning, clarifying, and reflecting.

Affix : a morpheme or meaningful part of a word attached before or after a root to modify its meaning. Principal kinds of affixes are prefixes and suffixes. The prefix un- is an affix, which added to balanced, makes unbalanced. The suffix -ed is an affix which, added to wish, makes wished.

Alliteration : the repetition of the same initial consonant sound of each word in connected text (e.g., Harry the happy hippo hula-hoops with Henrietta).

Allusion : a brief and indirect reference to a person, place, thing, or idea of historical, cultural, literary, or political significance.

Analogy : a comparison of the similar aspects of two different things.

Annotation : a critical or explanatory note or body of notes added to a text.

Antagonist : the adversary of the hero or protagonist of a drama or other literary work.

Antonyms : words which have opposite meanings (e.g., hot and cold).

Appropriate technology : technology that students can use independently or with minimal scaffolding.

Archetype : a symbol, plot pattern, character type, or theme that recurs in many different cultures.

Argument essay : a genre of writing that requires the student to investigate a topic; collect, generate, and evaluate evidence; and establish and defend a position on the topic in a concise manner.

Argumentation : writing that seeks to influence through appeals that direct readers to specific goals or try to win them to specific beliefs.

Audience : writer's targeted reader or readers.

Author's craft : specific techniques that an author chooses to relay an intended message.

Automaticity : reading without conscious effort or attention to decoding.

B

Base : a free morpheme to which affixes can be added, usually of Anglo-Saxon origin.

Blending : the task of combining sounds rapidly to accurately represent the word.

C

Cause & effect : text structure that notes a relationship in which an event or events (the cause) make(s) another event or action happen (effect).

Citing sources : a quotation of or explicit reference to a source indicating where the paraphrased or quoted materials came. Examples of citation style include MLA (Modern Language Association) and APA (American Psychological Association).

Claim : an assertion of the truth of something.

Close reading : a strategy that requires a student to focus on and arrive at a deep understanding of individual texts by reading and re-reading. Fisher, Frey, and Lapp (2012) describe four reader roles that help the reader uncover meaning in a text:

1. **Code Breaker**: understanding the text at the surface level (i.e., alphabetic, structural)

2. **Meaning maker**: comprehending the text at the level intended by the author

3. **Text user**: analyzing the factors that influenced the author and the text, including a historical grounding of the context within which it was written

4. **Text critic**: understanding that the text is not neutral and that existing biases inform calls to action.

Closed syllable : a written syllable containing a single vowel and ending in one or more consonants; the vowel sound is short.

Coherence : continuity of meaning that enables others to make sense of a text.

Collaborative discussions : discussions that provide opportunities for speakers and listeners to use dialogue and interaction to raise issues, explore ideas, make claims, discover differences, and find ways to explore all aspects of ELA. These take many forms like a Socratic seminar, debate, or blog and combine students in small or large discourse communities.

Compare : find similarities between two or more texts or text elements.

Comparison : text structure in which ideas are related to one another on the basis of similarities and differences. The text presents ideas organized to compare, to contrast, or to provide an alternative perspective.

Compound word : a word made by putting two or more words together (e.g., cowboy).

Comprehension : understanding what one is reading, the ultimate goal of all reading activity.

Conflict : struggle or clash between opposing characters, forces, or emotions.

Connotation : a meaning that is implied by a word apart from the thing it describes explicitly. Words carry cultural and emotional associations or meanings in addition to their literal meanings or denotations.

Consonant blend : two or more consecutive consonants that retain their individual sounds (e.g., /bl/ in block; /str/ in string).

Consonant digraph : two consecutive consonants that represent one phoneme, or sound (e.g., /ch/, /sh/).

Consonant trigraph : a combination of three letters used to represent a single speech sound or phoneme*. (e.g.*/tch/)

Content-specific : vocabulary that includes technical words related to specific academic disciplines. *(See also academic and domain-specific vocabulary)*

Context : the parts of a written or spoken statement/text that precede or follow a specific word or passage, usually influencing its meaning or effect.

Context clue : the information from the textual setting that helps identify a word or word group.

Contraction : a short way to write two words as one by writing the two words together, leaving out one or more letters and replacing the missing letters with an apostrophe (e.g., cannot = can't).

Conventional writing : expressing thoughts and ideas with agreed upon symbols, like the alphabet.

Counterclaim : a claim made to rebut a previous claim.

D

Declarative sentence : the kind of sentence that makes a statement or "declares" something.

Decode : translate a word from print to speech, usually by employing knowledge of sound symbol correspondences; also the act of deciphering a new word by sounding it out.

Denotation : the literal or dictionary meaning of a word.

Description : text structure that presents a topic, along with the attributes, specifics, or setting information that describe that topic.

Detail : piece of information revealed by the author or speaker that supports the attitude or tone in a piece of poetry or prose. In informational text, details provide information to support the author's main point.

Diction : the choice and use of words by a speaker or a writer.

Digital media : media created, viewed, distributed, modified, and preserved on digital devices (e.g. computers, tablets, phones). Digital media include computer programs, digital videos, video games, web pages and websites, social media, databases, audio, and e-books. Digital media are contrasted with print media such as books, newspapers, magazines, pictures, film, and audiotape.

Domain-specific vocabulary : **"**relatively low-frequency, content-specific words that appear in textbooks and other instructional materials; for example, apex in math, escarpment in geography, and isobar in science" (Blachowicz, C. & Fisher, P., p.1). *(See also academic and content-specific vocabulary)*

E

Edit : to review writing to make sure that it is free of any grammatical errors or strange phrases that make it difficult for readers to understand the meaning.

Emergent writing : “means that children begin to understand that writing is a form of communication and their marks on paper convey a message” (Mayer, 2007, p. 35). Emergent writing progresses along a developmental continuum.

Ethical and legal guidelines for research : guidelines for correctly citing print and digital text when using primary and secondary sources for research. In addition, copying and pasting texts, purchasing essays online, using another author’s work, or violating copyright laws are unethical and could result in legal action.

Exclamatory sentence : a type of sentence that expresses strong feelings by making an exclamation.

F

Fiction : imaginative literary works representing invented rather than actual persons, places, or events.

Figurative language : writing or speech not meant to be taken literally but used to express ideas in vivid or imaginative ways. Figurative language includes simile, metaphor, personification, analogy, hyperbole, and idiom.

Flashback : scene that interrupts the action of a work to show a previous event.

Fluency : ability to read grade-level text accurately, with expression, and with automaticity. The combination of accuracy, automaticity, and prosody allow the reader to build comprehension.

Foreshadowing : use of hints or clues in a narrative to suggest future action.

G

Generalize : to make general or broad statements by inferring from text details.

Genre : a category used to classify literary and other works, usually by form, technique, or content. The novel, the short story, and the lyric poems are all examples of literary genres.

Grammar : rules of language.

Grapheme : a letter or letter combination that spells a phoneme; can be one, two, three, or four letters in English (e.g., e, ei, igh, eigh).

Graphic features : pictorial representation of data or ideas using columns, matrices, or other formats. Graphics can be simple or complex, present information in a straightforward way as in a list or pie graph, or embed or nest information within the document's structure. Graphics may be included in texts or be stand-alone documents.

H

High frequency Irregular words : words in print containing letters that stray from the most common sound pronunciation because they do not follow common phonic patterns (e.g., were, was, laugh, been).

High frequency words : a small group of words (300-500) that account for a large percentage of the words in print and can be regular or irregular words. Often, they are referred to as "sight words" since automatic recognition of these words is required for fluent reading.

Homographs : words that are spelled alike but have different sounds and meanings (e.g., bow used with an arrow vs. bow of a ship).

Homonyms : words that sound the same but have different spellings and meanings (e.g., bear, bare).

Hyperbole : obvious and deliberate exaggeration; an extravagant statement.

I

Idiom : an expression that does not mean what it literally says (e.g., to have the upper hand has nothing to do with the hands).

Imagery : multiple words or a continuous phrase that a writer uses to represent persons, objects, actions, feelings, or ideas descriptively by appealing to the senses.

Imperative sentence : a sentence that gives a command, makes a request, or expresses a wish.

Indent : to set in or back from the margin, as the first line of a paragraph.

Independent reading levels : the level at which a reader can read text with 95% accuracy (i.e., no more than one error per 20 words read). Independent reading level is relatively easy text for the reader.

Inference : act or process of deriving logical conclusions from premises known or assumed to be true; the conclusions drawn from this process.

Inferring : making a reasonable assumption about meaning that is not explicitly stated in the text.

Inflectional endings : in English, a suffix that expresses plurality or possession when added to a noun, tense when added to a verb, and comparison when added to an adjective and some adverbs; Added to verbs, nouns, or adjectives do not change the grammatical role or part of speech of the base words (-s, -es,-ing, ¬ed).

Informational : non-fiction books; also referred to as expository text, that contain facts and information.

Interactive texts : multimodal texts in which readers may determine the order and duration of reading. For example, interactive texts, may include hyperlinks to other pages containing embedded images, videos and audio.

Interrogative sentence : the kind of sentence that asks a question and uses a question mark.

Irony : the use of words to express something other than and especially the opposite of the literal meaning.

L

Legend : inscription or title on an object (e.g., a key to symbols used on a map).

Letter-sound correspondences : the matching of an oral sound to its corresponding letter or group of letters.

Lexile : a quantitative measure of text complexity and individual reading level that can be used to predict how well a reader will likely comprehend a text.

Literal : information directly from the text (e.g., on the line).

Literary nonfiction : text that conveys factual information. The text may or may not employ a narrative structure and characteristics such as dialogue.

M

Main idea : the central thought or premise of a reading passage.

Meaning vocabulary : application of one's understanding of word meanings to passage comprehension.

Memoir : type of autobiography that usually focuses on a single time period or historical event.

Metaphor : a direct comparison of two unlike things.

Modified citation style : using author, title, and publication date of sources to document research. This special style is used only at the fifth grade level to ease students into more stringent citation styles which are used in later grades.

Mood : atmosphere or predominant emotion in a literary work.

Morpheme : the smallest meaningful unit of the language.

Morphology : the study and description of how words are formed from prefixes, roots, and suffixes (e.g., mis-spell-ing), and how words are related to each other.

Multimodal : multiple + mode. A mode refers to a way of meaning-making or communicating. The New London Group (1996) outlines five modes through which meaning is made: Linguistic, Aural, Visual, Gestural, and Spatial. Any combination of modes makes a multimodal text, and all texts—every piece of communication that a human composes—use more than one mode. Thus, all writing is multimodal."All Writing is Multimodal**,"** Cheryl Ball and Colin Charlton, in *Naming What We Know: Threshold Concepts of Writing Studies*, Linda Adler- Kassner & Elizabeth Wardle (Eds.), forthcoming from Utah State University Press.

Multimodal content : content utilizing more than one mode (e.g. still images + words, words + video) to convey a meaning.

Multimodal literacy : "the interplay of meaning-making systems (alphabetic, oral, visual, etc.) that teachers and students should strive to study and produce." NCTE Position Statement on Multimodal Literacies.

Multisyllabic : these are words with more than one syllable. A systematic introduction of prefixes, suffixes, and multisyllabic words should occur throughout a reading program. The average number of syllables in the words students read should increase steadily throughout the grades.

N

Narrative writing : writing that tells a story. This writing is often anecdotal, experiential, and personal—allowing students to express themselves in creative and, quite often, moving ways.

Nonfiction : text that is factual and may be presented by detailed descriptions or examples; organization follows a logical pattern and may include textual aids.

Nonverbal cues : nonverbal messages that are a key aspect of speaking, for example, intonation, pauses, facial expressions, eye contact, gestures, and body language. Listeners should study these cues to determine a speaker's message, argument, and credibility.

Nonverbal texts : In place of words, nonverbal texts may include images, gestures, and movement.

O

Onomatopoeia : use of words that mimic the sounds they describe; imitative harmony.

Onset : all of the sounds in a syllable that come before the first vowel.

Opinion writing : writing that clearly states a view or judgment about a topic, supported by examples, and offering reasons for assertions and/or explaining cause and effect.

P

Parallel structure : repetition of words, phrases, or sentences that have the same grammatical structure or that restate a similar idea.

Paraphrase : to sum something up or clarify a statement by rephrasing it; to say something in other simpler words.

Personification : the bestowing of human qualities on animals, ideas, or things.

Persuasion : form of discourse whose function is to convince an audience or to prove or refute a point of view or an issue.

Phoneme : a speech sound that combines with others in a language system to make words.

Phonemic awareness : the ability to notice, think about, or manipulate the individual phonemes (sounds) in words. It is the ability to understand that sounds in spoken language work together to make words. This term is used to refer to the highest level of phonological awareness: awareness of individual phonemes in words.

Phonics : the study of the relationships between letters and the sounds they represent; also used to describe reading instruction that teaches sound-symbol correspondences. Sound-symbol correspondence are the rules and patterns by which letters and letter combinations represent speech sounds.

Phonological awareness : one's sensitivity to, or explicit awareness of, the phonological structure of words in one's language. This is an "umbrella" term that is used to refer to a student's sensitivity to any aspect of phonological structure in language. It encompasses awareness of individual words in sentences, syllables, and onset-rime segments, as well as awareness of individual phonemes.

Picture walk : a strategy for previewing a book prior to reading by looking at the cover and illustrations and asking questions that require students to make predictions about the text.

Plagiarism : using another person or source's words or ideas without giving credit or obtaining permission.

Plot : sequence of events or actions in a short story, novel, drama, or narrative poem.

Point of view : the way in which an author reveals a viewpoint or perspective. This can be done through characters, ideas, events, and narration.

Prefix : a morpheme that precedes a root and that contributes to or modifies the meaning of a word, as "re" in reprint.

Pre-reading strategies : strategies for preparing students to read a text prior to reading. Examples include: picture walk, brainstorming about the topic/text, advance organizers, activating prior knowledge, vocabulary previews, structural organizers, establishing a purpose for reading, etc.

Primary source : firsthand account of an event or a time period written or created during that time period (examples: *Diary of Anne Frank*, Dorothea Lange's photographs, newspaper article about Hurricane Katrina).

Print concepts : the ability of a child to know and recognize the ways in which print "works" for the purposes of reading, particularly with regard to books.

Prior knowledge : refers to schema, the knowledge and experience that readers bring to the text.

Problem/solution : text structure in which the main ideas are organized into two parts: a problem and a subsequent solution that responds to the problem, or a question and an answer that responds to the question.

Protagonist : central character of a short story, novel, or narrative poem. The antagonist is the character who stands directly opposed to the protagonist.

Purpose : specific reason or reasons for the writing. It conveys what the readers have to gain by reading the selection. Purpose is the objective or the goal that the writer wishes to establish.

Q

Quote : in research, to directly copy down the words from a source, set off in quotation marks.

R

R-controlled vowels : the modified sound of a vowel immediately preceding /r/ in the same syllable (e.g., care, never, sir, or).

Rate : the speed at which a person reads.

Recursive : moving back and forth through a text in either reading or writing, as new ideas are developed or problems encountered. In reading a text, recursive processes might include rereading earlier portions in light of later ones, looking ahead to see what topics are addressed or how a narrative ends, and skimming through text to search for particular ideas or events before continuing a linear reading. In creating a written composition, recursive processes include moving back and forth among the planning, drafting, and revising phases of writing.

Reenact : to act out the events of a text.

Retell : recall the content of what was read or heard.

Revise : the process of rereading a text and making changes (in content, organization, sentence structures, and word choice) to improve it; not to be confused with edit.

Rhetorical device : technique used by writers to persuade an audience. (e.g. alliteration, hyperbole, metaphor, etc.)

Rhyme : words that have the same ending sound.

Rime : a vowel plus the consonants that follow in a syllable; (e.g., -ame, -ick, -out).

Root : a bound morpheme, usually of Latin origin, that cannot stand alone but is used to form a family of words with related meanings.

S

Schema : refers to prior knowledge, the knowledge and experience that readers bring to the text.

Secondary source : an interpretation or analysis of a primary source (examples: book about diaries kept during the Holocaust, book about Great Depression photography, an op-ed about how New Orleans handled the Hurricane Katrina aftermath from a later date).

Segmenting : separating the individual phonemes, or sounds, of a word into discrete units.

Semantics : the study of meaning in language.

Semantic relationships : associations that exist between the meanings of words.

Sequential structure: text structure in which ideas are grouped on the basis of order or time.

Setting : time and place in which events in a short story, novel, drama, or narrative poem take place.

Shared reading : an interactive reading experience that occurs when students join in or share the reading of a big book or other enlarged text while guided and supported by a teacher or other experienced reader.

Simile : a combination of two things that are unlike, usually using the words like or as.

Stem : the base form of a word; also called the root word.

Structural analysis : a procedure for teaching students to read words formed with prefixes, suffixes, or other meaningful word parts.

Style : writer's characteristic manner of employing language.

Suffix : a derivational morpheme added to the end of root or base that often changes the word's part of speech and that modifies its meaning.

Summarize : reducing large selections of text to their base essentials: the gist, the key ideas, the main points that are worth noting and remembering.

Supporting details : reasons, examples, facts, steps, or other kinds of evidence that back up and explain a main idea. Details make up most of the information in what a person reads, but some details are more important than others.

Syllable : a unit of pronunciation that is organized around a vowel sound; it may or may not have consonants before or after the vowel.

Symbol : object, person, place, or action that has both a meaning in itself and that stands for something larger than itself, such as a quality, attitude, belief, or value.

Synonyms : words which have the same meaning. (e.g. example, instance, occurrence)

Syntax : arrangement of words and order of grammatical elements in a sentence.

Synthesize : creating original insights, perspectives, and understanding by reflecting on text(s) and merging elements from text and existing schema.

T

Text complexity : based on Fisher and Frey (2013), three inter-related aspects determine text complexity: quantitative evaluation, qualitative evaluation, and matching readers with texts and tasks.

1. **Quantitative evaluation**: readability measures and other scores of text complexity
2. **Qualitative evaluation**: levels of meaning, structure, language features, and knowledge demands
3. **Matching readers with texts and tasks**: reader variables (such as motivation, knowledge, and experiences) and task variables (such as purpose and the complexity generated by the task assigned and the questions posed) (p.7)

Theme : central meaning of a literary work. A literary work can have more than one theme. Most themes are not directly stated but rather are implied. A literary theme is not the same as a topic or main idea.

Thesis statement : the guiding, arguable statement or claim an essay attempts to prove through evidence and reasoning.

Tone : writer or speaker's attitude toward a subject, character, or audience conveyed through the author's choice of words and detail. Tone can be serious, humorous, sarcastic, objective, etc.

Topic : the subject of the entire paragraph/text selection; tells what the passage is mainly about.

Track print : look and process all the letters in order from left-to-right.

Trait : distinguishing feature, as of a person's character.

V

Verbal cues : words and phrases that speakers use to add emphasis, clarify organization, make connections, and create ethos. Listeners should be focusing on these cues as it helps listeners determine a speaker's message, argument, and credibility.

Vocabulary notebook : a teaching strategy used to help students learn new vocabulary.

Voice : distinctive style or manner of expression of an author or of a character.

Vowel digraph : two vowels together that represent one phoneme, or sound (e.g., ea, ai, oa).

Vowel diphthong : a sound made by combining two vowels, specifically when it starts as one vowel sound and proceeds to another, like the *oy* sound in *oil*.

W

Word study : the integration of phonics, spelling, and vocabulary instruction. This approach teaches students how to look closely at words to discover the regularities and conventions of English orthography, or spelling. The purpose is twofold: (1) develop a general knowledge of English spelling and discover generalizations about spelling, and (2) increase students' specific knowledge of words and their meanings.

Word family : group of words that share a rime (a vowel plus the consonants that follow; e.g., -ame, -ick, -out).

Word wall : a literacy tool used for displaying commonly used vocabulary and/or sight words in large print so that all students can read the words from their desks. The purpose of a word wall is to help students naturally gain familiarity with high frequency words, as well as to gain reinforcement of vocabulary.

Writing Modes : major types of writing. (Narrative, Opinion, Informational, Argumentation).

Writing process : steps contained in the writing process include prewriting, drafting, revising, editing, and publishing. This process is often recursive.

The 44* Phonemes of the English Language

	Phoneme	Graphemes**	Examples		Phoneme	Graphemes**	Examples
Consonant Sounds:							
1	/**b**/	b, bb	big, ru**bb**er	14	/**t**/	t,tt,ed	**t**op,le**tt**er,stopp**ed**
2	/**d**/	d,dd,ed	**d**og, a**dd**, fill**ed**	15	/**v**/	v,ve	**v**et, gi**ve**
3	/**f**/	f,ph	**f**ish, **ph**one	16	/**w**/	w	**w**et, **w**in, s**w**im
4	/**g**/	g,gg	**g**o,e**gg**	17	/**y**/	y,i	**y**es, on**i**on
5	/**h**/	h	**h**ot	18	/**z**/	z,zz,ze,s,se,x	**z**ip, fi**zz**, snee**ze**, la**s**er,i**s**,wa**s**,plea**se**,**x**ylophone
6	/**j**/	j,g,ge,dge	**j**et,ca**ge**,bar**ge**,ju**dge**	**Consonant Digraphs:**			
7	/**k**/	c,k,ck,ch,cc,que	**c**at,**k**itten,du**ck**,s**ch**ool,o**cc**ur, anti**que**	19	/**th**/ (not voiced)	th	**th**umb, **th**in, thing
8	/**l**/	l.ll	**l**eg, be**ll**	20	/**th**/ (voiced)	th	**th**is, fea**th**er, **th**en
9	/**m**/	m,mm, mb	**m**ad, ha**mm**er, la**mb**	21	/**ng**/	ng,n	si**ng**, mo**n**key, si**n**k
10	/**n**/	n,nn,kn,gn	**n**o,di**nn**er,**kn**ee, **gn**ome	22	/**sh**/	sh,ss,ch,ti,ci	**sh**ip, mi**ss**ion, **ch**ef, mo**ti**on, spe**ci**al
11	/**p**/	p,pp	**p**ie, a**pp**le	23	/**ch**/	ch,tch	chip, ma**tch**
12	/**r**/	r,rr,wr	**r**un, ma**rr**y, **wr**ite	24	/**zh**/	ge,s	gara**ge**, mea**s**ure, divi**s**ion
13	/**s**/	s,se,ss,c,ce,sc	**s**un,mou**se**,dre**ss**,**c**ity,i**ce**, **sc**ience	25	/**wh**/ (with breath)	wh	**wh**at, **wh**en, **wh**ere, **wh**y

The 44* Phonemes of the English Language

	Phoneme	Graphemes**	Examples
Short Vowel Sounds:			
26	/a/	a, au	hat, laugh
27	/e/	e, ea	bed, bread
28	/i/	i	if
29	/o/	o, a, au, aw, ough	hot, want, haul, draw, bought
30	/u/	u, o	up, ton
Long Vowel Sounds:			
31	/ā/	a, a_e, ay, ai, ey, ei	bacon, late, day, train, they, eight, vein
32	/ē/	e, e_e, ea, ee, ey, ie, y	me, these, beat, feet, key, chief, baby
33	/ī/	i, i_e, igh, y, ie	find, ride, light, fly, pie
34	/ō/	o, o_e, oa, ou, ow	no, note, boat, soul, row
35	/ū/	u, u_e, ew	human, use, few, chew
Other Vowel Sounds:			
36	/oo/	oo,u,oul	book, put, could
37	/ōō/	oo,u,u_e	moon, truth, rule

	Phoneme	Graphemes**	Examples
Vowel Diphthongs:			
38	/ow/	ow, ou, ou_e	cow, out, mouse, house
39	/oy/	oi, oy	coin, toy
Vowel Sounds Influenced by r:			
40	/a(r)/	ar	car
41	/ā(r)/	air, ear, are	air, chair, fair, hair, bear, care
42	/i(r)/	irr, ere, eer	mirror, here, cheer
43	/o(r)/	or, ore, oor	for, core, door
44	/u(r)/	ur, ir, er, ear, or, ar	burn, first, fern, heard, work, dollar

Phoneme (speech sound)

Grapheme (letters or groups of letters representing the most common spellings for the individual phonemes

* The number of phonemes is different in some linguistics textbooks; this is evidence of the difficulty of classifying (Moats, 1998).

** This list does not include all possible graphemes for a given phoneme.

Source: Orchestrating Success in Reading by Dawn Reithaug (2002)

Standard 3: Critical Reading and Writing

Genre Guidance

The following provides a broad index of appropriate genres. This index does not include all genres or subgenres that students are expected to read. The genres align with expectations of the Standard 3 Critical Reading and Writing: Reading Strand - *Students will comprehend, interpret, evaluate, and respond to a variety of complex texts of all literary and informational genres from a variety of historical, cultural, ethnic, and global perspectives.*

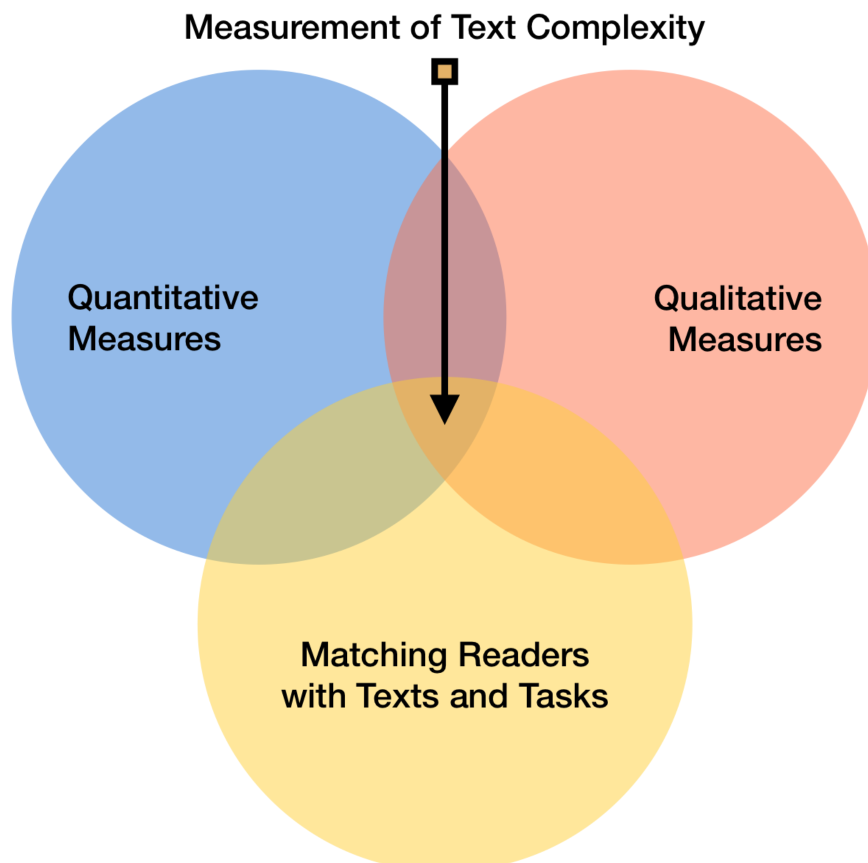
By end of **third grade,** students will have read grade-level appropriate texts in following:	By end of **fifth grade,** students will have read grade-level appropriate texts in following:	By end of **eighth grade,** students will have read grade-level appropriate texts in following:	By end of **English IV,** students will have read grade-level appropriate texts in following:
informational text	informational text	informational text	informational text
fiction	fiction	fiction	fiction
nonfiction	nonfiction	nonfiction	nonfiction
poetry	poetry	poetry	poetry
drama	drama	drama	drama
nursery rhyme	fable	fable	*Plus increasingly complex application of previous grades*
fable	legend	legend	
folk, fairy, and tall tale	fairy tale	fairy tale	
autobiography and biography	myth	myth	
	autobiography and biography	autobiography and biography	
	Plus increasingly complex application of previous grades	*Plus increasingly complex application of previous grades*	

Text Complexity Bands

In order to determine the complexity of a text, it is essential to consider three inter-related aspects: quantitative measures, qualitative measures, and reader-task considerations, (Fisher, Frey and Lapp, 2012).

Quantitative measures

Readability ranges (e.g. ATOS, Lexile Framework, Flesch-Kincaid) are available in order to measure the difficulty of the text. These ranges are created from an evaluation of word frequency and sentence length to determine text difficulty. Word frequency and sentence length are strong predictors of how difficult a text is to comprehend.



Qualitative measures

Readability ranges (quantitative measures) are not capable of assessing the subtleties of meaning, structure, language features and knowledge demands; therefore, Oklahoma educators will evaluate these qualitative measures using their professional judgment and expertise through a research- based rubric.

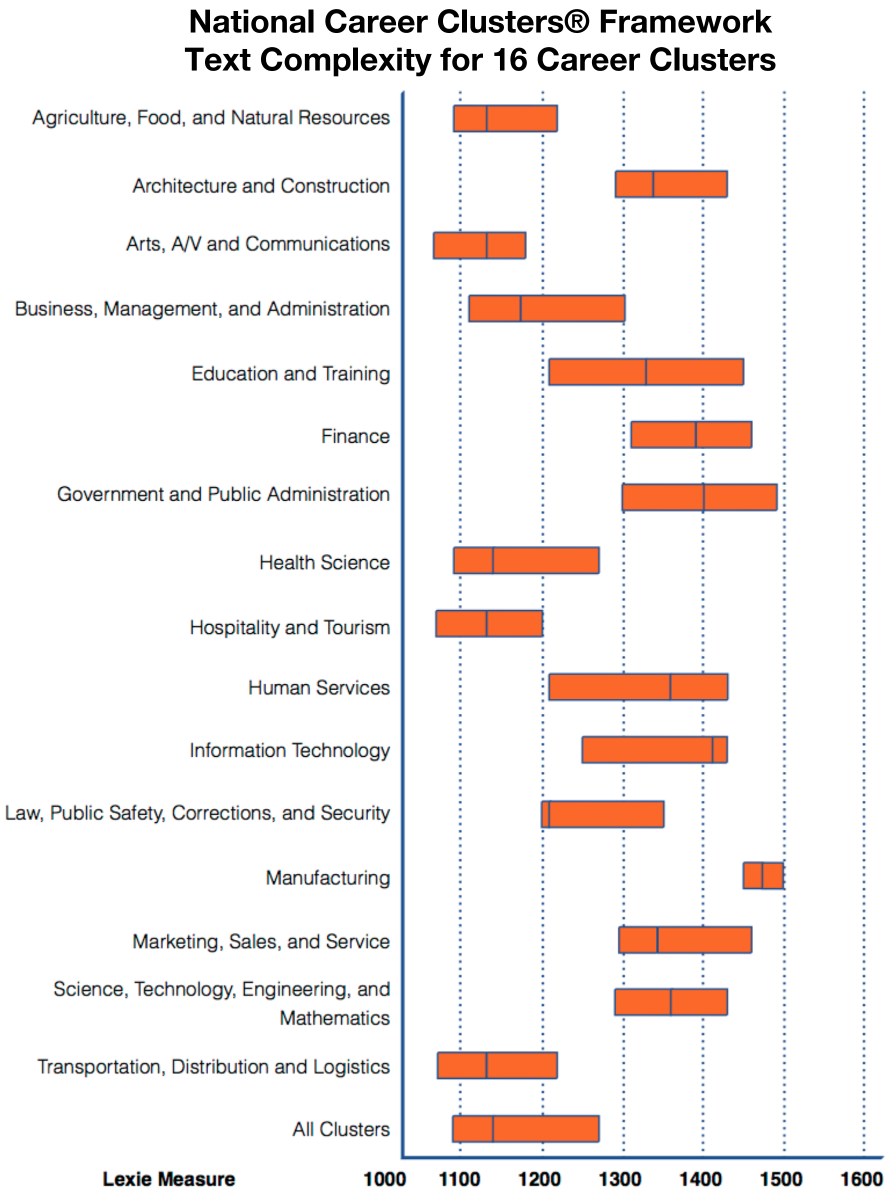
Matching readers with texts and tasks

Input from parents, local classroom teachers, reading specialists, and/ or school librarians help determine the appropriateness of a text in regards to the reader's age, interests and the content of the text. Matching readers with texts and tasks are foremost in selecting appropriate texts for readers. Reader variables include motivation, knowledge, and experiences, and task variables consist of purpose and the complexity generated by the task assigned and the questions posed.

Prekindergarten through Kindergarten guidance

According to Dr. Douglas Fisher in *Text Complexity, Raising the Rigor in Reading*," text complexity is a staircase effect and the first steps on this staircase need to be carefully scaled so the youngest readers successfully acquire the fundamental of reading, which means that they are reading texts that allow for practice with decoding and fluency" (p. 37)

College- and Career-Readiness Reading Range



Minimum reading range required for careers.

Typical Lexile Reader Measures, by Grade

lexile.com/about-lexile/grade-equivalent/grade-equivalent-chart

Grade	Lexie Reader Measures, Mid-Year 25th Percentile to 75th percentile (IQR)
1	Up to 300L
2	140L to 500L
3	330L 700L
4	445L to 810L
5	565L to 910L
6	665L to 1000L
7	735L to 1065L
8	805L to 1100L
9	855L to 1165L
10	905L to 1195L
11 and 12	940L to 1210L

If students read in the mid range and continue to progress through the grades, they should be effectively prepared for postsecondary education or the workforce.

Grammar Companion

Eight Parts of Speech

Noun - a word that names a person, place, thing, or idea.

- Proper Noun - the specific name of a particular person, place, or thing. These will always be capitalized.

    Ex: Mr. Smith, Riverdale Elementary, American

- Common noun - refers to a general group of persons, places, things, or ideas.

    Ex: teacher, school, citizen

- Concrete noun - these can be sensed by your five senses; they can be seen, touched, felt, tasted, heard, or smelled.

    Ex: apple, ball, telephone

- Abstract noun - represents a feeling, idea, or quality. These cannot be sensed by your five senses.

    Ex: hope, love, peace, hatred

- Collective noun - refers to things or people as a unit.

    Ex: team, family, class

Pronoun - a word that takes the place of a noun.

- Personal pronoun - refers to who is speaking, being spoken to, or spoken about.

	Personal Pronouns	
	Singular	**Plural**
First Person	I, me	we, us
Second Person	you	you
Third Person	he, him, she, it	they, them

- Possessive pronoun - a word that shows possession and defines who owns a particular object.

	Possessive Pronouns	
	Singular	**Plural**
First Person	my, mine	our, ours
Second Person	your, yours	your, yours
Third Person	his, her, hers, its	their, theirs

- Reflexive pronoun - a word that refers back to the subject of a sentence, clause, or phrase. It is formed by adding **–self** or **–selves** to a personal pronoun.

    Ex: myself, herself, himself, itself, ourselves, themselves

- Demonstrative pronoun - **this, that, these, those.** Points out a person, place, thing, or idea.

    Ex: This is my book. Those are my shoes. These are mine.

- Interrogative pronoun - **what, which, who, whom, whose.** Used at the beginning of a question.

- Antecedent - the noun the pronoun replaces.

    Ex: **Joann** placed **her** coat in the closet**. Joann** is the antecedent for **her**.

Verb - a word that expresses action or state of being.

- Action verb - a verb that expresses physical or mental action of the subject.

    Ex: Joe **walks** to school. The team **played** a great game. She is **talking** to me.

- Linking verb - **am, is, are, was, were, be, being, been.** These words are used to link the subject to some other word in the sentence that describes, identifies, or gives more information about it.

    Ex: John **was** sick for two days. (sick describes John) | John **is** hungry. (hungry describes John)

- Helping verb - used with the main verb to tell what happens or what exists.

may	am	do	should	have	will
might	is	does	could	had	can
must	are	did	would	has	shall
	was				
	were				
	be				
	being				
	been (also linking)				

Ex: We **might win** the game tomorrow. (might is the helping verb and win is the main verb)

Adjectives - a word that modifies or describes a noun or pronoun. Adjectives tell **what kind, how many, how much,** and **which one**.

- Articles- **a, an, the,** are always adjectives.
- Adjectives tell What Kind. Ex: We stayed in a **large high-rise** hotel.
- Adjectives tell How Many. Ex: I have attended **four** schools.
- Adjectives tell How Much. Ex: We have **some** books to shelve in the library.
- Adjectives tell Which One. Ex: I live in **the blue** house.
    - Demonstrative Adjectives: **this, that, these, those.** When these words are used to describe a noun, they are adjectives. When they are used in place of a noun, they are demonstrative pronouns.

      Ex: This is my book. – demonstrative pronoun taking the place of book.

      This book is mine. – demonstrative adjective describing book.
- Adjectives that Compare - these are usually formed by adding **–er, -ier, -est, -iest.** Ex: **larger** hat, **angrier** than you, **biggest** car.
- Other comparative adjectives - better, best, more, most, little, less

Adverbs - a word that modifies or describes a verb, adjective, or other adverb. Adverbs tell **when, where, how, how often, how much, to what extent.** Common adverbs end in **–ly.**

- Adverbs tell **How**.

  Ex: The dolphin floated **gracefully** in the water.

  John finished the race **strong**.

- Adverbs tell **When**.

  Ex: Lisa will go **first**.

  Sometimes I eat cereal for dinner.

- Adverbs tell **Where**.

  Ex: Turn **left** at the stoplight.

  The dogs are **outside**.

- Adverbs modify other Adjectives and other Adverbs by showing the degree such as **almost, entirely, early, so, frequently, extremely, occasionally, too, awfully, completely, always, very.**

  Ex: It is **very** cold here. (The adverb *very* tells about the adjective *cold*.)

  I work **extremely** fast. (The adverb *extremely* tells about the adverb *fast.*)

Prepositions and Prepositional Phrases - a word or group of words linked to a noun or verb to describe direction or condition.

- One-word Prepositions - consists of one word

    Examples in sentences: The deer ran <u>across</u> the road. We stopped <u>at</u> the store <u>down</u> the street.

Common One-word Prepositions

about	at	but (meaning except)	in	out	under
above	before	by	inside	outside	underneath
across	behind	concerning	into	over	until
after	below	despite	like	past	unto
against	beneath	down	near	since	up
along	beside	during	of	through	upon
among	besides	except	off	throughout	with
around	between	for	on	toward	within
as	beyond	from	onto	to (unless a verb comes after it)	without

- Phrasal Prepositions- consist of more than one word.
    Example in a sentence: Water flowed <u>in front of</u> the rocks.

<u>Common Phrasal Prepositions</u>

according to	from among	in case of	in spite of	out of
along with	from between	in front of	instead of	next to
as for	in accordance with	in place of	on account of	with reference
except for	in addition to	in regard to	on top of	with regard to

Conjunction - a word that connects parts of a sentence.

- Coordinate conjunctions - **and, or, nor, for, so, but, yet -** connect equal parts of a sentence.

  Ex: I like to read **and** watch TV.

  We are going to go to a movie **and** we are going to go to dinner.

- Subordinate conjunctions - connect a dependent clause to an independent clause.

<u>Common Subordinating Conjunctions</u>

after	if	than	until	which
although	how	that	when	
as	since	though	where	
because	supposing	unless	whether	

- Correlative conjunctions - connect two ideas in pairs. **Neither…nor, either…or, not only…but also**

  Ex: **Not only** do I like football, **but** I **also** like baseball.

Interjection - a word or phrase that expresses emotion and often stands alone in a sentence.

Ex: wow, yes, well, please, yuck

Parts of the Sentence

Subject

The subject of a sentence is the person, place, or thing that is performing the action of the sentence. It is what or whom the sentence is about.

Ex: The young **man** built the family a the new house.

The simple subject is the subject and any modifiers.

Ex. **The young man** built the family a new house.

Predicate

The predicate of a sentence expresses the action or being within the sentence.

Ex: The young man **built** the family a new house.

The simple predicate contains the verb and words that modify the verb.

Ex: The young man **built the family a new house.**

Direct Object

The direct object receives the action of the sentence. It is usually a noun or pronoun.

Ex: The young man built the family a new **house**.

Indirect Object

The indirect object indicates to whom or for whom the action of the sentence is being done.

Ex: The young man built the **family** a new house.

Subject Complement

A subject complement either renames or describes the subject and is usually a noun, pronoun, or adjective. Subject complements follow a linking verb within the sentence.

Ex: The man is a good **father**. (father is the noun complement of man.) | The man seems **kind**. (kind is the adjective complement of man.)

Phrases - groups of words that do not contain both a subject and a verb.

Prepositional Phrase -made up of a preposition and its modifiers. It can function as an adjective or adverb in a sentence.

- Adjectival prepositional phrase: The store **around the corner** is green. (around the corner describes the noun store.)
- Adverbial prepositional phrase: Sally is coloring **outside the lines**. (outside the lines describes where the coloring takes place.)

Verbal Phrases - groups of words using verbs as other parts of the sentence. Infinitive, Gerund, and Participial

- **Infinitive Phrase - the word "to" plus a verb. Infinitive phrases can function as adjective, adverbs, or nouns**

  Ex: **To dance gracefully** is my ambition. (noun as the subject of a sentence)

  Her plan **to become a millionaire** fell through when the stock market crashed. (adjective describing plan)

  John went to college **to study engineering.** (adverb describing why he went)

- **Participial Phrase - a verb form functioning as an adjective.**

  Ex: **Swimming for his life**, John made it to shore. (swimming for his life describes John)

- **Gerund Phrase - an –ing verb form functioning as a noun.**

  Ex: **Walking the dog** is not my favorite task. (subject)

Appositive Phrase - renames or identifies a noun or pronoun. It is set off by commas if the added information is nonessential to the meaning of the sentence.

Ex: My teacher, **a woman with curly hair**, is very fun. (curly hair is nonessential to the teacher being fun)

The dog with the sharp teeth **Bowser** is the one who bit me. (Bowser is essential to identifying which dog bites)

Absolute Phrase - is a modifier, or a modifier and a few other words, that attaches to a sentence or a noun, with no conjunction. It cannot contain a finite verb.

Absolute phrases usually consist of a noun and a modifier that modifies this noun, NOT another noun in the sentence.

Absolute phrases are optional in sentences, i.e., they can be removed without damaging the grammatical integrity of the sentence. Since absolute phrases are optional in the sentence, they are often set off from the sentence with commas or, less often, with dashes. We normally explain absolute phrases by saying that they modify entire sentences, rather than one word.

Ex: **Their minds whirling from the events of the school day**, the students made their way to the parking lot.

His head pounding, his hands shaking, the young man knelt and proposed marriage to his girlfriend.

Clauses

Clauses - a group of related words that contains a subject and a verb. Independent clauses can stand alone as complete sentences. Dependent or subordinate clauses cannot stand alone and must be in the sentence with an independent clause.

Adjective Clauses - dependent clauses that describe nouns or pronouns. They begin with relative pronouns: **that, where, which, who, whose.**

Ex: The teacher **who left her papers on the desk** will be late turning in her grades.

Adverb Clauses - dependent clauses that describe verbs, adjectives, or adverbs. They begin with subordinating conjunctions.

Subordinating conjunctions to show time: **after, before, when, while, as , whenever, since, until, as soon as, as long as, once**

Subordinating conjunctions to show cause and effect: **because, since, now that, as, so, in order that**

Subordinating conjunctions to show condition: **if, unless, whether, providing**

Subordinating conjunctions to show contrast: **although, even though, though, whereas, while**

Examples:

Time: **After the family spent the day at the zoo,** they were very tired.

Cause and Effect: The family was very tired **since they spent the day at the zoo.**

Condition: **Unless you plan your trip to the zoo carefully,** you won't be able to see all the animals in one day.

Contrast: The family visited the park, **although they really wanted to spend the day at the zoo.**

Noun Clauses - dependent clauses that function as the subject, object, or compliment of a sentence.
They begin with subordinating conjunctions.

how	when	who
however	whenever	whoever
if	where	whom
that	wherever	whomever
what	which	whose
whether	whichever	why
whatever		

Examples:

Whatever you want for dinner is fine with me. (subject)

John will make **whatever you want for dinner.** (direct object)

I have dinner ready for **whoever wants to eat.** (object of the preposition)

Verb Tense

The tense of a verb is determined by when the action took place. The three tenses are:

- The Past Tense
- The Present Tense
- The Future Tense

Examples of Tenses

Here are some examples of verbs in different tenses:

- I walked to work. (The verb *walked* is in the **past tense**.)
- I walk to work. (The verb *walk* is in the **present tense**.)
- I will walk to work. (The verb *will walk* is in the **future tense**.)

Verbs do not just express actions. They can also express a state of being. For example:

- I was happy. (The verb *was* is in the **past tense**.)
- I am happy. (The verb *am* is in the **present tense**.)
- I will be happy. (The verb *will be* is in the **future tense**.)

Some of the verbs in the past tense are made up of more than one word. We need these different versions of the tenses because the tenses are further categorized depending on whether the action (or state of being) they describe is in progress or completed. For example, the different versions of the verb *to laugh* are:

- **Past Tense**: laughed, was/were laughing, had laughed, had been laughing
- **Present Tense**: laugh, am/is/are laughing, has/have laughed, has/have been laughing
- **Future Tense**: will laugh, will be laughing, will have laughed, will have been laughing

The Full List of Tenses

The table below shows the full list of the tenses:

The 4 Past Tenses	Example
simple past tense	I went
past progressive tense	I was going
past perfect tense	I had gone
past perfect progressive tense	I had been going
The 4 Present Tenses	**Example**
simple present tense	I go
present progressive tense	I am going
present perfect tense	I have gone
present perfect progressive tense	I have been going
The 4 Future Tenses	**Example**
simple future tense	I will go
future progressive tense	I will be going
future perfect tense	I will have gone
future perfect progressive tense	I will have been going

Sentence Structure

1. Simple - a simple sentence contains one independent clause.

Ex: Judy laughed.

2. Compound - a compound sentence contains two or more independent clauses joined by a conjunction.

Ex: Judy laughed and Jimmy cried.

3. Complex - a complex sentence contains an independent clause and at least one dependent clause.

Ex: Jimmy cried when Judy laughed.

4. Compound Complex - a compound-complex sentence contains two or more independent clauses and at least one dependent clause.

Ex: Judy laughed and Jimmy cried when the clowns ran past their seats.

Types of Sentences

1. Declarative sentences make a statement to relay information or ideas. They are punctuated with a simple period. Formal essays or reports are composed almost entirely of declarative sentences.

Ex: The concert begins in two hours. July 4th is Independence Day.

2. Imperative sentences issue commands or requests or they can express a desire or wish. They are punctuated with a simple period or they can be exclamations requiring an exclamation mark. It all depends on the strength of emotion you want to express. Imperative sentences can consist of a single verb or they can be more lengthy and complex.

Ex: Watch out for oncoming traffic. Please do your homework.

3. Exclamatory sentences express strong emotion. It doesn't really matter what the emotion is, an exclamatory sentence is the type of sentence needed to express it. Exclamatory sentences always end in an exclamation mark, so it's pretty easy to spot them.

Ex: The river is rising! I can't wait for the party!

4. Interrogative sentences are also easy to spot. That's because they always ask a question and end in a question mark.

Ex: Is it snowing? Have you had breakfast?

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OKLAHOMA ACADEMIC STANDARDS

MATHEMATICS

OKLAHOMA STATE DEPARTMENT OF EDUCATION

CHAMPION EXCELLENCE

Table of Contents

Introduction

The Oklahoma Academic Standards for Mathematics 2016 is the result of the contributions of hundreds of mathematics teachers, mathematics educators, and mathematicians from across the state of Oklahoma. This document reflects a balanced synthesis of the work of all members of the Oklahoma Academic Standards for Mathematics Writing Committee and feedback from teachers, mathematicians, external reviews, and numerous education stakeholders including business, industry and commerce, parent groups, career tech, higher education, and external reviewers.

The Oklahoma Academic Standards for Mathematics 2016 specify what students should know and be able to do as learners of mathematics at the end of each grade level or course. Students are held responsible for learning standards listed at earlier grade levels as well as their current grade level. Throughout this document, the standards are written to allow time for study of additional material at every grade level. The order of the standards at any grade level is not meant to imply a sequence of topics and should be considered flexible for the organization of any course. The document provides standards for PK-7, Pre-Algebra, Algebra I, Geometry, and Algebra II with Algebra I as the pre-requisite for both Geometry and Algebra II.

Development of the Oklahoma Academic Standards for Mathematics

The Oklahoma Academic Standards for Mathematics writing team drew on the work of the National Council of Teachers of Mathematics (NCTM) standards documents; the National Research Council's report Adding It Up, the Oklahoma Priority Academic Standards (PASS), and other states' standards documents and curriculum framework guides (e.g., Minnesota, Virginia, and Massachusetts). Please see the reference list at the end of this document for a more complete list of all resources consulted.

Vision and Guiding Principles

These standards envision all students in Oklahoma will become mathematically proficient and literate through a strong mathematics program that emphasizes and engages them in problem solving, communicating, reasoning and proof, making connections, and using representations. Mathematically proficient and literate students can confidently and effectively use mathematics concepts, computation skills, and numbers to problem-solve, reason, and analyze information. Developing mathematical proficiency and literacy for Oklahoma students depends in large part on a clear, comprehensive, coherent, and developmentally appropriate set of standards to guide curricular decisions. The understanding and implementation of these standards throughout PK-12 mathematics experience for students is based on the following guiding principles:

Guiding Principle 1: Excellence in mathematics education requires equity—high expectations and strong support for all students.
All students must have opportunities to study—and support to learn—mathematics. Equity does not mean that every student should receive identical instruction; instead, it demands that reasonable and appropriate accommodations be made as needed to promote access and attainment for all students.

Guiding Principle 2: Mathematical ideas should be explored in ways that stimulate curiosity, create enjoyment of mathematics, and develop depth of understanding.
Students need to understand mathematics deeply and use it effectively. To achieve mathematical understanding, students should be actively engaged in doing meaningful mathematics, discussing mathematical ideas, and applying mathematics in interesting, thought provoking situations. Student understanding is

further developed through ongoing reflection about cognitively demanding and tasks relevant to their lives.

Tasks should challenge and engage students in mathematics in multiple ways. Short- and long-term investigations that connect procedures and skills with conceptual understanding are integral components of an effective mathematics program. Activities should build upon curiosity and prior knowledge, and enable students to solve progressively deeper, broader, and more sophisticated problems. Mathematical tasks reflecting significant mathematics should generate active classroom talk, promote the development of conjectures, and lead to an understanding of the necessity for mathematical reasoning.

Guiding Principle 3: An effective mathematics program focuses on problem solving.
Mathematical problem solving is the hallmark of an effective mathematics program. Skill in mathematical problem solving requires practice with a variety of mathematical problems as well as a firm grasp of mathematical techniques and their underlying principles. Students who possess a deeper knowledge of mathematics can then use mathematics in a flexible way to attack various problems and devise different ways of solving any particular problem. Mathematical problem solving calls for reflective thinking, persistence, and learning from the ideas of others. Success in solving mathematical problems helps to create an abiding interest in mathematics.

Guiding Principle 4: Technology is essential in teaching and learning mathematics.
Technology enhances the mathematics curriculum in many ways. Technology enables students to communicate ideas within the classroom or to search for needed information. It can be especially helpful in assisting students with special needs in regular and special classrooms, at home, and in the community. Technology changes what mathematics is to be learned and when and how it is learned. Tools such as measuring instruments, manipulatives (such as base ten blocks and fraction pieces), scientific and graphing calculators, and computers with appropriate software, if properly used, contribute to a rich learning environment for developing and applying mathematical concepts. Appropriate use of calculators is essential; calculators should not be used as a replacement for basic understanding and skills. Although the use of a graphing calculator can help middle and secondary students to visualize properties of functions and their graphs, graphing calculators should be used to enhance their understanding and skills rather than replace them.

Standards Overview

The Oklahoma Academic Standards for Mathematics are developed around four main content strands, Algebraic Reasoning and Algebra, Number and Operations, Geometry and Measurement, and Data and Probability organize the content standards throughout PK-7 and Pre-Algebra. The standards for Algebra I, Algebra II, and Geometry are fundamentally organized around these strands as well. The process standards are defined as the Mathematical Actions and Processes and are comprised of the skills and abilities students should develop and be engaged in throughout their PK-12 mathematics education. Among these are the ability to problem solve, communicate, and reason about mathematics which will help students be ready for the mathematics expectations of college and the skills desired by many employers. While the process and content standards work in concert to create clear, concise, and rigorous mathematics standards and expectations for Oklahoma students with the aim of helping them be college and career ready, it is not intended that each mathematical action and process will be utilized or developed with each standard. Certainly some standards and objectives can be achieved more readily with particular mathematics actions and processes. For example, an objective that involves explaining a particular concept may be best accomplished by also engaging students in communicating mathematically. Whereas, standards and objectives that focus in the early grades on fluency with operations will align well with the mathematical action and process focused on procedural fluency.

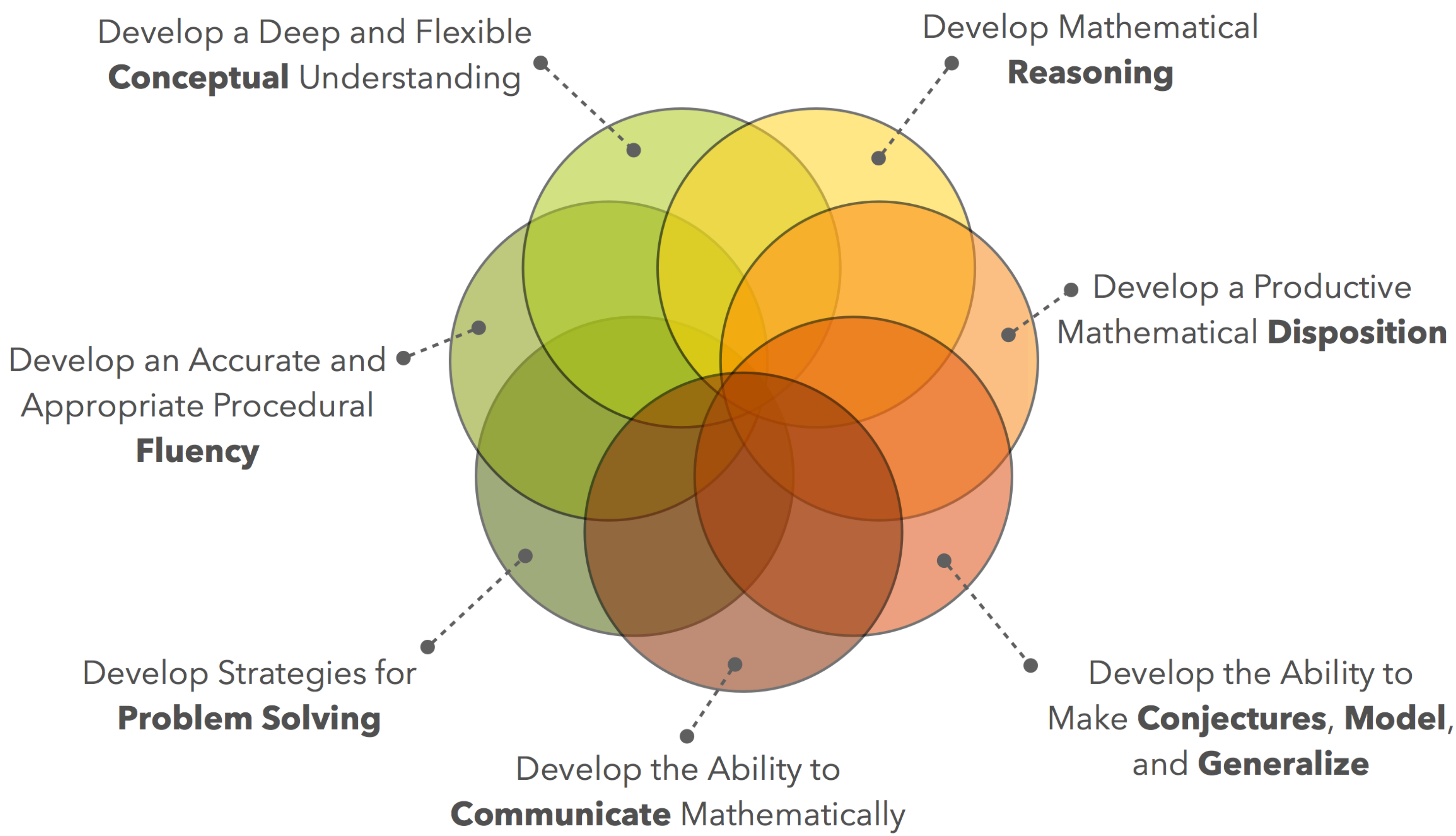
Number and Operations Strand: A focus on number and operations is the cornerstone of a strong mathematics program. Developing students' fluency with number and operations throughout their PK-12 mathematics experience requires a balance and connection between conceptual understanding and computational proficiency and efficiency. This strand provides focus on the importance of students' understanding of numbers, ways of representing numbers, relationships among numbers, relationships among number systems, and meanings of operations and how they relate to one another. An emphasis is placed on the development of estimation so students can determine the reasonableness of solutions and answers. Further, it requires that students should be able to compute efficiently and proficiently.

Algebraic Reasoning and Algebra Strand: All students should be able to reason algebraically and learn algebra. This strand provides focus for the PK-7 and Pre-Algebra standards around the notion that algebra is more than moving symbols around. It is about understanding patterns, relations and functions, representing and analyzing mathematical situations and structures using algebraic symbols, using mathematical models to represent and understand quantitative relationships, and analyzing change in various contexts. Understanding change is fundamental to algebraic reasoning and the concept of function with depth. This understanding is critical for success in college-level mathematics. It is also fundamental to understanding many real-world problems and situations students will face in their future careers.

Geometry and Measurement Strand: All students should gain experience using a variety of visual and coordinate representations to analyze and solve problems and learn how to use appropriate units and tools for measuring. This strand provides focus for the PK-7 and Geometry standards around the notion that geometry and measurement help students understand and represent ideas and solve problems they will encounter in their daily lives. A focus on geometry should enable students to analyze characteristics of two- and three-dimensional objects, develop arguments based on geometric relationships, describe spatial relationships using coordinate geometry and other representational systems, apply transformations and symmetry to analyze mathematical situations, and utilize visualization, spatial reasoning and geometric modeling to solve problems. A focus on measurement should enable students to understand measureable attributes of objects and the units, systems, and processes of measurement, and apply appropriate techniques, tools, and formulas to determine measurements.

Data and Probability Strand: An increased emphasis on understanding data should span all grade levels. Making sense of data and probability has become a part of our daily lives, supporting the importance of this strand throughout a students' PK-12 mathematics experience. A focus on data and probability should enable all students to formulate questions that can be addressed with data, and to collect, organize, and display relevant data to answer them. Students should select and use appropriate statistical methods to analyze data, develop and evaluate inferences and predictions that are based on data, and understand and apply basic concepts of probability. The study of data is also an opportunity to apply the basic skills of computing with numbers and being an educated consumer of information presented in the news and media while the study of probability provides application and use of fractions in daily life.

Mathematical Actions and Processes



Mathematical Actions and Processes

The Mathematical Actions and Processes simultaneously reflect the holistic nature of mathematics as a discipline in which patterns and relationships among quantities, numbers, and space are studied (National Academies of Sciences, 2014) and as a form of literacy such that all students are supported in accessing and understanding mathematics for life, for the workplace, for the scientific and technical community, and as a part of cultural heritage (NCTM, 2000). The seven Mathematical Actions and Processes leverage both the NCTM Process Standards and the Five Mathematical Proficiencies (NRC, 2001) to capture the mathematical experience of Oklahoma students as they pursue mathematical literacy.

Throughout their Pk-12 education experience, mathematically literate students will:

Develop a Deep and Flexible Conceptual Understanding
Demonstrate a deep and flexible conceptual understanding of mathematical concepts, operations, and relations while making mathematical and real-world connections. Students will develop an understanding of how and when to apply and use the mathematics they know to solve problems.

Develop Accurate and Appropriate Procedural Fluency
Learn efficient procedures and algorithms for computations and repeated processes based on a strong sense of numbers. Develop fluency in addition, subtraction, multiplication, and division of numbers and expressions. Students will generate a sophisticated understanding of the development and application of algorithms and procedures.

Develop Strategies for Problem Solving
Analyze the parts of complex mathematical tasks and identify entry points to begin the search for a solution. Students will select from a variety of problem solving strategies and use corresponding multiple representations (verbal, physical, symbolic, pictorial, graphical, tabular) when appropriate. They will pursue solutions to various tasks from real-world situations and applications that are often interdisciplinary in nature. They will find methods to verify their answers in context and will always question the reasonableness of solutions.

Develop Mathematical Reasoning
Explore and communicate a variety of reasoning strategies to think through problems. Students will apply their logic to critique the thinking and strategies of others to develop and evaluate mathematical arguments, including making arguments and counterarguments and making connections to other contexts.

Develop a Productive Mathematical Disposition
Hold the belief that mathematics is sensible, useful and worthwhile. Students will develop the habit of looking for and making use of patterns and mathematical structures. They will persevere and become resilient, effective problem solvers.

Develop the Ability to Make Conjectures, Model, and Generalize
Make predictions and conjectures and draw conclusions throughout the problem solving process based on patterns and the repeated structures in mathematics. Students will create, identify, and extend patterns as a strategy for solving and making sense of problems.

Develop the Ability to Communicate Mathematically
Students will discuss, write, read, interpret and translate ideas and concepts mathematically. As they progress, students' ability to communicate mathematically will include their increased use of mathematical language and terms and analysis of mathematical definitions.

Reading the Oklahoma Academic Standards for Mathematics

Math Actions and Processes

Oklahoma Academic Standards for Mathematics 5th Grade (5)

Grade or Course

Develop a Deep and Flexible Conceptual Understanding	Develop Accurate and Appropriate Procedural Fluency	Develop Strategies for Problem Solving	Develop Mathematical Reasoning	Develop a Productive Mathematical Disposition	Develop the Ability to Make Conjectures, Model, and Generalize	Develop the Ability to Communicate Mathematically

Number & Operations (N)

Strands

Standards

Objectives

5.N.1 Divide multi-digit numbers and solve real-world and mathematical problems using arithmetic.	**5.N.1.1** [illegible]stimate solutio[illegible]ion problems in order to assess the reasonableness of results.
	5.N.1.2 Divide multi-digit [illegible]ers, by one- and two-digit divisors, using efficient and generalizable procedures, based on knowledge of place value, including standard algorithms.
	5.N.1.3 Recognize that quotients can be represented in a variety of ways, including a whole number with a remainder, a fraction or mixed number, or a decimal and consider the context in which a problem is situated to select and interpret the most useful form of the quotient for the solution.
	5.N.1.4 Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers. Use various strategies, including the inverse relationships between operations, the use of technology, and the context of the problem to assess the reasonableness of results.
5.N.2 Read, write, represent, and compare fractions and decimals; recognize and write equivalent fractions; convert between fractions and decimals; use fractions and decimals in real-world and mathematical situations.	**5.N.2.1** Represent deci[illegible]ns (e.g., $\frac{1}{10}, \frac{1}{100}$) using a variety of models (e.g., 10 by 10 grids, rational number wheel, base-ten blocks, meter stick) and make connections betw[illegible] and decimals.
	5.N.2.2 Represent, read and write decimals using place value to describe decimal numbers including fractional numbers as small as thousandths and whole numbers as large as millions.
	5.N.2.3 Compare and order fractions and decimals, including mixed numbers and fractions less than one, and locate on a number line.
	5.N.2.4 Recognize and generate equivalent decimals, fractions, mixed numbers, and fractions less than one in various contexts.
5.N.3 Add and subtract fractions with like and unlike denominators, mixed numbers and decimals to solve real-world and mathematical problems.	**5.N.3.1** Estimate sums and differences of fractions with like and unlike denominators, mixed numbers, and decimals to assess the reasonableness of the results.
	5.N.3.2 Illustrate addition and subtraction of fractions with like and unlike denominators, mixed numbers, and decimals using a variety of representations (e.g., fraction strips, area models, number lines, fraction rods).
	5.N.3.3 Add and subtract fractions with like and unlike denominators, mixed numbers, and decimals, using efficient and generalizable procedures, including but not limited to standard algorithms in order to solve real-world and mathematical problems including those involving money, measurement, geometry, and data.
	5.N.3.4 Find 0.1 more than a number and 0.1 less than a number. Find 0.01 more than a number and 0.01 less than a number. Find 0.001 more than a number and 0.001 less than a number.

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Number & Operations (N)

PK.N.1 Know number names and count in sequence.	**PK.N.1.1** Count aloud forward in sequence by 1s to 20.
	PK.N.1.2 Recognize and name written numerals 0-10.
	PK.N.1.3 Recognize that zero represents the count of no objects.
PK.N.2 Count to tell the number of objects.	**PK.N.2.1** Identify the number of objects, up to 10, in a row or column.
	PK.N.2.2 Use one-to-one correspondence in counting objects and matching groups of objects.
	PK.N.2.3 Understand the last numeral spoken, when counting aloud, tells how many total objects are in a set.
	PK.N.2.4 Count up to 5 items in a scattered configuration; not in a row or column.
PK.N.3 Compare sets using number.	**PK.N.3.1** Compare two sets of 1-5 objects using comparative language such as same, more, or fewer.

Algebraic Reasoning & Algebra (A)

PK.A.1 Recognize, duplicate, and extend patterns.	**PK.A.1.1** Sort and group up to 5 objects into a set based upon characteristics such as color, size, and shape and explain verbally what the objects have in common.
	PK.A.1.2 Recognize, duplicate, and extend repeating patterns involving manipulatives, sound, movement, and other contexts.

Geometry & Measurement (GM)

PK.GM.1 Identify common shapes.	**PK.GM.1.1** Identify circles, squares, rectangles, and triangles by pointing to the shape when given the name.
PK.GM.2 Describe and compare measureable attributes.	**PK.GM.2.1** Identify measurable attributes of objects. Describe them as little, big, long, short, tall, heavy, light, or other age appropriate vocabulary.
	PK.GM.2.2 Directly compare two objects with a common measurable attribute using words such as longer/shorter; heavier/lighter; or taller/shorter.
	PK.GM.2.3 Sort objects into sets by one or more attributes.

Data & Probability (D)	
PK.D.1 Collect and organize categorical data.	**PK.D.1.1** Collect and organize information about objects and events in the environment.
	PK.D.1.2 Use categorical data to create real-object graphs.

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Number & Operations (N)

K.N.1 Understand the relationship between quantities and whole numbers.	**K.N.1.1** Count aloud forward in sequence to 100 by 1's and 10's.
	K.N.1.2 Recognize that a number can be used to represent how many objects are in a set up to 10.
	K.N.1.3 Use ordinal numbers to represent the position of an object in a sequence up to 10.
	K.N.1.4 Recognize without counting (subitize) the quantity of a small group of objects in organized and random arrangements up to 10. **Clarification statement**: Subitizing is defined as instantly recognizing the quantity of a set without having to count. "Subitizing" is not a vocabulary word and is not meant for student discussion at this age.
	K.N.1.5 Count forward, with and without objects, from any given number up to 10.
	K.N.1.6 Read, write, discuss, and represent whole numbers from 0 to at least 10. Representations may include numerals, pictures, real objects and picture graphs, spoken words, and manipulatives.
	K.N.1.7 Find a number that is 1 more or 1 less than a given number up to 10.
	K.N.1.8 Using the words more than, less than or equal to compare and order whole numbers, with and without objects, from 0 to 10.
K.N.2 Develop conceptual fluency with addition and subtraction (up to 10) using objects and pictures.	**K.N.2.1** Compose and decompose numbers up to 10 with objects and pictures.
K.N.3 Understand the relationship between whole numbers and fractions through fair share.	**K.N.3.1** Distribute equally a set of objects into at least two smaller equal sets.
K.N.4 Identify coins by name.	**K.N.4.1** Identify pennies, nickels, dimes, and quarters by name.

Algebraic Reasoning & Algebra (A)	
K.A.1 Duplicate patterns in a variety of contexts.	**K.A.1.1** Sort and group up to 10 objects into a set based upon characteristics such as color, size, and shape. Explain verbally what the objects have in common.
	K.A.1.2 Recognize, duplicate, complete, and extend repeating, shrinking and growing patterns involving shape, color, size, objects, sounds, movement, and other contexts.

Geometry & Measurement (GM)	
K.GM.1 Recognize and sort basic two-dimensional shapes and use them to represent real-world objects.	**K.GM.1.1** Recognize squares, circles, triangles, and rectangles.
	K.GM.1.2 Sort two-dimensional objects using characteristics such as shape, size, color, and thickness.
	K.GM.1.3 Identify attributes of two-dimensional shapes using informal and formal geometric language interchangeably.
	K.GM.1.4 Use smaller shapes to form a larger shape when there is an outline to follow.
	K.GM.1.5 Compose free-form shapes with blocks.
	K.GM.1.6 Use basic shapes and spatial reasoning to represent objects in the real world.
K.GM.2 Compare and order objects according to location and measurable attributes.	**K.GM.2.1** Use words to compare objects according to length, size, weight, position, and location.
	K.GM.2.2 Order up to 6 objects using measurable attributes, such as length and weight.
	K.GM.2.3 Sort objects into sets by more than one attribute.
	K.GM.2.4 Compare the number of objects needed to fill two different containers.
K.GM.3 Tell time as it relates to daily life.	**K.GM.3.1** Develop an awareness of simple time concepts using words such as yesterday, today, tomorrow, morning, afternoon, and night within his/her daily life.

Data & Probability (D)	
K.D.1 Collect, organize, and interpret categorical data.	**K.D.1.1** Collect and sort information about objects and events in the environment.
	K.D.1.2 Use categorical data to create real-object and picture graphs.
	K.D.1.3 Draw conclusions from real-object and picture graphs.

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Number & Operations (N)

1.N.1 Count, compare, and represent whole numbers up to 100, with an emphasis on groups of tens and ones.	**1.N.1.1** Recognize numbers to 20 without counting (subitize) the quantity of structured arrangements. **Clarification statement**: Subitizing is defined as instantly recognizing the quantity of a set without having to count. "Subitizing" is not a vocabulary word and is not meant for student discussion at this age.
	1.N.1.2 Use concrete representations to describe whole numbers between 10 and 100 in terms of tens and ones.
	1.N.1.3 Read, write, discuss, and represent whole numbers up to 100. Representations may include numerals, addition and subtraction, pictures, tally marks, number lines and manipulatives, such as bundles of sticks and base 10 blocks.
	1.N.1.4 Count forward, with and without objects, from any given number up to 100 by 1s, 2s, 5s and 10s.
	1.N.1.5 Find a number that is 10 more or 10 less than a given number up to 100.
	1.N.1.6 Compare and order whole numbers from 0 to 100.
	1.N.1.7 Use knowledge of number relationships to locate the position of a given whole number on an open number line up to 20.
	1.N.1.8 Use objects to represent and use words to describe the relative size of numbers, such as more than, less than, and equal to.
1.N.2 Solve addition and subtraction problems up to 10 in real-world and mathematical contexts.	**1.N.2.1** Represent and solve real-world and mathematical problems using addition and subtraction up to ten.
	1.N.2.2 Determine if equations involving addition and subtraction are true.
	1.N.2.3 Demonstrate fluency with basic addition facts and related subtraction facts up to 10.
1.N.3 Develop foundational ideas for fractions.	**1.N.3.1** Partition a regular polygon using physical models and recognize when those parts are equal.
	1.N.3.2 Partition (fair share) sets of objects into equal groupings.

1.N.4 Identify coins and their values.	**1.N.4.1** Identifying pennies, nickels, dimes, and quarters by name and value.
	1.N.4.2 Write a number with the cent symbol to describe the value of a coin.
	1.N.4.3 Determine the value of a collection of pennies, nickels, or dimes up to one dollar counting by ones, fives, or tens.
Algebraic Reasoning & Algebra (A)	
1.A.1 Identify patterns found in real-world and mathematical situations.	**1.A.1.1** Identify, create, complete, and extend repeating, growing, and shrinking patterns with quantity, numbers, or shapes in a variety of real-world and mathematical contexts.
Geometry & Measurement (GM)	
1.GM.1 Recognize, compose, and decompose two- and three-dimensional shapes.	**1.GM.1.1** Identify trapezoids and hexagons by pointing to the shape when given the name.
	1.GM.1.2 Compose and decompose larger shapes using smaller two-dimensional shapes.
	1.GM.1.3 Compose structures with three-dimensional shapes.
	1.GM.1.4 Recognize three-dimensional shapes such as cubes, cones, cylinders, and spheres.
1.GM.2 Select and use nonstandard and standard units to describe length and volume/capacity.	**1.GM.2.1** Use nonstandard and standard measuring tools to measure the length of objects to reinforce the continuous nature of linear measurement.
	1.GM.2.2 Illustrate that the length of an object is the number of same-size units of length that, when laid end-to-end with no gaps or overlaps, reach from one end of the object to the other.
	1.GM.2.3 Measure the same object/distance with units of two different lengths and describe how and why the measurements differ.
	1.GM.2.4 Describe a length to the nearest whole unit using a number and a unit.
	1.GM.2.5 Use standard and nonstandard tools to identify volume/capacity. Compare and sort containers that hold more, less, or the same amount.
1.GM.3 Tell time to the half and full hour.	**1.GM.3.1** Tell time to the hour and half-hour (analog and digital).
Data & Probability (D)	
1.D.1 Collect, organize, and interpret categorical and numerical data.	**1.D.1.1** Collect, sort, and organize data in up to three categories using representations (e.g., tally marks, tables, Venn diagrams).
	1.D.1.2 Use data to create picture and bar-type graphs to demonstrate one-to-one correspondence.
	1.D.1.3 Draw conclusions from picture and bar-type graphs.

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Number & Operations (N)

2.N.1 Compare and represent whole numbers up to 1,000 with an emphasis on place value and equality.	**2.N.1.1** Read, write, discuss, and represent whole numbers up to 1,000. Representations may include numerals, words, pictures, tally marks, number lines and manipulatives.
	2.N.1.2 Use knowledge of number relationships to locate the position of a given whole number on an open number line up to 100.
	2.N.1.3 Use place value to describe whole numbers between 10 and 1,000 in terms of hundreds, tens and ones. Know that 100 is 10 tens, and 1,000 is 10 hundreds.
	2.N.1.4 Find 10 more or 10 less than a given three-digit number. Find 100 more or 100 less than a given three-digit number.
	2.N.1.5 Recognize when to round numbers to the nearest 10 and 100.
	2.N.1.6 Use place value to compare and order whole numbers up to 1,000 using comparative language, numbers, and symbols (e.g., 425 > 276, 73 < 107, page 351 comes after page 350, 753 is between 700 and 800).
2.N.2 Add and subtract one- and two-digit numbers in real-world and mathematical problems.	**2.N.2.1** Use the relationship between addition and subtraction to generate basic facts up to 20.
	2.N.2.2 Demonstrate fluency with basic addition facts and related subtraction facts up to 20.
	2.N.2.3 Estimate sums and differences up to 100.
	2.N.2.4 Use strategies and algorithms based on knowledge of place value and equality to add and subtract two-digit numbers.
	2.N.2.5 Solve real-world and mathematical addition and subtraction problems involving whole numbers up to 2 digits.
	2.N.2.6 Use concrete models and structured arrangements, such as repeated addition, arrays and ten frames to develop understanding of multiplication.
2.N.3 Explore the foundational ideas of fractions.	**2.N.3.1** Identify the parts of a set and area that represent fractions for halves, thirds, and fourths.
	2.N.3.2 Construct equal-sized portions through fair sharing including length, set, and area models for halves, thirds, and fourths.
2.N.4 Determine the value of a set of coins.	**2.N.4.1** Determine the value of a collection(s) of coins up to one dollar using the cent symbol.
	2.N.4.2 Use a combination of coins to represent a given amount of money up to one dollar.

Algebraic Reasoning & Algebra (A)	
2.A.1 Describe the relationship found in patterns to solve real-world and mathematical problems.	**2.A.1.1** Represent, create, describe, complete, and extend growing and shrinking patterns with quantity and numbers in a variety of real-world and mathematical contexts.
	2.A.1.2 Represent and describe repeating patterns involving shapes in a variety of contexts.
2.A.2 Use number sentences involving unknowns to represent and solve real-world and mathematical problems.	**2.A.2.1** Use objects and number lines to represent number sentences.
	2.A.2.2 Generate real-world situations to represent number sentences and vice versa.
	2.A.2.3 Apply commutative and identity properties and number sense to find values for unknowns that make number sentences involving addition and subtraction true or false.
Geometry & Measurement (GM)	
2.GM.1 Analyze attributes of two-dimensional figures and develop generalizations about their properties.	**2.GM.1.1** Recognize trapezoids and hexagons.
	2.GM.1.2 Describe, compare, and classify two-dimensional figures according to their geometric attributes.
	2.GM.1.3 Compose two-dimensional shapes using triangles, squares, hexagons, trapezoids, and rhombi.
	2.GM.1.4 Recognize right angles and classify angles as smaller or larger than a right angle.
2.GM.2 Understand length as a measurable attribute and explore capacity.	**2.GM.2.1** Explain the relationship between the size of the unit of measurement and the number of units needed to measure the length of an object.
	2.GM.2.2 Explain the relationship between length and the numbers on a ruler by using a ruler to measure lengths to the nearest whole unit.
	2.GM.2.3 Explore how varying shapes and styles of containers can have the same capacity.
2.GM.3 Tell time to the quarter hour.	**2.GM.3.1** Read and write time to the quarter-hour on an analog and digital clock. Distinguish between a.m. and p.m.
Data & Probability (D)	
2.D.1 Collect, organize, and interpret data.	**2.D.1.1** Explain that the length of a bar in a bar graph or the number of objects in a picture graph represents the number of data points for a given category.
	2.D.1.2 Organize a collection of data with up to four categories using pictographs and bar graphs with intervals of 1s, 2s, 5s or 10s.
	2.D.1.3 Write and solve one-step word problems involving addition or subtraction using data represented within pictographs and bar graphs with intervals of one.
	2.D.1.4 Draw conclusions and make predictions from information in a graph.

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Number & Operations (N)

3.N.1 Compare and represent whole numbers up to 100,000 with an emphasis on place value and equality.	**3.N.1.1** Read, write, discuss, and represent whole numbers up to 100,000. Representations may include numerals, expressions with operations, words, pictures, number lines, and manipulatives.
	3.N.1.2 Use place value to describe whole numbers between 1,000 and 100,000 in terms of ten thousands, thousands, hundreds, tens and ones, including expanded form.
	3.N.1.3 Find 10,000 more or 10,000 less than a given five-digit number. Find 1,000 more or 1,000 less than a given four- or five-digit number. Find 100 more or 100 less than a given four- or five-digit number.
	3.N.1.4 Use place value to compare and order whole numbers up to 100,000, using comparative language, numbers, and symbols.
3.N.2 Add and subtract multi-digit whole numbers; multiply with factors up to 10; represent multiplication and division in various ways; Solve real-world and mathematical problems through the representation of related operations.	**3.N.2.1** Represent multiplication facts by using a variety of approaches, such as repeated addition, equal-sized groups, arrays, area models, equal jumps on a number line and skip counting.
	3.N.2.2 Demonstrate fluency of multiplication facts with factors up to 10.
	3.N.2.3 Use strategies and algorithms based on knowledge of place value and equality to fluently add and subtract multi-digit numbers.
	3.N.2.4 Recognize when to round numbers and apply understanding to round numbers to the nearest ten thousand, thousand, hundred, and ten and use compatible numbers to estimate sums and differences.
	3.N.2.5 Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results.
	3.N.2.6 Represent division facts by using a variety of approaches, such as repeated subtraction, equal sharing and forming equal groups.
	3.N.2.7 Recognize the relationship between multiplication and division to represent and solve real-world problems.
	3.N.2.8 Use strategies and algorithms based on knowledge of place value, equality and properties of addition and multiplication to multiply a two-digit number by a one-digit number.

3.N.3 Understand meanings and uses of fractions in real-world and mathematical situations.	**3.N.3.1** Read and write fractions with words and symbols.
	3.N.3.2 Construct fractions using length, set, and area models.
	3.N.3.3 Recognize unit fractions and use them to compose and decompose fractions related to the same whole. Use the numerator to describe the number of parts and the denominator to describe the number of partitions.
	3.N.3.4 Use models and number lines to order and compare fractions that are related to the same whole.
3.N.4 Determine the value of a set of coins or bills.	**3.N.4.1** Use addition to determine the value of a collection of coins up to one dollar using the cent symbol and a collection of bills up to twenty dollars.
	3.N.4.2 Select the fewest number of coins for a given amount of money up to one dollar.
Algebraic Reasoning & Algebra (A)	
3.A.1 Describe and create representations of numerical and geometric patterns.	**3.A.1.1** Create, describe, and extend patterns involving addition, subtraction, or multiplication to solve problems in a variety of contexts.
	3.A.1.2 Describe the rule (single operation) for a pattern from an input/output table or function machine involving addition, subtraction, or multiplication.
	3.A.1.3 Explore and develop visual representations of growing geometric patterns and construct the next steps.
3.A.2 Use number sentences involving multiplication and unknowns to represent and solve real-world and mathematical problems.	**3.A.2.1** Find unknowns represented by symbols in arithmetic problems by solving one-step open sentences (equations) and other problems involving addition, subtraction, and multiplication. Generate real-world situations to represent number sentences.
	3.A.2.2 Recognize, represent and apply the number properties (commutative, identity, and associative properties of addition and multiplication) using models and manipulatives to solve problems.
Geometry & Measurement (GM)	
3.GM.1 Use geometric attributes to describe and create shapes in various contexts.	**3.GM.1.1** Sort three-dimensional shapes based on attributes.
	3.GM.1.2 Build a three-dimensional figure using unit cubes when picture/shape is shown.
	3.GM.1.3 Classify angles as acute, right, obtuse, and straight.
3.GM.2 Understand measurable attributes of real-world and mathematical objects using various tools.	**3.GM.2.1** Find perimeter of polygon, given whole number lengths of the sides, in real-world and mathematical situations.
	3.GM.2.2 Develop and use formulas to determine the area of rectangles. Justify why length and width are multiplied to find the area of a rectangle by breaking the rectangle into one unit by one unit squares and viewing these as grouped into rows and columns.
	3.GM.2.3 Choose an appropriate measurement instrument and measure the length of objects to the nearest whole centimeter or meter.
	3.GM.2.4 Choose an appropriate measurement instrument and measure the length of objects to the nearest whole yard, whole foot, or half inch.

	3.GM.2.5 Using common benchmarks, estimate the lengths (customary and metric) of a variety of objects.
	3.GM.2.6 Use an analog thermometer to determine temperature to the nearest degree in Fahrenheit and Celsius.
	3.GM.2.7 Count cubes systematically to identify number of cubes needed to pack the whole or half of a three-dimensional structure.
	3.GM.2.8 Find the area of two-dimensional figures by counting total number of same size unit squares that fill the shape without gaps or overlaps.
3.GM.3 Solve problems by telling time to the nearest 5 minutes.	**3.GM.3.1** Read and write time to the nearest 5-minute (analog and digital).
	3.GM.3.2 Determine the solutions to problems involving addition and subtraction of time in intervals of 5 minutes, up to one hour, using pictorial models, number line diagrams, or other tools.
Data & Probability (D)	
3.D.1 Summarize, construct, and analyze data.	**3.D.1.1** Summarize and construct a data set with multiple categories using a frequency table, line plot, pictograph, and/or bar graph with scaled intervals.
	3.D.1.2 Solve one- and two-step problems using categorical data represented with a frequency table, pictograph, or bar graph with scaled intervals.

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Number & Operations (N)

4.N.1 Solve real-world and mathematical problems using multiplication and division.	**4.N.1.1** Demonstrate fluency with multiplication and division facts with factors up to 12.
	4.N.1.2 Use an understanding of place value to multiply or divide a number by 10, 100 and 1,000.
	4.N.1.3 Multiply 3-digit by 1-digit or a 2-digit by 2-digit whole numbers, using efficient and generalizable procedures and strategies, based on knowledge of place value, including but not limited to standard algorithms.
	4.N.1.4 Estimate products of 3-digit by 1-digit or 2-digit by 2-digit whole numbers using rounding, benchmarks and place value to assess the reasonableness of results. Explore larger numbers using technology to investigate patterns.
	4.N.1.5 Solve multi-step real-world and mathematical problems requiring the use of addition, subtraction, and multiplication of multi-digit whole numbers. Use various strategies, including the relationship between operations, the use of appropriate technology, and the context of the problem to assess the reasonableness of results.
	4.N.1.6 Use strategies and algorithms based on knowledge of place value, equality and properties of operations to divide 3-digit dividend by 1-digit whole number divisors. (e.g., mental strategies, standard algorithms, partial quotients, repeated subtraction, the commutative, associative, and distributive properties).
	4.N.1.7 Determine the unknown addend(s) or factor(s) in equivalent and non-equivalent expressions. (e.g., $5 + 6 = 4 + \square$, $3 \times 8 < 3 \times \square$).
4.N.2 Represent and compare fractions and decimals in real-world and mathematical situations; use place value to understand how decimals represent quantities.	**4.N.2.1** Represent and rename equivalent fractions using fraction models (e.g. parts of a set, area models, fraction strips, number lines).
	4.N.2.2 Use benchmark fractions ($0, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, 1$) to locate additional fractions on a number line. Use models to order and compare whole numbers and fractions less than and greater than one using comparative language and symbols.
	4.N.2.3 Decompose a fraction in more than one way into a sum of fractions with the same denominator using concrete and pictorial models and recording results with symbolic representations (e.g., $\frac{3}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$).
	4.N.2.4 Use fraction models to add and subtract fractions with like denominators in real-world and mathematical situations.
	4.N.2.5 Represent tenths and hundredths with concrete models, making connections between fractions and decimals.
	4.N.2.6 Represent, read and write decimals up to at least the hundredths place in a variety of contexts including money.

	4.N.2.7 Compare and order decimals and whole numbers using place value, a number line and models such as grids and base 10 blocks.
	4.N.2.8 Compare benchmark fractions ($\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$) and decimals (0.25, 0.50, 0.75) in real-world and mathematical situations.
4.N.3 Determine the value of coins in order to solve monetary transactions.	**4.N.3.1** Given a total cost (whole dollars up to $20 or coins) and amount paid (whole dollars up to $20 or coins), find the change required in a variety of ways. Limited to whole dollars up to $20 or sets of coins.
Algebraic Reasoning & Algebra (A)	
4.A.1 Use multiple representations of patterns to solve real-world and mathematical problems.	**4.A.1.1** Create an input/output chart or table to represent or extend a numerical pattern.
	4.A.1.2 Describe the single operation rule for a pattern from an input/output table or function machine involving any operation of a whole number.
	4.A.1.3 Create growth patterns involving geometric shapes and define the single operation rule of the pattern.
4.A.2 Use multiplication and division with unknowns to create number sentences representing a given problem situation.	**4.A.2.1** Use number sense, properties of multiplication and the relationship between multiplication and division to solve problems and find values for the unknowns represented by letters and symbols that make number sentences true.
	4.A.2.2 Solve for unknowns in problems by solving open sentences (equations) and other problems involving addition, subtraction, multiplication, or division with whole numbers. Use real-world situations to represent number sentences and vice versa.
Geometry & Measurement (GM)	
4.GM.1 Name, describe, classify and construct polygons, and three-dimensional figures.	**4.GM.1.1** Identify points, lines, line segments, rays, angles, endpoints, and parallel and perpendicular lines in various contexts.
	4.GM.1.2 Describe, classify, and sketch quadrilaterals, including squares, rectangles, trapezoids, rhombuses, parallelograms, and kites. Recognize quadrilaterals in various contexts.
	4.GM.1.3 Given two three-dimensional shapes, identify similarities, and differences.
4.GM.2 Understand angle, length, and area as measurable attributes of real-world and mathematical objects. Use various tools to measure angles, length, area, and volume.	**4.GM.2.1** Measure angles in geometric figures and real-world objects with a protractor or angle ruler.
	4.GM.2.2 Find the area of polygons that can be decomposed into rectangles.
	4.GM.2.3 Using a variety of tools and strategies, develop the concept that the volume of rectangular prisms with whole-number edge lengths can be found by counting the total number of same-sized unit cubes that fill a shape without gaps or overlaps. Use appropriate measurements such as cm^3.
	4.GM.2.4 Choose an appropriate instrument and measure the length of an object to the nearest whole centimeter or quarter-inch.
	4.GM.2.5 Solve problems that deal with measurements of length, when to use liquid volumes, when to use mass, temperatures above zero and money using addition, subtraction, multiplication, or division as appropriate (customary and metric).

4.GM.3 Determine elapsed time and convert between units of time.	**4.GM.3.1** Determine elapsed time.
	4.GM.3.2 Solve problems involving the conversion of one measure of time to another.
Data & Probability (D)	
4.D.1 Collect, organize, and analyze data.	**4.D.1.1** Represent data on a frequency table or line plot marked with whole numbers and fractions using appropriate titles, labels, and units.
	4.D.1.2 Use tables, bar graphs, timelines, and Venn diagrams to display data sets. The data may include benchmark fractions or decimals ($\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, 0.25, 0.50, 0.75).
	4.D.1.3 Solve one- and two-step problems using data in whole number, decimal, or fraction form in a frequency table and line plot.

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Number & Operations (N)

5.N.1 Divide multi-digit numbers and solve real-world and mathematical problems using arithmetic.	**5.N.1.1** Estimate solutions to division problems in order to assess the reasonableness of results.
	5.N.1.2 Divide multi-digit numbers, by one- and two-digit divisors, using efficient and generalizable procedures, based on knowledge of place value, including standard algorithms.
	5.N.1.3 Recognize that quotients can be represented in a variety of ways, including a whole number with a remainder, a fraction or mixed number, or a decimal and consider the context in which a problem is situated to select and interpret the most useful form of the quotient for the solution.
	5.N.1.4 Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers. Use various strategies, including the inverse relationships between operations, the use of technology, and the context of the problem to assess the reasonableness of results.
5.N.2 Read, write, represent, and compare fractions and decimals; recognize and write equivalent fractions; convert between fractions and decimals; use fractions and decimals in real-world and mathematical situations.	**5.N.2.1** Represent decimal fractions (e.g., $\frac{1}{10}, \frac{1}{100}$) using a variety of models (e.g., 10 by 10 grids, rational number wheel, base-ten blocks, meter stick) and make connections between fractions and decimals.
	5.N.2.2 Represent, read and write decimals using place value to describe decimal numbers including fractional numbers as small as thousandths and whole numbers as large as millions.
	5.N.2.3 Compare and order fractions and decimals, including mixed numbers and fractions less than one, and locate on a number line.
	5.N.2.4 Recognize and generate equivalent decimals, fractions, mixed numbers, and fractions less than one in various contexts.
5.N.3 Add and subtract fractions with like and unlike denominators, mixed numbers and decimals to solve real-world and mathematical problems.	**5.N.3.1** Estimate sums and differences of fractions with like and unlike denominators, mixed numbers, and decimals to assess the reasonableness of the results.
	5.N.3.2 Illustrate addition and subtraction of fractions with like and unlike denominators, mixed numbers, and decimals using a variety of representations (e.g., fraction strips, area models, number lines, fraction rods).
	5.N.3.3 Add and subtract fractions with like and unlike denominators, mixed numbers, and decimals, using efficient and generalizable procedures, including but not limited to standard algorithms in order to solve real-world and mathematical problems including those involving money, measurement, geometry, and data.
	5.N.3.4 Find 0.1 more than a number and 0.1 less than a number. Find 0.01 more than a number and 0.01 less than a number. Find 0.001 more than a number and 0.001 less than a number.

Algebraic Reasoning & Algebra (A)	
5.A.1 Describe and graph patterns of change created through numerical patterns.	**5.A.1.1** Use tables and rules of up to two operations to describe patterns of change and make predictions and generalizations about real-world and mathematical problems.
	5.A.1.2 Use a rule or table to represent ordered pairs of whole numbers and graph these ordered pairs on a coordinate plane, identifying the origin and axes in relation to the coordinates.
5.A.2 Understand and interpret expressions, equations, and inequalities involving variables and whole numbers, and use them to represent and evaluate real-world and mathematical problems.	**5.A.2.1** Generate equivalent numerical expressions and solve problems involving whole numbers by applying the commutative, associative, and distributive properties and order of operations (no exponents).
	5.A.2.2 Determine whether an equation or inequality involving a variable is true or false for a given value of the variable.
	5.A.2.3 Evaluate expressions involving variables when values for the variables are given.
Geometry & Measurement (GM)	
5.GM.1 Describe, classify, and draw representations of two- and three-dimensional figures.	**5.GM.1.1** Describe, classify and construct triangles, including equilateral, right, scalene, and isosceles triangles. Recognize triangles in various contexts.
	5.GM.1.2 Describe and classify three-dimensional figures including cubes, rectangular prisms, and pyramids by the number of edges, faces or vertices as well as the shapes of faces.
	5.GM.1.3 Recognize and draw a net for a three-dimensional figure (e.g., cubes, rectangular prisms, pyramids).
5.GM.2 Understand how the volume of rectangular prisms and surface area of shapes with polygonal faces are determined by the dimensions of the object and that shapes with varying dimensions can have equivalent values of surface area or volume.	**5.GM.2.1** Recognize that the volume of rectangular prisms can be determined by the number of cubes (n) and by the product of the dimensions of the prism ($a \times b \times c = n$). Know that rectangular prisms of different dimensions (p, q, and r) can have the same volume if $a \times b \times c = p \times q \times r = n$.
	5.GM.2.2 Recognize that the surface area of a three-dimensional figure with rectangular faces with whole numbered edges can be found by finding the area of each component of the net of that figure. Know that three-dimensional shapes of different dimensions can have the same surface area.
	5.GM.2.3 Find the perimeter of polygons and create arguments for reasonable values for the perimeter of shapes that include curves.
5.GM.3 Understand angle and length as measurable attributes of real-world and mathematical objects. Use various tools to measure angles and lengths.	**5.GM.3.1** Measure and compare angles according to size.
	5.GM.3.2 Choose an appropriate instrument and measure the length of an object to the nearest whole centimeter or 1/16-inch.
	5.GM.3.3 Recognize and use the relationship between inches, feet, and yards to measure and compare objects.
	5.GM.3.4 Recognize and use the relationship between millimeters, centimeters, and meters to measure and compare objects.

Data & Probability (D)	
5.D.1 Display and analyze data to find the range and measures of central tendency (mean, median, and mode).	**5.D.1.1** Find the measures of central tendency (mean, median, or mode) and range of a set of data. Understand that the mean is a "leveling out" or central balance point of the data.
	5.D.1.2 Create and analyze line and double-bar graphs with whole numbers, fractions, and decimals increments.

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Number & Operations (N)

6.N.1 Read, write, and represent integers and rational numbers expressed as fractions, decimals, percents, and ratios; write positive integers as products of factors; use these representations in real-world and mathematical situations.	**6.N.1.1** Represent integers with counters and on a number line and rational numbers on a number line, recognizing the concepts of opposites, direction, and magnitude; use integers and rational numbers in real-world and mathematical situations, explaining the meaning of 0 in each situation.
	6.N.1.2 Compare and order positive rational numbers, represented in various forms, or integers using the symbols <, >, and =.
	6.N.1.3 Explain that a percent represents parts "out of 100" and ratios "to 100."
	6.N.1.4 Determine equivalencies among fractions, decimals, and percents. Select among these representations to solve problems.
	6.N.1.5 Factor whole numbers and express prime and composite numbers as a product of prime factors with exponents.
	6.N.1.6 Determine the greatest common factors and least common multiples. Use common factors and multiples to calculate with fractions, find equivalent fractions, and express the sum of two-digit numbers with a common factor using the distributive property.
6.N.2 Add and subtract integers in order to solve real-world and mathematical problems.	**6.N.2.1** Estimate solutions to addition and subtraction of integers problems in order to assess the reasonableness of results.
	6.N.2.2 Illustrate addition and subtraction of integers using a variety of representations.
	6.N.2.3 Add and subtract integers; use efficient and generalizable procedures including but not limited to standard algorithms.
6.N.3 Understand the concept of ratio and its relationship to fractions and percents and to the multiplication and division of whole numbers. Use ratios to solve real-world and mathematical problems.	**6.N.3.1** Identify and use ratios to compare quantities. Recognize that multiplicative comparison and additive comparison are different.
	6.N.3.2 Determine the unit rate for ratios.
	6.N.3.3 Apply the relationship between ratios, equivalent fractions and percents to solve problems in various contexts, including those involving mixture and concentrations.
	6.N.3.4 Use multiplicative reasoning and representations to solve ratio and unit rate problems.
6.N.4 Multiply and divide decimals, fractions, and mixed numbers; solve real-world and mathematical problems with rational numbers.	**6.N.4.1** Estimate solutions to problems with whole numbers, decimals, fractions, and mixed numbers and use the estimates to assess the reasonableness of results in the context of the problem.
	6.N.4.2 Illustrate multiplication and division of fractions and decimals to show connections to fractions, whole number multiplication, and inverse relationships.

	6.N.4.3 Multiply and divide fractions and decimals using efficient and generalizable procedures.
	6.N.4.4 Solve and interpret real-world and mathematical problems including those involving money, measurement, geometry, and data requiring arithmetic with decimals, fractions and mixed numbers.
Algebraic Reasoning & Algebra (A)	
6.A.1 Recognize and represent relationships between varying quantities; translate from one representation to another; use patterns, tables, graphs and rules to solve real-world and mathematical problems.	**6.A.1.1** Plot integer- and rational-valued (limited to halves and fourths) ordered-pairs as coordinates in all four quadrants and recognize the reflective relationships among coordinates that differ only by their signs.
	6.A.1.2 Represent relationships between two varying quantities involving no more than two operations with rules, graphs, and tables; translate between any two of these representations.
	6.A.1.3 Use and evaluate variables in expressions, equations, and inequalities that arise from various contexts, including determining when or if, for a given value of the variable, an equation or inequality involving a variable is true or false.
6.A.2 Use properties of arithmetic to generate equivalent numerical expressions and evaluate expressions involving positive rational numbers.	**6.A.2.1** Generate equivalent expressions and evaluate expressions involving positive rational numbers by applying the commutative, associative, and distributive properties and order of operations to solve real-world and mathematical problems.
6.A.3 Use equations and inequalities to represent real-world and mathematical problems and use the idea of maintaining equality to solve equations. Interpret solutions in the original context.	**6.A.3.1** Represent real-world or mathematical situations using expressions, equations and inequalities involving variables and rational numbers.
	6.A.3.2 Use number sense and properties of operations and equality to solve real-world and mathematical problems involving equations in the form $x + p = q$ and $px = q$, where x, p, and q are nonnegative rational numbers. Graph the solution on a number line, interpret the solution in the original context, and assess the reasonableness of the solution.
Geometry & Measurement (GM)	
6.GM.1 Calculate area of squares, parallelograms, and triangles to solve real-world and mathematical problems.	**6.GM.1.1** Develop and use formulas for the area of squares and parallelograms using a variety of methods including but not limited to the standard algorithm.
	6.GM.1.2 Develop and use formulas to determine the area of triangles.
	6.GM.1.3 Find the area of right triangles, other triangles, special quadrilaterals, and polygons that can be decomposed into triangles and other shapes to solve real-world and mathematical problems.
6.GM.2 Understand and use relationships between angles in geometric figures.	**6.GM.2.1** Solve problems using the relationships between the angles (vertical, complementary, and supplementary) formed by intersecting lines.
	6.GM.2.2 Develop and use the fact that the sum of the interior angles of a triangle is 180° to determine missing angle measures in a triangle.

6.GM.3 Choose appropriate units of measurement and use ratios to convert within measurement systems to solve real-world and mathematical problems.	**6.GM.3.1** Estimate weights, capacities and geometric measurements using benchmarks in customary and metric measurement systems with appropriate units.
	6.GM.3.2 Solve problems in various real-world and mathematical contexts that require the conversion of weights, capacities, geometric measurements, and time within the same measurement systems using appropriate units.
6.GM.4 Use translations, reflections, and rotations to establish congruency and understand symmetries.	**6.GM.4.1** Predict, describe, and apply translations (slides), reflections (flips), and rotations (turns) to a two-dimensional figure.
	6.GM.4.2 Recognize that translations, reflections, and rotations preserve congruency and use them to show that two figures are congruent.
	6.GM.4.3 Use distances between two points that are either vertical or horizontal to each other (not requiring the distance formula) to solve real-world and mathematical problems about congruent two-dimensional figures.
	6.GM.4.4 Identify and describe the line(s) of symmetry in two-dimensional shapes.
Data & Probability (D)	
6.D.1 Display and analyze data.	**6.D.1.1** Calculate the mean, median, and mode for a set of real-world data.
	6.D.1.2 Explain and justify which measure of central tendency (mean, median, or mode) would provide the most descriptive information for a given set of data.
	6.D.1.3 Create and analyze box and whisker plots observing how each segment contains one quarter of the data.
6.D.2 Use probability to solve real-world and mathematical problems; represent probabilities using fractions and decimals.	**6.D.2.1** Represent possible outcomes using a probability continuum from impossible to certain.
	6.D.2.2 Determine the sample space for a given experiment and determine which members of the sample space are related to certain events. Sample space may be determined by the use of tree diagrams, tables or pictorial representations.
	6.D.2.3 Demonstrate simple experiments in which the probabilities are known and compare the resulting relative frequencies with the known probabilities, recognizing that there may be differences between the two results.

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Number & Operations (N)

7.N.1 Read, write, represent, and compare rational numbers, expressed as integers, fractions, and decimals.	**7.N.1.1** Know that every rational number can be written as the ratio of two integers or as a terminating or repeating decimal.
	7.N.1.2 Compare and order rational numbers expressed in various forms using the symbols <, >, and =.
	7.N.1.3 Recognize and generate equivalent representations of rational numbers, including equivalent fractions.
7.N.2 Calculate with integers and rational numbers, with and without positive integer exponents, to solve real-world and mathematical problems; explain the relationship between absolute value of a rational number and the distance of that number from zero.	**7.N.2.1** Estimate solutions to multiplication and division of integers in order to assess the reasonableness of results.
	7.N.2.2 Illustrate multiplication and division of integers using a variety of representations.
	7.N.2.3 Solve real-world and mathematical problems involving addition, subtraction, multiplication and division of rational numbers; use efficient and generalizable procedures including but not limited to standard algorithms.
	7.N.2.4 Raise integers to positive integer exponents.
	7.N.2.5 Solve real-world and mathematical problems involving calculations with rational numbers and positive integer exponents.
	7.N.2.6 Explain the relationship between the absolute value of a rational number and the distance of that number from zero on a number line. Use the symbol for absolute value.

Algebraic Reasoning & Algebra (A)

7.A.1 Understand the concept of proportionality in real-world and mathematical situations, and distinguish between proportional and other relationships.	**7.A.1.1** Describe that the relationship between two variables, x and y, is proportional if it can be expressed in the form $\frac{y}{x} = k$ or $y = kx$; distinguish proportional relationships from other relationships, including inversely proportional relationships ($xy = k$ or $y = \frac{k}{x}$).
	7.A.1.2 Recognize that the graph of a proportional relationship is a line through the origin and the coordinate $(1, r)$, where both r and the slope are the unit rate (constant of proportionality, k).

7.A.2 Recognize proportional relationships in real-world and mathematical situations; represent these and other relationships with tables, verbal descriptions, symbols, and graphs; solve problems involving proportional relationships and interpret results in the original context.	**7.A.2.1** Represent proportional relationships with tables, verbal descriptions, symbols, and graphs; translate from one representation to another. Determine and compare the unit rate (constant of proportionality, slope, or rate of change) given any of these representations.
	7.A.2.2 Solve multi-step problems involving proportional relationships involving distance-time, percent increase or decrease, discounts, tips, unit pricing, similar figures, and other real-world and mathematical situations.
	7.A.2.3 Use proportional reasoning to solve real-world and mathematical problems involving ratios.
	7.A.2.4 Use proportional reasoning to assess the reasonableness of solutions.
7.A.3 Represent and solve linear equations and inequalities.	**7.A.3.1** Write and solve problems leading to linear equations with one variable in the form $px + q = r$ and $p(x + q) = r$, where $p, q, and\ r$ are rational numbers.
	7.A.3.2 Represent, write, solve, and graph problems leading to linear inequalities with one variable in the form $x + p > q$ and $x + p < q$, where p, and q are nonnegative rational numbers.
	7.A.3.3 Represent real-world or mathematical situations using equations and inequalities involving variables and rational numbers.
7.A.4 Use order of operations and properties of operations to generate equivalent numerical and algebraic expressions containing rational numbers and grouping symbols; evaluate such expressions.	**7.A.4.1** Use properties of operations (limited to associative, commutative, and distributive) to generate equivalent numerical and algebraic expressions containing rational numbers, grouping symbols and whole number exponents.
	7.A.4.2 Apply understanding of order of operations and grouping symbols when using calculators and other technologies.
Geometry & Measurement (GM)	
7.GM.1 Develop and understand the concept of surface area and volume of rectangular prisms.	**7.GM.1.1** Using a variety of tools and strategies, develop the concept that surface area of a rectangular prism with rational-valued edge lengths can be found by wrapping the figure with same-sized square units without gaps or overlap. Use appropriate measurements such as cm^2.
	7.GM.1.2 Using a variety of tools and strategies, develop the concept that the volume of rectangular prisms with rational-valued edge lengths can be found by counting the total number of same-sized unit cubes that fill a shape without gaps or overlaps. Use appropriate measurements such as cm^3.
7.GM.2 Determine the area of trapezoids and area and perimeter of composite figures.	**7.GM.2.1** Develop and use the formula to determine the area of a trapezoid to solve problems.
	7.GM.2.2 Find the area and perimeter of composite figures to solve real-world and mathematical problems.
7.GM.3 Use reasoning with proportions and ratios to determine measurements, justify formulas, and solve real-world and mathematical problems involving circles and related geometric figures.	**7.GM.3.1** Demonstrate an understanding of the proportional relationship between the diameter and circumference of a circle and that the unit rate (constant of proportionality) is π and can be approximated by rational numbers such as $\frac{22}{7}$ and 3.14.
	7.GM.3.2 Calculate the circumference and area of circles to solve problems in various contexts, in terms of π and using approximations for π.

7.GM.4 Analyze the effect of dilations, translations, and reflections on the attributes of two-dimensional figures on and off the coordinate plane.	**7.GM.4.1** Describe the properties of similarity, compare geometric figures for similarity, and determine scale factors resulting from dilations.
	7.GM.4.2 Apply proportions, ratios, and scale factors to solve problems involving scale drawings and determine side lengths and areas of similar triangles and rectangles.
	7.GM.4.3 Graph and describe translations and reflections of figures on a coordinate plane and determine the coordinates of the vertices of the figure after the transformation.
Data & Probability (D)	
7.D.1 Display and analyze data in a variety of ways.	**7.D.1.1** Design simple experiments, collect data and calculate measures of central tendency (mean, median, and mode) and spread (range). Use these quantities to draw conclusions about the data collected and make predictions.
	7.D.1.2 Use reasoning with proportions to display and interpret data in circle graphs (pie charts) and histograms. Choose the appropriate data display and know how to create the display using a spreadsheet or other graphing technology.
7.D.2 Calculate probabilities and reason about probabilities using proportions to solve real-world and mathematical problems.	**7.D.2.1** Determine the theoretical probability of an event using the ratio between the size of the event and the size of the sample space; represent probabilities as percents, fractions and decimals between 0 and 1.
	7.D.2.2 Calculate probability as a fraction of sample space or as a fraction of area. Express probabilities as percents, decimals and fractions.
	7.D.2.3 Use proportional reasoning to draw conclusions about and predict relative frequencies of outcomes based on probabilities.

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Number & Operations (N)

PA.N.1 Read, write, compare, classify, and represent real numbers and use them to solve problems in various contexts.	**PA.N.1.1** Develop and apply the properties of integer exponents, including $a^0 = 1$ (with $a \neq 0$), to generate equivalent numerical and algebraic expressions.
	PA.N.1.2 Express and compare approximations of very large and very small numbers using scientific notation.
	PA.N.1.3 Multiply and divide numbers expressed in scientific notation, express the answer in scientific notation.
	PA.N.1.4 Classify real numbers as rational or irrational. Explain why the rational number system is closed under addition and multiplication and why the irrational system is not. Explain why the sum of a rational number and an irrational number is irrational; and the product of a non-zero rational number and an irrational number is irrational.
	PA.N.1.5 Compare real numbers; locate real numbers on a number line. Identify the square root of a perfect square to 400 or, if it is not a perfect square root, locate it as an irrational number between two consecutive positive integers.

Algebraic Reasoning & Algebra (A)

PA.A.1 Understand the concept of function in real-world and mathematical situations, and distinguish between linear and nonlinear functions.	**PA.A.1.1** Recognize that a function is a relationship between an independent variable and a dependent variable in which the value of the independent variable determines the value of the dependent variable.
	PA.A.1.2 Use linear functions to represent and explain real-world and mathematical situations.
	PA.A.1.3 Identify a function as linear if it can be expressed in the form $y = mx + b$ or if its graph is a straight line.
PA.A.2 Recognize linear functions in real-world and mathematical situations; represent linear functions and other functions with tables, verbal descriptions, symbols, and graphs; solve problems involving linear functions and interpret results in the original context.	**PA.A.2.1** Represent linear functions with tables, verbal descriptions, symbols, and graphs; translate from one representation to another.
	PA.A.2.2 Identify, describe, and analyze linear relationships between two variables.
	PA.A.2.3 Identify graphical properties of linear functions including slope and intercepts. Know that the slope equals the rate of change, and that the y-intercept is zero when the function represents a proportional relationship.
	PA.A.2.4 Predict the effect on the graph of a linear function when the slope or y-intercept changes. Use appropriate tools to examine these effects.
	PA.A.2.5 Solve problems involving linear functions and interpret results in the original context.

PA.A.3 Generate equivalent numerical and algebraic expressions and use algebraic properties to evaluate expressions.	**PA.A.3.1** Use substitution to simplify and evaluate algebraic expressions.
	PA.A.3.2 Justify steps in generating equivalent expressions by identifying the properties used, including the properties of operations (associative, commutative, and distributive laws) and the order of operations, including grouping symbols.
PA.A.4 Represent real-world and mathematical problems using equations and inequalities involving linear expressions. Solve and graph equations and inequalities symbolically and graphically. Interpret solutions in the original context.	**PA.A.4.1** Illustrate, write, and solve mathematical and real-world problems using linear equations with one variable with one solution, infinitely many solutions, or no solutions. Interpret solutions in the original context.
	PA.A.4.2 Represent, write, solve, and graph problems leading to linear inequalities with one variable in the form $px + q > r$ and $px + q < r$, where p, q, and r are rational numbers.
	PA.A.4.3 Represent real-world situations using equations and inequalities involving one variable.
Geometry & Measurement (GM)	
PA.GM.1 Solve problems involving right triangles using the Pythagorean Theorem.	**PA.GM.1.1** Informally justify the Pythagorean Theorem using measurements, diagrams, or dynamic software and use the Pythagorean Theorem to solve problems in two and three dimensions involving right triangles.
	PA.GM.1.2 Use the Pythagorean Theorem to find the distance between any two points in a coordinate plane.
PA.GM.2 Calculate surface area and volume of three-dimensional figures.	**PA.GM.2.1** Calculate the surface area of a rectangular prism using decomposition or nets. Use appropriate measurements such as cm^2.
	PA.GM.2.2 Calculate the surface area of a cylinder, in terms of π and using approximations for π, using decomposition or nets. Use appropriate measurements such as cm^2.
	PA.GM.2.3 Develop and use the formulas $V = lwh$ and $V = Bh$ to determine the volume of rectangular prisms. Justify why base area (*B*) and height (*h*) are multiplied to find the volume of a rectangular prism. Use appropriate measurements such as cm^3.
	PA.GM.2.4 Develop and use the formulas $V = \pi r^2 h$ and $V = Bh$ to determine the volume of right cylinders, in terms of π and using approximations for π. Justify why base area (*B*) and height (*h*) are multiplied to find the volume of a right cylinder. Use appropriate measurements such as cm^3.

Data & Probability (D)	
PA.D.1 Display and interpret data in a variety of ways, including using scatterplots and approximate lines of best fit. Use line of best fit and average rate of change to make predictions and draw conclusions about data.	**PA.D.1.1** Describe the impact that inserting or deleting a data point has on the mean and the median of a data set. Know how to create data displays using a spreadsheet and use a calculator to examine this impact.
	PA.D.1.2 Explain how outliers affect measures of central tendency.
	PA.D.1.3 Collect, display and interpret data using scatterplots. Use the shape of the scatterplot to informally estimate a line of best fit, make statements about average rate of change, and make predictions about values not in the original data set. Use appropriate titles, labels and units.
PA.D.2 Calculate experimental probabilities and reason about probabilities to solve real-world and mathematical problems.	**PA.D.2.1** Calculate experimental probabilities and represent them as percents, fractions and decimals between 0 and 1 inclusive. Use experimental probabilities to make predictions when actual probabilities are unknown.
	PA.D.2.2 Determine how samples are chosen (random, limited, biased) to draw and support conclusions about generalizing a sample to a population.
	PA.D.2.3 Compare and contrast dependent and independent events.

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Number & Operations (N)

A1.N.1 Extend the understanding of number and operations to include square roots and cube roots.	**A1.N.1.1** Write square roots and cube roots of monomial algebraic expressions in simplest radical form.
	A1.N.1.2 Add, subtract, multiply, and simplify square roots of monomial algebraic expressions and divide square roots of whole numbers, rationalizing the denominator when necessary.

Algebraic Reasoning & Algebra (A)

A1.A.1 Represent and solve mathematical and real-world problems using linear equations, absolute value equations, and systems of equations; interpret solutions in the original context.	**A1.A.1.1** Use knowledge of solving equations with rational values to represent and solve mathematical and real-world problems (e.g., angle measures, geometric formulas, science, or statistics) and interpret the solutions in the original context.
	A1.A.1.2 Solve absolute value equations and interpret the solutions in the original context.
	A1.A.1.3 Analyze and solve real-world and mathematical problems involving systems of linear equations with a maximum of two variables by graphing (may include graphing calculator or other appropriate technology), substitution, and elimination. Interpret the solutions in the original context.
A1.A.2 Represent and solve real-world and mathematical problems using linear inequalities, compound inequalities and systems of linear inequalities; interpret solutions in the original context.	**A1.A.2.1** Represent relationships in various contexts with linear inequalities; solve the resulting inequalities, graph on a coordinate plane, and interpret the solutions.
	A1.A.2.2 Represent relationships in various contexts with compound and absolute value inequalities and solve the resulting inequalities by graphing and interpreting the solutions on a number line.
	A1.A.2.3 Solve systems of linear inequalities with a maximum of two variables; graph and interpret the solutions on a coordinate plane.
A1.A.3 Generate equivalent algebraic expressions and use algebraic properties to evaluate expressions and arithmetic and geometric sequences.	**A1.A.3.1** Solve equations involving several variables for one variable in terms of the others.
	A1.A.3.2 Simplify polynomial expressions by adding, subtracting, or multiplying.
	A1.A.3.3 Factor common monomial factors from polynomial expressions and factor quadratic expressions with a leading coefficient of 1.
	A1.A.3.4 Evaluate linear, absolute value, rational, and radical expressions. Include applying a nonstandard operation such as $a \odot b = 2a + b$.
	A1.A.3.5 Recognize that arithmetic sequences are linear using equations, tables, graphs, and verbal descriptions. Use the pattern, find the next term.
	A1.A.3.6 Recognize that geometric sequences are exponential using equations, tables, graphs and verbal descriptions. Given the formula $f(x) = a(r)^x$, find the next term and define the meaning of a and r within the context of the problem.

A1.A.4 Analyze mathematical change involving linear equations in real-world and mathematical problems.	**A1.A.4.1** Calculate and interpret slope and the x- and y-intercepts of a line using a graph, an equation, two points, or a set of data points to solve real-world and mathematical problems.
	A1.A.4.2 Solve mathematical and real-world problems involving lines that are parallel, perpendicular, horizontal, or vertical.
	A1.A.4.3 Express linear equations in slope-intercept, point-slope, and standard forms and convert between these forms. Given sufficient information (slope and *y*-intercept, slope and one-point on the line, two points on the line, *x*- and *y*-intercept, or a set of data points), write the equation of a line.
	A1.A.4.4 Translate between a graph and a situation described qualitatively.
Functions (F)	
A1.F.1 Understand functions as descriptions of covariation (how related quantities vary together) in real-world and mathematical problems.	**A1.F.1.1** Distinguish between relations and functions.
	A1.F.1.2 Identify the dependent and independent variables as well as the domain and range given a function, equation, or graph. Identify restrictions on the domain and range in real-world contexts.
	A1.F.1.3 Write linear functions, using function notation, to model real-world and mathematical situations.
	A1.F.1.4 Given a graph modeling a real-world situation, read and interpret the linear piecewise function (excluding step functions).
A1.F.2 Recognize functions and understand that families of functions are characterized by their rate of change.	**A1.F.2.1** Distinguish between linear and nonlinear (including exponential) functions arising from real-world and mathematical situations that are represented in tables, graphs, and equations. Understand that linear functions grow by equal intervals and that exponential functions grow by equal factors over equal intervals.
	A1.F.2.2 Recognize the graph of the functions $f(x) = x$ and $f(x) = \|x\|$ and predict the effects of transformations [$f(x + c)$ and $f(x) + c$, where c is a positive or negative constant] algebraically and graphically using various methods and tools that may include graphing calculators.
A1.F.3 Represent functions in multiple ways and use the representation to interpret real-world and mathematical problems.	**A1.F.3.1** Identify and generate equivalent representations of linear equations, graphs, tables, and real-world situations.
	A1.F.3.2 Use function notation; evaluate a function, including nonlinear, at a given point in its domain algebraically and graphically. Interpret the results in terms of real-world and mathematical problems.
	A1.F.3.3 Add, subtract, and multiply functions using function notation.

Data & Probability (D)	
A1.D.1 Display, describe, and compare data. For linear relationships, make predictions and assess the reliability of those predictions.	**A1.D.1.1** Describe a data set using data displays, describe and compare data sets using summary statistics, including measures of central tendency, location, and spread. Know how to use calculators, spreadsheets, or other appropriate technology to display data and calculate summary statistics.
	A1.D.1.2 Collect data and use scatterplots to analyze patterns and describe linear relationships between two variables. Using graphing technology, determine regression lines and correlation coefficients; use regression lines to make predictions and correlation coefficients to assess the reliability of those predictions.
	A1.D.1.3 Interpret graphs as being discrete or continuous.
A1.D.2 Calculate probabilities and apply probability concepts.	**A1.D.2.1** Select and apply counting procedures, such as the multiplication and addition principles and tree diagrams, to determine the size of a sample space (the number of possible outcomes) and to calculate probabilities.
	A1.D.2.2 Describe the concepts of intersections, unions, and complements using Venn diagrams to evaluate probabilities. Understand the relationships between these concepts and the words AND, OR, and NOT.
	A1.D.2.3 Calculate experimental probabilities by performing simulations or experiments involving a probability model and using relative frequencies of outcomes.
	A1.D.2.4 Apply probability concepts to real-world situations to make informed decisions.

Develop a Deep and Flexible Conceptual Understanding	Develop Accurate and Appropriate Procedural Fluency	Develop Strategies for Problem Solving	Develop Mathematical Reasoning	Develop a Productive Mathematical Disposition	Develop the Ability to Make Conjectures, Model, and Generalize	Develop the Ability to Communicate Mathematically

Geometry: Reasoning & Logic (G.RL)

G.RL.1 Use appropriate tools and logic to evaluate mathematical arguments.	**G.RL.1.1** Understand the use of undefined terms, definitions, postulates, and theorems in logical arguments/proofs.
	G.RL.1.2 Analyze and draw conclusions based on a set of conditions using inductive and deductive reasoning. Recognize the logical relationships between a conditional statement and its inverse, converse, and contrapositive.
	G.RL.1.3 Assess the validity of a logical argument and give counterexamples to disprove a statement.

Geometry: Two Dimensional Shapes (G.2D)

G.2D.1 Discover, evaluate and analyze the relationships between lines, angles, and polygons to solve real-world and mathematical problems; express proofs in a form that clearly justifies the reasoning, such as two-column proofs, paragraph proofs, flow charts, or illustrations.	**G.2D.1.1** Apply the properties of parallel and perpendicular lines, including properties of angles formed by a transversal, to solve real-world and mathematical problems and determine if two lines are parallel, using algebraic reasoning and proofs.
	G.2D.1.2 Apply the properties of angles, including corresponding, exterior, interior, vertical, complementary, and supplementary angles to solve real-world and mathematical problems using algebraic reasoning and proofs.
	G.2D.1.3 Apply theorems involving the interior and exterior angle sums of polygons and use them to solve real-world and mathematical problems using algebraic reasoning and proofs.
	G.2D.1.4 Apply the properties of special quadrilaterals (square, rectangle, trapezoid, isosceles trapezoid, rhombus, kite, parallelogram) and use them to solve real-world and mathematical problems involving angle measures and segment lengths using algebraic reasoning and proofs.
	G.2D.1.5 Use coordinate geometry to represent and analyze line segments and polygons, including determining lengths, midpoints, and slopes of line segments.
	G.2D.1.6 Apply the properties of polygons to solve real-world and mathematical problems involving perimeter and area (e.g., triangles, special quadrilaterals, regular polygons up to 12 sides, composite figures).
	G.2D.1.7 Apply the properties of congruent or similar polygons to solve real-world and mathematical problems using algebraic and logical reasoning.
	G.2D.1.8 Construct logical arguments to prove triangle congruence (SSS, SAS, ASA, AAS and HL) and triangle similarity (AA, SSS, SAS).
	G.2D.1.9 Use numeric, graphic and algebraic representations of transformations in two dimensions, such as reflections, translations, dilations, and rotations about the origin by multiples of 90˚, to solve problems involving figures on a coordinate plane and identify types of symmetry.

Geometry: Three Dimensional Shapes (G.3D)	
G.3D.1 Solve real-world and mathematical problems involving three-dimensional figures.	**G.3D.1.1** Solve real-world and mathematical problems using the surface area and volume of prisms, cylinders, pyramids, cones, spheres, and composites of these figures. Use nets, measuring devices, or formulas as appropriate.
	G.3D.1.2 Use ratios derived from similar three-dimensional figures to make conjectures, generalize, and to solve for unknown values such as angles, side lengths, perimeter or circumference of a face, area of a face, and volume.

Geometry: Circles (G.C)	
G.C.1 Solve real-world and mathematical problems using the properties of circles.	**G.C.1.1** Apply the properties of circles to solve problems involving circumference and area, approximate values and in terms of π, using algebraic and logical reasoning.
	G.C.1.2 Apply the properties of circles and relationships among angles; arcs; and distances in a circle among radii, chords, secants and tangents to solve problems using algebraic and logical reasoning.
	G.C.1.3 Recognize and write the radius r, center (h,k), and standard form of the equation of a circle $(x-h)^2+(y-k)^2=r^2$ with and without graphs.
	G.C.1.4 Apply the distance and midpoint formula, where appropriate, to develop the equation of a circle in standard form.

Geometry: Right Triangle Trigonometry (G.RT)	
G.RT.1 Develop and verify mathematical relationships of right triangles and trigonometric ratios to solve real-world and mathematical problems.	**G.RT.1.1** Apply the distance formula and the Pythagorean Theorem and its converse to solve real-world and mathematical problems, as approximate and exact values, using algebraic and logical reasoning (include Pythagorean Triples).
	G.RT.1.2 Verify and apply properties of right triangles, including properties of 45-45-90 and 30-60-90 triangles, to solve problems using algebraic and logical reasoning.
	G.RT.1.3 Use the definition of the trigonometric functions to determine the sine, cosine, and tangent ratio of an acute angle in a right triangle. Apply the inverse trigonometric functions to find the measure of an acute angle in right triangles.
	G.RT.1.4 Apply the trigonometric functions as ratios (sine, cosine, and tangent) to find side lengths in right triangles in real-world and mathematical problems.

Develop a Deep and Flexible Conceptual Understanding	Develop Accurate and Appropriate Procedural Fluency	Develop Strategies for Problem Solving	Develop Mathematical Reasoning	Develop a Productive Mathematical Disposition	Develop the Ability to Make Conjectures, Model, and Generalize	Develop the Ability to Communicate Mathematically

Number & Operations (N)

A2.N.1 Extend the understanding of number and operations to include complex numbers, matrices, radical expressions, and expressions written with rational exponents.	**A2.N.1.1** Find the value of i^n for any whole number n.
	A2.N.1.2 Simplify, add, subtract, multiply, and divide complex numbers.
	A2.N.1.3 Use matrices to organize and represent data. Identify the order (dimension) of a matrix, add and subtract matrices of appropriate dimensions, and multiply a matrix by a scalar to create a new matrix to solve problems.
	A2.N.1.4 Understand and apply the relationship of rational exponents to integer exponents and radicals to solve problems.

Algebraic Reasoning & Algebra (A)

A2.A.1 Represent and solve mathematical and real-world problems using nonlinear equations and systems of linear equations; interpret the solutions in the original context.	**A2.A.1.1** Represent real-world or mathematical problems using quadratic equations and solve using various methods (including graphing calculator or other appropriate technology), factoring, completing the square, and the quadratic formula. Find non-real roots when they exist.
	A2.A.1.2 Represent real-world or mathematical problems using exponential equations, such as compound interest, depreciation, and population growth, and solve these equations graphically (including graphing calculator or other appropriate technology) or algebraically.
	A2.A.1.3 Solve one-variable rational equations and check for extraneous solutions.
	A2.A.1.4 Solve polynomial equations with real roots using various methods and tools that may include factoring, polynomial division, synthetic division, graphing calculators or other appropriate technology.
	A2.A.1.5 Solve square root equations with one variable and check for extraneous solutions.
	A2.A.1.6 Solve common and natural logarithmic equations using the properties of logarithms.
	A2.A.1.7 Solve real-world and mathematical problems that can be modeled using arithmetic or finite geometric sequences or series given the n^{th} terms and sum formulas. Graphing calculators or other appropriate technology may be used.
	A2.A.1.8 Represent real-world or mathematical problems using systems of linear equations with a maximum of three variables and solve using various methods that may include substitution, elimination, and graphing (may include graphing calculators or other appropriate technology).
	A2.A.1.9 Solve systems of equations containing one linear equation and one quadratic equation using tools that may include graphing calculators or other appropriate technology.

A2.A.2 Represent and analyze mathematical situations and structures using algebraic symbols using various strategies to write equivalent forms of expressions.	**A2.A.2.1** Factor polynomial expressions including but not limited to trinomials, differences of squares, sum and difference of cubes, and factoring by grouping using a variety of tools and strategies.
	A2.A.2.2 Add, subtract, multiply, divide, and simplify polynomial and rational expressions.
	A2.A.2.3 Recognize that a quadratic function has different equivalent representations [$f(x) = ax^2 + bx + c$, $f(x) = a(x - h)^2 + k$, and $f(x) = (x - h)(x - k)$]. Identify and use the representation that is most appropriate to solve real-world and mathematical problems.
	A2.A.2.4 Rewrite expressions involving radicals and rational exponents using the properties of exponents.
Functions (F)	
A2.F.1 Understand functions as descriptions of covariation (how related quantities vary together).	**A2.F.1.1** Use algebraic, interval, and set notations to specify the domain and range of functions of various types and evaluate a function at a given point in its domain.
	A2.F.1.2 Recognize the graphs of exponential, radical (square root and cube root only), quadratic, and logarithmic functions. Predict the effects of transformations [$f(x + c)$, $f(x) + c$, $f(cx)$, and $cf(x)$, where c is a positive or negative real-valued constant] algebraically and graphically, using various methods and tools that may include graphing calculators or other appropriate technology.
	A2.F.1.3 Graph a quadratic function. Identify the *x*- and *y*-intercepts, maximum or minimum value, axis of symmetry, and vertex using various methods and tools that may include a graphing calculator or appropriate technology.
	A2.F.1.4 Graph exponential and logarithmic functions. Identify asymptotes and *x*- and *y*-intercepts using various methods and tools that may include graphing calculators or other appropriate technology. Recognize exponential decay and growth graphically and algebraically.
	A2.F.1.5 Analyze the graph of a polynomial function by identifying the domain, range, intercepts, zeros, relative maxima, relative minima, and intervals of increase and decrease.
	A2.F.1.6 Graph a rational function and identify the *x*- and *y*-intercepts, vertical and horizontal asymptotes, using various methods and tools that may include a graphing calculator or other appropriate technology. (Excluding slant or oblique asymptotes and holes.)
	A2.F.1.7 Graph a radical function (square root and cube root only) and identify the *x*- and *y*-intercepts using various methods and tools that may include a graphing calculator or other appropriate technology.
	A2.F.1.8 Graph piecewise functions with no more than three branches (including linear, quadratic, or exponential branches) and analyze the function by identifying the domain, range, intercepts, and intervals for which it is increasing, decreasing, and constant.

A2.F.2 Analyze functions through algebraic combinations, compositions, and inverses, if they exist.	**A2.F.2.1** Add, subtract, multiply, and divide functions using function notation and recognize domain restrictions.
	A2.F.2.2 Combine functions by composition and recognize that $g(x) = f^{-1}(x)$, the inverse function of $f(x)$, if and only if $f(g(x)) = g(f(x)) = x$.
	A2.F.2.3 Find and graph the inverse of a function, if it exists, in real-world and mathematical situations. Know that the domain of a function f is the range of the inverse function f^{-1}, and the range of the function f is the domain of the inverse function f^{-1}.
	A2.F.2.4 Apply the inverse relationship between exponential and logarithmic functions to convert from one form to another.
Data & Probability (D)	
A2.D.1 Display, describe, and compare data. For linear and nonlinear relationships, make predictions and assess the reliability of those predictions.	**A2.D.1.1** Use the mean and standard deviation of a data set to fit it to a normal distribution (bell-shaped curve).
	A2.D.1.2 Collect data and use scatterplots to analyze patterns and describe linear, exponential or quadratic relationships between two variables. Using graphing calculators or other appropriate technology, determine regression equation and correlation coefficients; use regression equations to make predictions and correlation coefficients to assess the reliability of those predictions.
	A2.D.1.3 Based upon a real-world context, recognize whether a discrete or continuous graphical representation is appropriate and then create the graph.
A2.D.2 Analyze statistical thinking to draw inferences, make predictions, and justify conclusions.	**A2.D.2.1** Evaluate reports based on data published in the media by identifying the source of the data, the design of the study, and the way the data are analyzed and displayed. Given spreadsheets, tables, or graphs, recognize and analyze distortions in data displays. Show how graphs and data can be distorted to support different points of view.
	A2.D.2.2 Identify and explain misleading uses of data. Recognize when arguments based on data confuse correlation and causation.

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Mathematical Glossary Terms and Tables

Whenever possible a reference was identified for glossary terms from the following resources:

(DPI) *http://dpi.wi.gov/standards*
(H) *http://www.hbschool.com/glossary/math2/*
(M) *http://www.merriam-webster.com/*
(MW) *http://www.mathwords.com*
(MA) *http://www.doe.mass.edu/frameworks/current.html*
(NCTM) *http://www.nctm.org*
(PASS) *http://www.ok.gov./sde/sites/ok.gov.sde/files/C3%20PASS%20math.pdf*

AA similarity (Angle-Angle similarity) If two triangles have two pairs of corresponding angles that are congruent, then the triangles are similar. (MW)

ASA congruence (Angle-Side-Angle congruence) If two triangles have two corresponding angles and the side adjacent to both angles congruent, then the triangles themselves are congruent. (MW)

Absolute value The absolute value of a real number is its (non-negative) distance from 0 on a number line. Formally,

$$|k| = \begin{cases} k \text{ if } k \geq 0 \\ -k \text{ if } k < 0 \end{cases}$$

Addend In the addition problem 3+2+6 = 11, the addends are 3, 2, and 6. (PASS)

Addition and subtraction within 5, 10, 20, 100, or 1,000 Addition or subtraction of two whole numbers with whole number answers, and with sum or minuend in the range 0–5, 0–10, 0–20, or 0–100, respectively. *Example: 8 + 2 = 10 is an addition within 10, 14 – 5 = 9 is a subtraction within 20, and 55 – 18 = 37 is a subtraction within 100. (MA)*

Additive inverses Two numbers whose sum is 0 are additive inverses of one another. *Example: 3/4 and –3/4 are additive inverses of one another because 3/4 + (–3/4) = (–3/4) + 3/4 = 0. (MA)*

Algorithm A finite set of steps for completing a procedure, e.g., long division. (H)

Analog Having to do with data represented by continuous variables, e.g., a clock with hour, minute, and second hands. (M)

Arc (minor and major) A portion of the circumference of a circle with ending points A and B. Unless stated otherwise, arc AB always refers to the shorter segment of the two (the minor arc). Together with the major arc the two portions beginning and ending at points A and B form the entire circumference of a circle.

Arc length The distance along the curved line forming the arc.

Arc measure The angle formed by the arc at the center of the circle.

Area A measurement of the amount of space within a closed two-dimensional shape. Area is usually measured in terms of "square units", in which 1 square unit is the amount of space within a square that measures 1 unit by 1 unit (for a given unit of length). For example, area may be measured in "square centimeters", 1 square centimeter being the amount of space within a 1cm by 1cm square.

Arithmetic sequence (progression) A sequence in which successive terms exhibit a common difference.

Array (rectangular) An orderly arrangement of objects into a rectangular configuration (e.g., take six tiles and arrange two long and three wide to form a rectangle). (PASS)

Associative property of addition See Table 1 in this Glossary.

Associative property of multiplication See Table 1 in this Glossary.

Assumption A fact or statement (as a proposition, axiom, postulate, or notion) taken for granted. (M)

Attribute Characteristic (e.g., size, shape, color, weight). (PASS)

Benchmark fraction A common fraction against which other fractions can be measured, such as ½. (MA)

Bar graph A display of categorical data in which vertical or horizontal bars represent the count of a category. The relative lengths of the various bars in the graph are commensurate with the relative sizes of the counts of the data.

Bivariate data Pairs of linked numerical observations. *Example: a list of heights and weights for each player on a football team.* (MA)

Box plot A graphic method that shows the distribution of data values by using the median, quartiles, and extremes of the data set. A box shows the middle 50% of the data. (DPI)

Capacity The maximum amount or number that can be contained or accommodated, e.g., a jug with a one-gallon *capacity;* the auditorium was filled to *capacity*. (MA)

Cardinal number A number (such as 1, 5, 15) that is used in simple counting and that indicates how many elements there are in a set. (MA)

Cardinality The cardinality of a finite collection of objects is the number of objects in the set. (For example, in PK-Grade 1 students are still learning that "5" represents the number of objects in any group of "five" objects.)

Categorical data Data that measures the number of occurrences of a discrete set of outcomes (e.g., noticing the different colors of shoes in the class and then recording the number of each color).

Chord A chord is a line that connects two points on a circle.

Circle The set of all points that are equidistant from a given point, called the center of the circle. The set of all points that lie inside the circle is called the *interior* of the circle.

Radius of a circle Both a segment with one endpoint on the center of the circle and the other endpoint on the circle, and the length of this segment (which is necessarily the same for any point on the circle).

Diameter of a circle Both a segment with endpoints on the circle that contains the center, and the length of this segment.

Circumference of a circle The length of the circle if cut and opened up to make a straight line segment, which can be found with $C = 2\pi r$ where r is the radius and π is the irrational number "pi". (Can be thought of as the perimeter of the circle.)

Area of a circle The area of the interior of the circle, which can be found with $A = \pi r^2$ where r is the radius and π the irrational number "pi".

Combinations A selection of objects without regard to order. (PASS)

Coefficient Any of the factors of a product considered in relation to a specific factor. Often, this will be a numerical factor in a product of numbers and variables, e.g., $3x^2$ has coefficient 3. (W)

Commutative property See Table 1 in this Glossary.

Complement (of a set) A set *A* is typically considered to be a subset of an understood "universal set." The complement of *A,* denoted by *A/C* is the set of all elements of the universal set that are not members of *A*.

Complementary angles Two angles whose measures have a sum of 90 degrees. (PASS)

Complex fraction A fraction *A*/*B* where *A* and/or *B* are fractions ($B \neq 0$). (MA)

Complex number Numbers of the form $a + bi$, where a, a real number, is the "real part" and b, also a real number, is the "imaginary part," and i is the imaginary number. *See also:* ***imaginary number***.

Complex plane A Cartesian plane in which the point (a,b) is used to represent $a + bi$.

Compose numbers To compose numbers is to create new numbers using any of the four operations with other numbers. For example, students compose 10 in many ways (9+1, 8+2, … , 5+5, …). Also, each place in the base ten place value is composed of ten units of the place to the left, i.e., one hundred is composed of ten bundles of ten, one ten is composed of ten ones, etc.

Compose shapes Join geometric shapes without overlaps to form new shapes. (MA)

Composite number Any positive integer divisible by one or more positive integers other than itself and 1. (PASS)

Computation algorithm A set of predefined steps applicable to a class of problems that gives the correct result in every case when the steps are carried out correctly. *See also:* ***algorithm***; ***computation strategy***. (MA)

Computation strategy Purposeful manipulations that may be chosen for specific problems, may not have a fixed order, and may be aimed at converting one problem into another. *See also:* ***computation algorithm***. (MA)

Conditional statement A statement of the form, "If P, then Q," where each of P and Q are themselves statements. For example, "If *it rains*, then *the streets get wet*," is a conditional statement. If the conditional statement "If P, then Q," is *true,* then this means that it is never the case that the statement P is true while the statement Q is false. For example, it will never be the case that "it rained" but "the streets are not wet".

Related statements are:

Converse: "If Q, then P." This may or may not be true if the original statement is true.

Inverse: "If NOT P, then NOT Q." This may or may not be true if the original statement is true.

Contrapositive: "If NOT Q, then NOT P." This is always true if the original statement is true, and vice versa. For an example, notice that, "If the streets are NOT wet, then it did NOT rain," is logically equivalent to the example statement above.

Congruent Two geometric objects are congruent if one can be mapped onto the other using a sequence of rigid motions (*rigid motions* are geometric transformations that preserve lengths and angles).

Conjugate The result of writing a sum of two terms as a difference, or vice versa. *For example, the conjugate of x – 2 is x + 2.* (MW)

Conjecture A statement believed to be true but not yet proved. (PASS)

Constant A number on its own, or sometimes a letter such as a, b or c to stand for a fixed number. Example: in "x + 5 = 9", 5 and 9 are constants. If it is not a constant it is called a variable.

Constant of proportionality Given a proportional relationship expressed as $y=kx$, the number k is often called the constant of proportionality.

Coordinate plane A plane in which a point is represented using two coordinates that determine the precise location of the point. In the Cartesian plane, two perpendicular number lines are used to determine the locations of points. In the polar coordinate plane, points are determined by their distance along a ray through that point and the origin, and the angle that ray makes with a pre-determined horizontal axis.

Cosine (of an acute angle) In a right triangle, the cosine of an acute angle is the ratio of the length of the leg adjacent to the angle to the length of the hypotenuse. (PASS)

Counterexample An example to show that a given statement is false. For example, to disprove the statement "All right triangles are isosceles," all one needs to do is produce a right triangle that is scalene.

Counting number A number used in counting objects, i.e., a number from the set

$$\{1, 2, 3, 4, 5, \dots\}.$$

See also: ***Natural number***.

Counting on A strategy for finding the number of objects in a group without having to count every member of the group. *For example, if a stack of books is known to have 8 books and 3 more books are added to the top, it is not necessary to count the stack all over again; one can find the total by counting on—pointing to the top book and saying "eight," following this with, "nine, ten, eleven. There are eleven books now."* (MA)

Continuous graph (of data) A graph is continuous if it contains intervals of data points.

Decimal expansion The resulting decimal number found when dividing a rational number in fraction form. May include terminating and repeating decimals.

Decimal fraction A fraction (as 0.25 = 25/100 or 0.025 = 25/1000) or mixed number (as 3.025 = 3 25/1000) in which the denominator is a power of ten, usually expressed by the use of the decimal point. (M)

Decimal number Any real number expressed in base 10 notation, such as 2.673. (MA)

Decompose numbers Given a number, identify pairs, triples, etc. of numbers that combine to form the given number.

Decompose shapes. Given a geometric shape, identify geometric shapes that meet without overlap to form the given shape. (MA)

Deductive reasoning Informally, the process of using known facts and relationships to derive new facts and relationships.

Dependent events. Events that influence each other. If one of the events occurs, it changes the probability of the other event. (PASS)

Dependent variable The output of a function. The quantity that is affected when the input is changed.

Digit a) Any of the Arabic numerals 1 to 9 and usually the symbol 0; b) One of the elements that combine to form numbers in a system other than the decimal system. (MA)

Digital Having to do with data that is represented in the form of numerical digits; providing a readout in numerical digits, e.g., a digital watch. (MA)

Dilation A transformation that moves each point along the ray through the point emanating from a fixed center, and multiplies distances from the center by a common scale factor. (MA)

Discrete graph (of data) A graph is discrete if it consists of separated data points and contains no intervals of data.

Divisible A non-zero integer *p* is said to be divisible by a non-zero integer *q* if there exists an integer *r* such that $q \times r = p$.

Domain of a relation The set of all the first elements or x-coordinates of a relation. (PASS)

Dot plot *See:* ***line plot***.

Equivalent expressions Two expressions (numerical or otherwise) are said to be equivalent if one can be obtained from the other using the properties of operations, such as the commutative, associative and distributive properties, as well as by representing numbers in the expressions in different but equivalent forms.

Equivalent fractions Two fractions a/b and c/d are said to be equivalent if there exists a non-zero number n such that $na/nb=c/d$. Equivalent fractions represent the same amount by changing both the size and the number of parts of a given fraction.

Equivalent ratios Two ratios $a{:}b$ and $c{:}d$ are equivalent if there is a non-zero number k such that $ka=c$ and $kb=d$. Equivalent ratios can be shown to have the same unit rate.

Expanded form A multi-digit number is expressed in expanded form when it is written as a sum of single-digit multiples of powers of ten. *For example, 643 = 600 + 40 + 3. (MA)*

Expected value For a random variable, the weighted average of its possible values, with weights given by their respective probabilities. (MA)

Experimental probability When trials of a probability experiment are run and data is collected, the experimental probability of a desired outcome is the relative frequency of that outcome as a ratio of the number of such outcomes to the total number of outcomes. For example, if a coin is flipped 100 times, and heads comes up 45 times, then the experimental probability of heads is 45/100 or 0.45. (The *theoretical probability* is 0.50, and if the number of trials is increased the experimental probability will get closer and closer to 0.50.)

Exponent (Integer) A negative integer exponent denotes the reciprocal of the base raised to the corresponding opposite integer. Thus $x^{-2} = \frac{1}{x^2}$.

Exponent (Whole Number) The number that indicates how many times the base is used as a factor, e.g., in $4^3 = 4 \times 4 \times 4 = 64$, the exponent is 3, indicating that 4 is repeated as a factor three times. (MA)

Exponential function An exponential function with base b is defined by y = b^x, where *b* > 0 and b is not equal to 1. (PASS).

Expression A mathematical phrase that combines operations, numbers, and/or variables (e.g., $3^2 \div a$). (H)

Exterior angles (of a polygon) The supplement of an interior angle of a polygon that is formed by extending one of the line segments determining the interior angle at a given vertex.

Extraneous solution A solution, such as that to an equation, that emerges from the process of solving the problem but is not a valid solution to the original problem. For example, consider the equation $\sqrt{2x+12}-2=x$. After adding 2 to both sides and squaring both sides of the equation, we obtain $2x+12=x^2+4x+4$. We can subtract $2x$ and 12 to both sides to obtain the quadratic equation $x^2+2x-8=0$. Solving this quadratic equation, we obtain two possible solutions, $x=2$ and $x=-4$. While the original equation is true when evaluated at $x=2$, -4 is considered an extraneous solution because it is false when evaluated at $x=-4$.

$$\sqrt{2x+12}-2=x$$
$$\sqrt{2(-4)+12}-2=-4$$
$$\sqrt{-8+12}-2=-4$$
$$\sqrt{4}-2=-4$$
$$2-2=-4$$
$$0\neq-4$$

Fluency Easily and accurately responding to calculations (Van de Walle). See Table 4 in this Glossary.

First quartile[1] For a data set with median *M*, the first quartile is the median of the data values less than *M*. *Example: For the data set {1, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the first quartile is 6. See also:* ***median, third quartile, interquartile range***. (MA)

Fraction A number expressible in the form *a*/*b* where *a* is a whole number and *b* is a positive whole number. (The word *fraction* in these standards always refers to a non-negative number.) *See also:* ***rational number*** *and* ***complex fraction***. (MA)

[1] Many different methods for computing quartiles are in use. The method defined here is sometimes called the Moore and McCabe method. See Langford, E., "Quartiles in Elementary Statistics," *Journal of Statistics Education* Volume 14, Number 3 (2006).

Frequency table A representation of data in which categories are listed in one column (row) of a table and the number of occurrences (frequency) of each category is indicated in another column (row).

Function A rule that assigns to every element of one set (the domain) exactly one element of another set (the range). A function is often thought of as an "input/output" rule, as in every input determines an output (usually according to mathematical operations performed on the input).

Function machine An input/output model (often made with milk cartons, boxes, or drawn on the board) to show one number entering and a different number exiting. Students guess the rule that produced the second number (e.g., enter 3, exit 5, rule: add 2). (PASS)

Function notation A notation that describes a function. For a function f, when x is a member of the domain, the symbol $f(x)$ denotes the corresponding member of the range (e.g., $f(x) = x + 3$).

Geometric sequence (progression) An ordered list of numbers that has a common ratio between consecutive terms, e.g., 2, 6, 18, 54. (H)

Histogram A type of bar graph used to display the distribution of measurement data across a continuous range. (MA)

Hypotenuse The longest side of a right triangle, necessarily opposite to the right angle. The other sides are called the *legs* of the right triangle (*longer* and *shorter* if applicable).

HL (Hypotenuse-Leg) congruence If two right triangles have hypotenuse and one corresponding leg congruent, then the triangles are congruent.

Identity property of 0 See Table 1 in this Glossary.

Imaginary number A number i is considered imaginary if $i^2=-1$. *See also:* ***complex number***.

Independent events Events that do not influence one another. Each event occurs without changing the probability of the other event. Specifically, two events *A* and *B* are independent if $P(A \text{ AND } B)=P(A)\cdot P(B)$. (PASS)

Independent variable The input of a function. The quantity whose value is changed to affect the output.

Independently combined probability models. Two probability models are said to be combined independently if the probability of each ordered pair in the combined model equals the product of the original probabilities of the two individual outcomes in the ordered pair. (MA)

Inductive reasoning Informally, the process of examining patterns and making conclusions based on observed patterns.

Input/Output table Usually a two-column table (or two-row table) with one column (row) listing the inputs of a rule and the other column (row) listing the corresponding outputs for each input.

Integer The set of numbers that contains the whole numbers and their additive inverses (opposites). I.e., $\{\ldots, -2, -1, 0, 1, 2, 3, \ldots\}$.

Intercepts (of a graph) Geometrically, where a graph intersects an axis in a Cartesian plane.

Interquartile range A measure of variation in a set of numerical data, the interquartile range is the distance between the first and third quartiles of the data set. Example: For the data set {1, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the interquartile range is 15 – 6 = 9. *See also:* ***first quartile, third quartile***. (MA)

Intersection (of sets) For two sets and , the intersection ∩ is the set of all elements that are members of both sets simultaneously.

Inverse function. A function g that satisfies $g\big(f(x)\big) = x$ and $f\big(g(x)\big) = x$ is said to be an inverse function for f. The inverse of f is often denoted by f^{-1}.

Inverse operations Operations that undo each other (e.g., addition and subtraction are inverse operations; multiplication and division are inverse operations). (PASS)

Irrational number Numbers that are not rational. Irrational numbers have nonterminating, nonrepeating decimal expansions (e.g., square root of 2, pi). (MA)

Length (of a segment) The length of a (straight) line segment is a measurement of the distance from one endpoint of the object to the other. Once a unit of length is specified, the length of a segment is found by placing such units end-to-end without gaps or overlaps and counting how many such units are used.

Line Plot A representation of data in which categories are listed underneath points on a number line, and in which the number of occurrences (frequency) of each category is represented by a corresponding number of marks (X's, dots) above each category's point.

Linear association A set of bivariate data exhibits a linear association if a scatter plot of the data can be well-approximated by a line. (MA)

Linear equation Any equation that can be written in the form $Ax + By + C = 0$ where A and B cannot both be 0. The graph of such an equation is a line. (MA)

Linear function A function f is linear if it can be written in the form $f(x) = mx + b$.

Literal equation An equation involving multiple variables and numbers, often that cannot be solved for an explicit numerical value of any of the individual variables. In such a case one may solve for one variable as an expression of the others.

Logarithm The exponent that indicates the power to which a base number is raised to produce a given number. *For example, the logarithm of 100 to the base 10 is 2.* (M)

Logarithmic function Any function in which an independent variable appears in the form of a logarithm; they are the inverse functions of exponential functions. (MA)

Manipulatives Concrete materials (e.g., buttons, beans, egg and milk cartons, counters, attribute and pattern blocks, interlocking cubes, base-10 blocks, geometric models, geo-boards, fractions pieces, rulers, balances, spinners, dot paper) used to represent mathematical concepts, operations, and relationships. (PASS)

Matrix (pl. matrices) A rectangular array of numbers or variables. (MA)

Mean (arithmetic) A measure of center in a set of numerical data, computed by adding the values in a list and then dividing by the number of values in the list. *Example: For the data set {1, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the mean is 21.* (MA)

Mean absolute deviation A measure of variation in a set of numerical data, computed by adding the distances between each data value and the mean, then dividing by the number of data values. *Example: For the data set {2, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the mean absolute deviation is 20.* (MA)

Measure of central tendency A determination of the center of a data set meant to describe a set of data. *See also:* ***mean***, ***median***, ***mode***, *and* ***percentile***.

Measure of spread (or variability) A determination of how much the data in a set deviates from a measure of center .The most frequently used measure is standard deviation. *See also:* ***standard deviation***, ***range***.

Median A measure of center in a set of numerical data. The median of a list of values is the value appearing at the center of a sorted version of the list; or the mean of the two central values, if the list contains an even number of values. *Example: For the data set {2, 3, 6, 7, 10, 12, 14, 15, 22, 90}, the median is 11*. (MA)

Midline In the graph of a sine or cosine function, the horizontal line halfway between its maximum and minimum values. (MA)

Mixed number A number written in the form $A\frac{b}{c}$, which is a shorthand way to represent the quantity $A+\frac{b}{c}$. A mixed number may be written as a fraction greater than 1 by writing $A\frac{b}{c}=A+\frac{b}{c}=\frac{Ac}{c}+\frac{b}{c}=\frac{Ac+b}{c}$.

Model A mathematical representation (e.g., number, graph, matrix, equation(s), geometric figure) for real-world or mathematical objects, properties, actions, or relationships. (DPI)

Modulus of a complex number The distance between a complex number and the origin on the complex plane. The modulus of a complex number, $a+bi$ is written $|a+bi|$ and is found by finding the hypotenuse of the triangle with legs a and b. Thus, $|a+bi|=\sqrt{a^2+b^2}$. For a complex number in polar form, $r(\cos\theta+i\sin\theta)$, the modulus is $|r|$.

Multiplication and division within 100 Multiplication or division of two whole numbers with whole number answers, and with product or dividend in the range 0–100. *Example:* 72 ÷ 8 = 9. (MA)

Multiplication counting principle If *k* actions can be taken in N_1, N_2, … , N_k different ways, then there are a total of N_1, N_2, … , N_k different ways to perform those actions in sequence.

Multiplicative inverses Two numbers whose product is 1 are multiplicative inverses of one another. *Example: 3/4 and 4/3 are multiplicative inverses of one another because 3/4 ´ 4/3 = 4/3 ´ 3/4 = 1*. (MA)

Natural number A number used in counting objects, i.e., a number from the set

$$\{1, 2, 3, 4, 5, \ldots\}.$$

See also: ***Counting number***.

Net A two-dimensional representation of a three-dimensional figure constructed of polygons, such that if folds were made on certain edges of the net and appropriate sides were "glued" together, the resulting figure would be the original three-dimensional figure.

Network a) A figure consisting of vertices and edges that shows how objects are connected, b) A collection of points (vertices), with certain connections (edges) between them. (MA)

Non-linear association The relationship between two variables is nonlinear if the change in the second is not simply proportional to the change in the first, independent of the value of the first variable. (MA)

Nonstandard measurement A measurement determined by the use of nonstandard units such as hands, paper clips, beans, cotton balls, etc. (PASS)

Number line diagram A diagram of the number line used to represent numbers and support reasoning about them. In a number line diagram for measurement quantities, the interval from 0 to 1 on the diagram represents the unit of measure for the quantity. (MA)

Number sense The understanding of number size (relative magnitude), number representations, number operations, referents for quantities and measurement used in everyday situations, etc. (PASS)

Numeral A symbol or mark used to represent a number. (MA)

One-to-one correspondence A matching of the elements of two sets such that each element from the first set is matched with one and only one element of the second set, and such that each element of the second set is matched with some element of the first. Early grades students use this to establish the concept of cardinal use of numbers (as in "5" can represent any collection of five objects; if I can match the fingers on one hand to all the elements of a given set then that set has "5" objects.)

Operation General term for any one of addition, subtraction, multiplication, and division. (PASS)

Order of operations Convention adopted to perform mathematical operations in a consistent order.

Step 1. Perform all operations inside grouping symbols, and/or above and below a fraction bar in the order specified in Steps 2, 3 and 4.

Step 2. Find the value of any powers or roots;

Step 3. Multiply, including division, from left to right;

Step 4. Add, including subtraction, from left to right. (NCTM)

Ordinal number A number designating the place (as first, second, or third) occupied by an item in an ordered sequence. (M)

Outlier A data point that is far outside a representative range of the data set. For example, once the inter-quartile range (IQR) is computed, one might calculate the interval of 1.5× IQR above the median and 1.5× IQR below the median and decide that any data point that lies outside this range is considered an outlier.

Parallel lines Lines that do not intersect. Distinct lines can be shown to be parallel if and only if they have equal slopes.

Partition A process of dividing an object into parts or a set into (smaller) subsets. (MA)

Pascal's triangle A triangular arrangement of numbers in which each row starts and ends with 1, and each other number is the sum of the two numbers above it. (H)

Piecewise function A function that is defined differently on different intervals.

Percent rate of change A rate of change expressed as a percent. *Example: if a population grows from 50 to 55 in a year, it grows by 5/50 = 10% per year.* (MA)

Perfect square A number that is a whole number squared, that is, a number that can be expressed as n^2 for n a whole number.

Perimeter (of a polygon) The total length of all the edges of a polygon. Often, perimeter is thought of as the distance around an object, traversed once along the edges starting from one vertex and ending at the same vertex.

Periodic phenomena Events that recur over regular intervals, for example, ocean tides, machine cycles. (MA)

Perpendicular lines Lines that intersect such that all four angles that are created are congruent. Two lines can be shown to be perpendicular if and only if the product of their slopes is -1.

Pi (π) The irrational number that is derived by finding the ratio of the circumference to the diameter of circles. That this ratio is constant and an irrational number are important concepts and challenging to prove, so they are often arrived at empirically by students.

Picture graph A graph that uses pictures to show and compare information. (MA)

Place value The concept that the order in which digits are written in the base-10 number system determines the value of that digit. Thus, in the number 245, the digit 2 is in the "hundreds place", indicating that the value of that particular 2 is actually 2 hundreds or 200.

Polygon A closed, two-dimensional figure comprised of line segments connected end-to-end, and such that no two segments cross each other. The segments are typically called sides or edges, and the common endpoints of adjacent segments are called vertices (sing. vertex). The space within the polygon is called its *interior*. The angles formed by adjacent sides that lie in the interior of a polygon are called its *interior* angles.

Polynomial The sum or difference of terms which have variables raised to positive integer powers and which have coefficients that may be real or complex. The following are all polynomials: $5x^3 - 2x^2 + x - 13$, $x^2y^3 + xy$, and $(1 + i)a^2 + ib^2$. (MW)

Polynomial function Any function whose output is given by a polynomial expression of the input.

Postulate A statement accepted as true without proof. (MA)

Prime factorization A number written as the product of all its prime factors. (H)

Prime number A whole number greater than 1 whose only factors are 1 and itself. (MA)

Probability distribution The set of possible values of a random variable with a probability assigned to each. (MA)

Properties of equality See Table 2 in this Glossary.

Properties of inequality See Table 3 in this Glossary.

Properties of operations See Table 1 in this Glossary.

Probability The study and measure of the likelihood of an event happening. (PASS)

Probability model A probability model is used to assign probabilities to outcomes of a chance process by examining the nature of the process. The set of all outcomes is called the sample space, and their probabilities sum to 1. *See also:* ***uniform probability model***. (MA)

Proof A method of constructing a valid argument using deductive reasoning. (MA)

Proportion An equation that states that two ratios are equivalent, e.g., 4/8 = ½ or 4 : 8 = 1 : 2. (MA)

Pyramid A three-dimensional shape constructed from a polygon (called the *base*) and triangles that have one edge matching the edges of the base and such that the triangles share a common vertex.

Pythagorean theorem For any right triangle, the sum of the squares of the lengths of the legs equals the square of the lengths of the hypotenuse. (MA)

Quadratic equation An equation that is equivalent to $ax^2 + bx + c = 0$, where $a \neq 0$.

Quadratic expression An expression that contains variables raised to whole number exponents no higher than 2.

Quadratic function A function that can be represented by an equation of the form $y = ax^2 + bx + c$, where a, b, and c are arbitrary, but fixed, numbers and a $\neq 0$. The graph of this function is a parabola. (DPI)

Quadratic polynomial A polynomial where the highest degree of any of its terms is 2. (MA)

Quadrilateral A polygon with 4 sides. Important classes of quadrilaterals:

- **Trapezoid** A quadrilateral in which at least two sides are parallel.
- **Parallelogram** A quadrilateral in which opposite sides are parallel.
- **Rhombus** A parallelogram in which opposite sides are congruent (have the same length).
- **Rectangle** A parallelogram that has at least one right interior angle.
- **Square** A rectangle that has all sides congruent.
- **Kite** A quadrilateral that has two pairs of congruent adjacent sides.

Quotient The result of a division problem. Also, given whole numbers n and m with $n>m$, if we write $n=mq+r$ with $0 \leq r<m$, then we say q is the quotient and r is the remainder.

Radical The $\sqrt{\ }$ symbol, which is used to indicate square roots or n^{th} roots. (MW)

Random sampling A smaller group of people or objects chosen from a larger group or population by a process giving equal chance of selection to all possible people or objects. (H)

Random variable An assignment of a numerical value to each outcome in a sample space. (M)

Range (of a relation) The set of all the second elements or y-coordinates of a relation is called the range. (PASS)

Range (of a data set) The difference between the maximum and minimum values of a data set, a measure of the spread of the data.

Ratio A relationship between quantities such that for every a units of one quantity there are b units of the other. A ratio is often denoted by $a{:}\,b$, and read "a to b."

Rational expression A quotient of two polynomials with a non-zero denominator. (MA)

Rational number A number expressible in the form *a*/*b* or – *a*/*b* for some fraction *a*/*b*. The rational numbers include the integers. (MA)

Real number An element of the set of numbers consisting of all rational and all irrational numbers. (MA)

Rectangular array An arrangement of mathematical elements into rows and columns.(MA)

Rectangular prism A three-dimensional object constructed from three pairs of parallel rectangles (called *faces* in this context) that share common edges so as to form an enclosed space and such that opposite rectangles are congruent. The vertices of the rectangles are the vertices of the prism, and the sides of the rectangles are called edges. A **cube** is a rectangular prism in which each face is a square of the same size as the other faces.

Rectilinear figure A polygon, all angles of which are right angles. (MA)

Recursive pattern (or sequence) Patterns in which each number is found from the previous number by repeating a process (e.g. Fibonacci numbers). (PASS)

Reflection A type of transformation that flips points about a line, called the *line of reflection*. Taken together, the image and the pre-image have the line of reflection as a line of symmetry. (MA)

Real numbers (set of) The set of all rational and irrational numbers (PASS)

Relation A collection of ordered pairs of real numbers.

Relative frequency The empirical counterpart of probability. If an event occurs N' times in N trials, its relative frequency is N'/N. (M)

Remainder Theorem If f(x) is a polynomial in x then the remainder on dividing f(x) by x − a is f(a). (M)

Repeating decimal. A decimal in which, after a certain point, a particular digit or sequence of digits repeats itself indefinitely. (M) *See also:* ***terminating decimal***. (MA)

Right angle Informally, an angle whose measure is 90 degrees. Formally, if two congruent copies of a given angle are supplementary (that is, they form a straight line when one matches an edge of one copy with one edge of the other), then the given angle is said to be a right angle. (We can then define the measure of this angle to be 90 degrees and measure other angles in terms of a right angle.)

Rigid motion A transformation of points in space consisting of a sequence of one or more translations, reflections, and/or rotations. Rigid motions are here assumed to preserve distances and angle measures. (MA)

Rotation A type of transformation that turns a figure about a fixed point, called the *center of rotation*. (MA)

SAS congruence (Side-Angle-Side congruence) If in two triangles two corresponding sides and the angles formed by those sides are congruent, then the triangles are congruent. (MW)

SSS congruence (Side-Side-Side congruence) If two triangles have corresponding sides that are congruent, then the triangles are congruent. (MW)

Sample space In a probability model for a random process, a list of the individual outcomes that are to be considered. (MA)

Scale factor For similar shapes, the common ratio of corresponding side lengths is called the scale factor. Informally, it is the multiplicative amount by which the lengths of one shape are "blown up" or "shrunk down" to obtain the other shape to which it is similar.

Scatter plot A graph in the coordinate plane representing a set of bivariate data. *For example, the heights and weights of a group of people could be displayed on a scatter plot.* (DPI)

Scientific notation A widely used floating-point system in which numbers are expressed as products consisting of a number between 1 and 10 multiplied by an appropriate power of 10, e.g., $562 = 5.62 \times 10^2$. (MW)

Secant (of a circle) A line that intersects a circle at two points.

Sequence A set of elements ordered so that they can be labeled with consecutive positive integers starting with 1, e.g., 1, 3, 9, 27, 81. In this sequence, 1 is the *first term*, 3 is the *second term*, 9 is the *third term*, and so on. (MA)

Set model (for fractions) The use of a discrete set of objects to represent the whole and a subset of those objects to represent a fraction. For example, since 3 of the 15 students in class are wearing blue shirts, 3/15 of the students are wearing blue shirts.

Significant figures (digits) Digits included in a measurement that purposely indicate the precision of the measurement. For example, writing a measurement as 3.50 seconds instead of 3.5 seconds indicates that the measurement is accurate to the hundredths place.

Similar (shapes) Two geometric shapes are said to be similar (to each other) if one can be mapped onto the other by a sequence of similarity transformations.

Similarity transformation A rigid motion followed by a dilation. (MA)

Simultaneous equations Two or more equations containing common variables. (MW)

Sine (of an acute angle) The trigonometric function that for an acute angle is the ratio between the leg opposite the angle when the angle is considered part of a right triangle and the hypotenuse. (M)

Slope (of a line) A measure of the steepness of a line in a Cartesian plane, found by determining the constant change in the y-coordinate per 1-unit change in the x-coordinate.

Spatial sense The ability to build and manipulate mental representations of 2- and 3-dimensional objects and ideas. (PASS)

Standard deviation A measurement of how much each value in the data differs from the mean of the data. (PASS)

Statistics The study of data. (PASS)

Stem-and-leaf plot A frequency distribution made by arranging data in the following way (e.g., student scores on a test were 96, 87, 77, 93, 85, 85, and 75 would be displayed as:

9] 6,3

8] 7,5,5

7] 7,5

Subitize Instantly knowing "how many." Recognizing a number without using other mathematical processes. (Clements)

Substitution The substitution of one expression for an equivalent expression, used when rewriting expressions as equivalent ones or solving equations. It is based on the *transitive property of equality*, which states, "If = ,and = , then = ."

Summary statistics A collection of statistics (measurements based on data) that describe the data set. For example, the range, mean, and standard deviation of a given data set indicate certain features of the data set and hence are summary statistics.

Supplementary angles Two angles whose measures have a sum of 180 degrees. (PASS)

Supposition (act of supposing) Making a statement or assumption without proof. (PASS)

Surface area (of a rectangular prism) The total measure of the area of the faces of a rectangular prism. Equivalently, the total area of a net for the prism.

Tangent a) Meeting a curve or surface in a single point if a sufficiently small interval is considered. b) (of an acute angle) The trigonometric function that, for an acute angle, is the ratio between the leg opposite the angle and the leg adjacent to the angle when the angle is considered part of a right triangle. (MW)

Tape diagram A drawing that looks like a segment of tape, used to illustrate number relationships. Also known as a strip diagram, bar model, fraction strip, or length model. (MA)

Terminating decimal A decimal is called terminating if its repeating digit is 0. Every terminating decimal is the decimal form of some rational number. *See also:* ***repeating decimal***. (MA)

Third quartile For a data set with median *M*, the third quartile is the median of the data values greater than *M*. *Example: For the data set {2, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the third quartile is 15. See also:* ***median, first quartile, interquartile range***. (MA)

Transformation A prescription, or rule, that sets up a one-to-one correspondence between the points in a geometric object (the *pre-image*) and the points in another geometric object (the *image*). Reflections, rotations, translations, and dilations are particular examples of transformations. (MA)

Transitivity principle for indirect measurement If the length of object A is greater than the length of object B, and the length of object B is greater than the length of object C, then the length of object A is greater than the length of object C. This principle applies to measurement of other quantities as well. (MA)

Translation A type of transformation that moves every point in a graph or geometric figure by the same distance in the same direction without a change in orientation or size. (MW)

Transversal line A line that crosses two or more other lines is called a transversal.

Triangle A polygon with three sides. Important classes of triangles:

Equilateral triangle A triangle with all sides congruent.

Right triangle Contains an interior angle that is a right angle.

Scalene triangle A triangle with no side congruent to another.

Isosceles triangle A triangle with two congruent sides.

Trigonometric function Trigonometric functions (sine, cosine, tangent, and their reciprocals) are commonly defined as ratios of two sides of a right triangle containing the angle, and can equivalently be defined as the lengths of various line segments from a unit circle.

Trigonometry The study of trigonometric functions.

Uniform probability model A probability model which assigns equal probability to all outcomes. *See also:* ***probability model***.

Unit fraction A fraction with a numerator of 1, such as 1/3 or 1/5. (MA)

Unit of measurement When measuring a given attribute of an object, a "unit" is defined in terms of which all other measurements are determined. That a given unit is fixed is a concept to be learned by young students (e.g. we wouldn't measure the length of a room in hands because your hand is different from mine, and we wouldn't measure the length of a room using cm and inches at the same time).

Union (of sets) For two sets and , the union $\cup$ is the set of all elements that are members of one or both of the sets.

Variable (a) A quantity that can change or that may take on different values. (b) A symbol (often a letter of the alphabet, sometimes including the Greek alphabet) that represents a number in a mathematical expression.

Venn diagram A data display in which (typically) circles are used to represent categories and in which the overlapping of two (or more) circles indicates data that lies in each category in the overlap.

Visual fraction model A diagram or representation to show the relative size of a fraction, for example, a tape diagram, number line diagram, or area model. (MA)

Volume (of a 3D object) A measurement of the amount of space within a closed three-dimensional shape. Volume is often measured in terms of "cubic units", in which 1 cubic unit is the amount of space within a cube that measures 1 unit by 1 unit by 1 unit (for a given unit of length). For example, volume may be measured in "cubic centimeters", 1 cubic centimeter being the amount of space within a 1cm by 1cm by 1cm cube. Note that since one can measure the volume of a liquid by placing said liquid into a 3D shape, volume has historically been measured in various units such as cups, fluid ounces, and liters. Note that 1 cubic centimeter is equal to 1 milliliter, one way to connect such fluid units to cubic units.

Whole numbers The numbers 0, 1, 2, 3, …

Table 1: The Properties of Operations	
Here a, b and c stand for arbitrary numbers in a given number system. The properties of operations apply to the rational number system, the real number system, and the complex number system.	
Associative property of addition	$(a+b)+c=a+(b+c)$
Commutative property of addition	$a+b=b+a$
Additive identity property of 0	$a+0=0+a=a$
Existence of additive inverses	For every a there exists $-a$ so that $a+(-a)=(-a)+a=0$.
Associative property of multiplication	$(a\times b)\times c=a\times(b\times c)$
Commutative property of multiplication	$a\times b=b\times a$
Multiplicative identity property of 1	$a\times 1=1\times a=a$
Existence of multiplicative inverses	For every a (where $a\neq 0$) there exists $\frac{1}{a}$ so that $a\times\frac{1}{a}=\frac{1}{a}\times a=1$.
Distributive property of multiplication over addition	$a\times(b+c)=a\times b+a\times c$

Table 2: The Properties of Equality	
Here a, b, and c stand for arbitrary numbers in the rational, real, or complex number systems.	
Reflexive property of equality	$a=a$
Symmetric property of equality	If $a=b$, then $b=a$.
Transitive property of equality	If $a=b$ and $b=c$, then $a=c$.
Addition property of equality	If $a=b$, then $a+c=b+c$.
Subtraction property of equality	If $a=b$, then $a-c=b-c$.
Multiplication property of equality	If $a=b$, then $a\times c=b\times c$.
Division property of equality	If $a=b$ and $c\neq 0$, then $a\div c=b\div c$.
Substitution property of equality	If $a=b$, then b may be substituted for a in any expression containing a.

Table 3: The Properties of Inequality	
Here a, b, and c stand for arbitrary numbers in the rational or real number systems.	
Law of Trichotomy	Exactly one of the following is true: $a < b$, $a = b$, or $a > b$
Reversal Property	If $a > b$, then $b < a$.
Additive Inverse	If $a > b$, then $-a < -b$.
Addition and Subtraction Property of Inequality	If $a > b$, then $a \pm c > b \pm c$.
Positive Multiplication Property of Inequality	If $a > b$ and $c > 0$, then $a \times c > b \times c$.
Negative Multiplication Property of Inequality	If $a > b$ and $c < 0$, then $a \times c < b \times c$.
Positive Division Property of Inequality	If $a > b$ and $c > 0$, then $a \div c > b \div c$.
Negative Division Property of Inequality	If $a > b$ and $c < 0$, then $a \div c < b \div c$.

Table 4: Fluency Expectations				
Grade level fluency expectations apply to operations of whole numbers.	**Addition**	**Subtraction**	**Multiplication**	**Division**
1st Grade	Through 10	Through 10		
2nd Grade	Through 20	Through 20		
3rd Grade			Through factors of 10	
4th Grade			Through factors of 12	Through factors of 12

Number & Operations (N)			
Topic	**Pre-Kindergarten (PK)**	**Kindergarten (K)**	**First Grade (1)**
Quantity	**PK.N.1 Know number names and count in sequence.** **PK.N.1.1** Count aloud forward in sequence by 1's to 20. **PK.N.1.2** Recognize and name written numerals 0-10. **PK.N.1.3** Recognize that zero represents the count of no objects. **PK.N.2 Count to tell the number of objects.** **PK.N.2.1** Identify the number of objects, up to 10, in a row or column. **PK.N.2.2** Use one-to-one correspondence in counting objects and matching groups of objects. **PK.N.2.3** Understand the last numeral spoken, when counting aloud, tells how many total objects are in a set. **PK.N.2.4** Count up to 5 items in a scattered configuration; not in a row or column. **PK.N.3 Compare sets using number.** **PK.N.3.1** Compare two sets of 1-5 objects using comparative language such as same, more, or fewer.	**K.N.1 Understand the relationship between quantities and whole numbers.** **K.N.1.1** Count aloud forward in sequence to 100 by 1's and 10's. **K.N.1.2** Recognize that a number can be used to represent how many objects are in a set up to 10. **K.N.1.3** Use ordinal numbers to represent the position of an object in a sequence up to 10. **K.N.1.4** Recognize without counting (subitize) the quantity of a small group of objects in organized and random arrangements up to 10. **Clarification statement:** Subitizing is defined as instantly recognizing the quantity of a set without having to count. "Subitizing" is not a vocabulary word and is not meant for student discussion at this age. **K.N.1.5** Count forward, with and without objects, from any given number up to 10. **K.N.1.6** Read, write, discuss, and represent whole numbers from 0 to at least 10. Representations may include numerals, pictures, real objects and picture graphs, spoken words, and manipulatives. **K.N.1.7** Find a number that is 1 more or 1 less than a given number up to 10. **K.N.1.8** Using the words more than, less than or equal to compare and order whole numbers, with and without objects, from 0 to 10.	**1.N.1 Count, compare and represent whole numbers up to 100, with an emphasis on groups of tens and ones.** **1.N.1.1** Recognize numbers to 20 without counting (subitize) the quantity of structured arrangements. **Clarification statement:** Subitizing is defined as instantly recognizing the quantity of a set without having to count. "Subitizing" is not a vocabulary word and is not meant for student discussion at this age. **1.N.1.2** Use concrete representations to describe whole numbers between 10 and 100 in terms of tens and ones. **1.N.1.3** Read, write, discuss, and represent whole numbers up to 100. Representations may include numerals, addition and subtraction, pictures, tally marks, number lines and manipulatives, such as bundles of sticks and base 10 blocks. **1.N.1.4** Count forward, with and without objects, from any given number up to 100 by 1s, 2s, 5s and 10s. **1.N.1.5** Find a number that is 10 more or 10 less than a given number up to 100. **1.N.1.6** Compare and order whole numbers from 0 to 100. **1.N.1.7** Use knowledge of number relationships to locate the position of a given whole number on an open number line up to 20. **1.N.1.8** Use objects to represent and use words to describe the relative size of numbers, such as more than, less than, and equal to.
Operations	Topic addressed at other grade levels.	**K.N.2 Develop conceptual fluency with addition and subtraction (up to 10) using objects and pictures.** **K.N.2.1** Compose and decompose numbers up to 10 with objects and pictures.	**1.N.2 Solve addition and subtraction problems up to 10 in real-world and mathematical contexts.** **1.N.2.1** Represent and solve real-world and mathematical problems using addition and subtraction up to ten. **1.N.2.2** Determine if equations involving addition and subtraction are true. **1.N.2.3** Demonstrate fluency with basic addition facts and related subtraction facts up to 10.

Number & Operations (N)			
Topic	**Pre-Kindergarten (PK)**	**Kindergarten (K)**	**First Grade (1)**
Fractions	Topic addressed at other grade levels.	**K.N.3 Understand the relationship between whole numbers and fractions through fair share.** **K.N.3.1** Distribute equally a set of objects into at least two smaller equal sets.	**1.N.3 Develop foundational ideas for fractions.** **1.N.3.1** Partition a regular polygon using physical models and recognize when those parts are equal. **1.N.3.2** Partition (fair share) sets of objects into equal groupings.
Money	Topic addressed at other grade levels.	**K.N.4 Identify coins by name.** **K.N.4.1** Identify pennies, nickels, dimes, and quarters by name.	**1.N.4 Identify coins and their values.** **1.N.4.1** Identify pennies, nickels, dimes, and quarters by name and value. **1.N.4.2** Write a number with the cent symbol to describe the value of a coin. **1.N.4.3** Determine the value of a collection of pennies, nickels, or dimes up to one dollar counting by ones, fives, or tens.

Algebraic Reasoning & Algebra (A)			
Topic	**Pre-Kindergarten (PK)**	**Kindergarten (K)**	**First Grade (1)**
Patterns	**PK.A.1 Recognize, duplicate, and extend patterns.** **PK.A.1.1** Sort and group up to 5 objects into a set based upon characteristics such as color, size, and shape and explain verbally what the objects have in common. **PK.A.1.2** Recognize, duplicate, and extend repeating patterns involving manipulatives, sound, movement, and other contexts.	**K.A.1 Duplicate patterns in a variety of contexts.** **K.A.1.1** Sort and group up to 10 objects into a set based upon characteristics such as color, size, and shape. Explain verbally what the objects have in common. **K.A.1.2** Recognize, duplicate, complete, and extend repeating, shrinking and growing patterns involving shape, color, size, objects, sounds, movement, and other contexts.	**1.A.1 Identify patterns found in real-world and mathematical situations.** **1.A.1.1** Identify, create, complete, and extend repeating, growing, and shrinking patterns with quantity, numbers, or shapes in a variety of real-world and mathematical contexts.
Number Sentences	Topic addressed at other grade levels.	Topic addressed at other grade levels.	Topic addressed at other grade levels.

Geometry & Measurement (GM)			
Topic	**Pre-Kindergarten (PK)**	**Kindergarten (K)**	**First Grade (1)**
Geometry	**PK.GM.1 Identify common shapes.** **PK.GM.1.1** Identify circles, squares, rectangles, and triangles by pointing to the shape when given the name.	**K.GM.1 Recognize and sort basic two-dimensional shapes and use them to represent real-world objects.** **K.GM.1.1** Recognize squares, circles, triangles, and rectangles. **K.GM.1.2** Sort two-dimensional objects using characteristics such as shape, size, color, and thickness. **K.GM.1.3** Identify attributes of two-dimensional shapes using informal and formal geometric language interchangeably. **K.GM.1.4** Use smaller shapes to form a larger shape when there is an outline to follow. **K.GM.1.5** Compose free-form shapes with blocks. **K.GM.1.6** Use basic shapes and spatial reasoning to represent objects in the real world.	**1.GM.1 Recognize, compose, and decompose two- and three-dimensional shapes.** **1.GM.1.1** Identify trapezoids and hexagons by pointing to the shape when given the name. **1.GM.1.2** Compose and decompose larger shapes using smaller two-dimensional shapes. **1.GM.1.3** Compose structures with three-dimensional shapes. **1.GM.1.4** Recognize three-dimensional shapes such as cubes, cones, cylinders, and spheres.
Measurement	**PK.GM.2 Describe and compare measureable attributes.** **PK.GM.2.**1 Identify measurable attributes of objects. Describe them as little, big, long, short, tall, heavy, light, or other age appropriate vocabulary. **PK.GM.2.2** Directly compare two objects with a common measurable attribute using words such as longer/shorter; heavier/lighter; or taller/shorter. **PK.GM.2.3** Sort objects into sets by one or more attributes.	**K.GM.2 Compare and order objects according to location and measurable attributes.** **K.GM.2.1** Use words to compare objects according to length, size, weight, position, and location. **K.GM.2.2** Order up to 6 objects using measurable attributes, such as length and weight. **K.GM.2.3** Sort objects into sets by more than one attribute. **K.GM.2.4** Compare the number of objects needed to fill two different containers.	**1.GM.2 Select and use nonstandard and standard units to describe length and volume/capacity.** **1.GM.2.1** Use nonstandard and standard measuring tools to measure the length of objects to reinforce the continuous nature of linear measurement. **1.GM.2.2** Illustrate that the length of an object is the number of same-size units of length that, when laid end-to-end with no gaps or overlaps, reach from one end of the object to the other. **1.GM.2.3** Measure the same object/distance with units of two different lengths and describe how and why the measurements differ. **1.GM.2.4** Describe a length to the nearest whole unit using a number and a unit. **1.GM.2.5** Use standard and nonstandard tools to identify volume/capacity. Compare and sort containers that hold more, less, or the same amount.
Time	Topic addressed at other grade levels.	**K.GM.3 Tell time as it relates to daily life.** **K.GM.3.1** Develop an awareness of simple time concepts using words such as yesterday, today, tomorrow, morning, afternoon, and night within his/her daily life.	**1.GM.3 Tell time to the half and full hour.** **1.GM.3.1** Tell time to the hour and half-hour (analog and digital).

Data & Probability (D)			
Topic	**Pre-Kindergarten (PK)**	**Kindergarten (K)**	**First Grade (1)**
Data Analysis	**PK.D.1 Collect and organize categorical data.** **PK.D.1.1** Collect and organize information about objects and events in the environment. **PK.D.1.2** Use categorical data to create real-object graphs.	**K.D.1 Collect, organize, and interpret categorical data.** **K.D.1.1** Collect and sort information about objects and events in the environment. **K.D.1.2** Use categorical data to create real-object and picture graphs. **K.D.1.3** Draw conclusions from real-object and picture graphs.	**1.D.1 Collect, organize, and interpret categorical and numerical data.** **1.D.1.1** Collect, sort, and organize data in up to three categories using representations (e.g., tally marks, tables, Venn diagrams). **1.D.1.2** Use data to create picture and bar-type graphs to demonstrate one-to-one correspondence. **1.D.1.3** Draw conclusions from picture and bar-type graphs.

Number & Operations (N)			
Topic	**Second Grade (2)**	**Third Grade (3)**	**Fourth Grade (4)**
Quantity	**2.N.1 Compare and represent whole numbers up to 1,000 with an emphasis on place value and equality.** **2.N.1.1** Read, write, discuss, and represent whole numbers up to 1,000. Representations may include numerals, words, pictures, tally marks, number lines and manipulatives. **2.N.1.2** Use knowledge of number relationships to locate the position of a given whole number on an open number line up to 100. **2.N.1.3** Use place value to describe whole numbers between 10 and 1,000 in terms of hundreds, tens and ones. Know that 100 is 10 tens, and 1,000 is 10 hundreds. **2.N.1.4** Find 10 more or 10 less than a given three-digit number. Find 100 more or 100 less than a given three-digit number. **2.N.1.5** Recognize when to round numbers to the nearest 10 and 100. **2.N.1.6** Use place value to compare and order whole numbers up to 1,000 using comparative language, numbers, and symbols (e.g., 425 > 276, 73 < 107, page 351 comes after page 350, 753 is between 700 and 800).	**3.N.1 Compare and represent whole numbers up to 100,000 with an emphasis on place value and equality.** **3.N.1.1** Read, write, discuss, and represent whole numbers up to 100,000. Representations may include numerals, expressions with operations, words, pictures, number lines, and manipulatives. **3.N.1.2** Use place value to describe whole numbers between 1,000 and 100,000 in terms of ten thousands, thousands, hundreds, tens and ones, including expanded form. **3.N.1.3** Find 10,000 more or 10,000 less than a given five-digit number. Find 1,000 more or 1,000 less than a given four- or five-digit number. Find 100 more or 100 less than a given four- or five-digit number. **3.N.1.4** Use place value to compare and order whole numbers up to 100,000, using comparative language, numbers, and symbols.	Topic addressed at other grade levels.

Number & Operations (N)			
Topic	**Second Grade (2)**	**Third Grade (3)**	**Fourth Grade (4)**
Operations	**2.N.2 Add and subtract one- and two-digit numbers in real-world and mathematical problems.** **2.N.2.1** Use the relationship between addition and subtraction to generate basic facts up to 20. **2.N.2.2** Demonstrate fluency with basic addition facts and related subtraction facts up to 20. **2.N.2.3** Estimate sums and differences up to 100. **2.N.2.4** Use strategies and algorithms based on knowledge of place value and equality to add and subtract two-digit numbers. **2.N.2.5** Solve real-world and mathematical addition and subtraction problems involving whole numbers up to 2 digits. **2.N.2.6** Use concrete models and structured arrangements, such as repeated addition, arrays and ten frames to develop understanding of multiplication.	**3.N.2 Add and subtract multi-digit whole numbers; multiply with factors up to 10; represent multiplication and division in various ways; Solve real-world and mathematical problems through the representation of related operations.** **3.N.2.1** Represent multiplication facts by using a variety of approaches, such as repeated addition, equal-sized groups, arrays, area models, equal jumps on a number line and skip counting. **3.N.2.2** Demonstrate fluency of multiplication facts with factors up to 10. **3.N.2.3** Use strategies and algorithms based on knowledge of place value and equality to fluently add and subtract multi-digit numbers. **3.N.2.4** Recognize when to round numbers and apply understanding to round numbers to the nearest ten thousand, thousand, hundred, and ten and use compatible numbers to estimate sums and differences. **3.N.2.5** Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results. **3.N.2.6** Represent division facts by using a variety of approaches, such as repeated subtraction, equal sharing and forming equal groups. **3.N.2.7** Recognize the relationship between multiplication and division to represent and solve real-world problems. **3.N.2.8** Use strategies and algorithms based on knowledge of place value, equality and properties of addition and multiplication to multiply a two-digit number by a one-digit number.	**4.N.1 Solve real-world and mathematical problems using multiplication and division.** **4.N.1.1** Demonstrate fluency with multiplication and division facts with factors up to 12. **4.N.1.2** Use an understanding of place value to multiply or divide a number by 10, 100 and 1,000. **4.N.1.3** Multiply 3-digit by 1-digit or a 2-digit by 2-digit whole numbers, using efficient and generalizable procedures and strategies, based on knowledge of place value, including but not limited to standard algorithms. **4.N.1.4** Estimate products of 3-digit by 1-digit or 2-digit by 2-digit whole numbers using rounding, benchmarks and place value to assess the reasonableness of results. Explore larger numbers using technology to investigate patterns. **4.N.1.5** Solve multi-step real-world and mathematical problems requiring the use of addition, subtraction, and multiplication of multi-digit whole numbers. Use various strategies, including the relationship between operations, the use of appropriate technology, and the context of the problem to assess the reasonableness of results. **4.N.1.6** Use strategies and algorithms based on knowledge of place value, equality and properties of operations to divide 3-digit dividend by 1-digit whole number divisors. (e.g., mental strategies, standard algorithms, partial quotients, repeated subtraction, the commutative, associative, and distributive properties). **4.N.1.7** Determine the unknown addend(s) or factor(s) in equivalent and non-equivalent expressions. (e.g., $5 + 6 = 4 + \square$, $3 \times 8 < 3 \times \square$).

Number & Operations (N)			
Topic	**Second Grade (2)**	**Third Grade (3)**	**Fourth Grade (4)**
Fractions	**2.N.3 Explore the foundational ideas of fractions.** **2.N.3.1** Identify the parts of a set and area that represent fractions for halves, thirds, and fourths. **2.N.3.2** Construct equal-sized portions through fair sharing including length, set, and area models for halves, thirds, and fourths.	**3.N.3 Understand meanings and uses of fractions in real-world and mathematical situations**. **3.N.3.1** Read and write fractions with words and symbols. **3.N.3.2** Construct fractions using length, set, and area models. **3.N.3.3** Recognize unit fractions and use them to compose and decompose fractions related to the same whole. Use the numerator to describe the number of parts and the denominator to describe the number of partitions. **3.N.3.4** Use models and number lines to order and compare fractions that are related to the same whole.	**4.N.2 Represent and compare fractions and decimals in real-world and mathematical situations; use place value to understand how decimals represent quantities**. **4.N.2.**1 Represent and rename equivalent fractions using fraction models (e.g. parts of a set, area models, fraction strips, number lines). **4.N.2.2** Use benchmark fractions ($0, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, 1$) to locate additional fractions on a number line. Use models to order and compare whole numbers and fractions less than and greater than one using comparative language and symbols. **4.N.2.3** Decompose a fraction in more than one way into a sum of fractions with the same denominator using concrete and pictorial models and recording results with symbolic representations (e.g., $\frac{3}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$). **4.N.2.4** Use fraction models to add and subtract fractions with like denominators in real-world and mathematical situations. **4.N.2.5** Represent tenths and hundredths with concrete models, making connections between fractions and decimals. **4.N.2.6** Represent, read and write decimals up to at least the hundredths place in a variety of contexts including money. **4.N.2.7** Compare and order decimals and whole numbers using place value, a number line and models such as grids and base 10 blocks. **4.N.2.8** Compare benchmark fractions ($\frac{1}{4}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$) and decimals (0.25, 0.50, 0.75) in real-world and mathematical situations.
Money	**2.N.4 Determine the value of a set of coins**. **2.N.4.1** Determine the value of a collection(s) of coins up to one dollar using the cent symbol. **2.N.4.2** Use a combination of coins to represent a given amount of money up to one dollar.	**3.N.4 Determine the value of a set of coins or bills.** **3.N.4.1** Use addition to determine the value of a collection of coins up to one dollar using the cent symbol and a collection of bills up to twenty dollars. **3.N.4.2** Select the fewest number of coins for a given amount of money up to one dollar.	**4.N.3 Determine the value of coins in order to solve monetary transactions.** **4.N.3.1** Given a total cost (whole dollars up to \$20 or coins) and amount paid (whole dollars up to \$20 or coins), find the change required in a variety of ways. Limited to whole dollars up to \$20 or sets of coins.

Algebraic Reasoning & Algebra (A)			
Topic	**Second Grade (2)**	**Third Grade (3)**	**Fourth Grade (4)**
Patterns	**2.A.1 Describe the relationship found in patterns to solve real-world and mathematical problems.** **2.A.1.1** Represent, create, describe, complete, and extend growing and shrinking patterns with quantity and numbers in a variety of real-world and mathematical contexts. **2.A.1.2** Represent and describe repeating patterns involving shapes in a variety of contexts.	**3.A.1 Describe and create representations of numerical and geometric patterns.** **3.A.1.1** Create, describe, and extend patterns involving addition, subtraction, or multiplication to solve problems in a variety of contexts. **3.A.1.2** Describe the rule (single operation) for a pattern from an input/output table or function machine involving addition, subtraction, or multiplication. **3.A.1.3** Explore and develop visual representations of growing geometric patterns and construct the next steps.	**4.A.1 Use multiple representations of patterns to solve real-world and mathematical problems.** **4.A.1.1** Create an input/output chart or table to represent or extend a numerical pattern. **4.A.1.2** Describe the single operation rule for a pattern from an input/output table or function machine involving any operation of a whole number. **4.A.1.3** Create growth patterns involving geometric shapes and define the single operation rule of the pattern.
Number Sentences	**2.A.2 Use number sentences involving unknowns to represent and solve real-world and mathematical problems.** **2.A.2.1** Use objects and number lines to represent number sentences. **2.A.2.2** Generate real-world situations to represent number sentences and vice versa. **2.A.2.3** Apply commutative and identity properties and number sense to find values for unknowns that make number sentences involving addition and subtraction true or false.	**3.A.2 Use number sentences involving multiplication and unknowns to represent and solve real-world and mathematical problems.** **3.A.2.1** Find unknowns represented by symbols in arithmetic problems by solving one-step open sentences (equations) and other problems involving addition, subtraction, and multiplication. Generate real-world situations to represent number sentences. **3.A.2.2** Recognize, represent and apply the number properties (commutative, identity, and associative properties of addition and multiplication) using models and manipulatives to solve problems.	**4.A.2 Use multiplication and division with unknowns to create number sentences representing a given problem situation.** **4.A.2.1** Use number sense, properties of multiplication and the relationship between multiplication and division to solve problems and find values for the unknowns represented by letters and symbols that make number sentences true. **4.A.2.2** Solve for unknowns in problems by solving open sentences (equations) and other problems involving addition, subtraction, multiplication, or division with whole numbers. Use real-world situations to represent number sentences and vice versa.

Geometry & Measurement (GM)			
Topic	**Second Grade (2)**	**Third Grade (3)**	**Fourth Grade (4)**
Geometry	**2.GM.1 Analyze attributes of two-dimensional figures and develop generalizations about their properties.** **2.GM.1.1** Recognize trapezoids and hexagons. **2.GM.1.2** Describe, compare, and classify two-dimensional figures according to their geometric attributes. **2.GM.1.3** Compose two-dimensional shapes using triangles, squares, hexagons, trapezoids, and rhombi. **2.GM.1.4** Recognize right angles and classify angles as smaller or larger than a right angle.	**3.GM.1 Use geometric attributes to describe and create shapes in various contexts.** **3.GM.1.1** Sort three-dimensional shapes based on attributes. **3.GM.1.2** Build a three-dimensional figure using unit cubes when picture/shape is shown. **3.GM.1.3** Classify angles as acute, right, obtuse, and straight.	**4.GM.1 Name, describe, classify, and construct polygons and three-dimensional figures.** **4.GM.1.1** Identify points, lines, line segments, rays, angles, endpoints, and parallel and perpendicular lines in various contexts. **4.GM.1.2** Describe, classify, and sketch quadrilaterals, including squares, rectangles, trapezoids, rhombuses, parallelograms, and kites. Recognize quadrilaterals in various contexts. **4.GM.1.3** Given two three-dimensional shapes, identify similarities, and differences.
Measurement	**2.GM.2 Understand length as a measurable attribute and explore capacity.** **2.GM.2.1** Explain the relationship between the size of the unit of measurement and the number of units needed to measure the length of an object. **2.GM.2.2** Explain the relationship between length and the numbers on a ruler by using a ruler to measure lengths to the nearest whole unit. **2.GM.2.3** Explore how varying shapes and styles of containers can have the same capacity.	**3.GM.2 Understand measurable attributes of real-world and mathematical objects using various tools.** **3.GM.2.1** Find perimeter of polygon, given whole number lengths of the sides, in real-world and mathematical situations. **3.GM.2.2** Develop and use formulas to determine the area of rectangles. Justify why length and width are multiplied to find the area of a rectangle by breaking the rectangle into one unit by one unit squares and viewing these as grouped into rows and columns. **3.GM.2.3** Choose an appropriate measurement instrument and measure the length of objects to the nearest whole centimeter or meter. **3.GM.2.4** Choose an appropriate measurement instrument and measure the length of objects to the nearest whole yard, whole foot, or half inch. **3.GM.2.5** Using common benchmarks, estimate the lengths (customary and metric) of a variety of objects. **3.GM.2.6** Use an analog thermometer to determine temperature to the nearest degree in Fahrenheit and Celsius. **3.GM.2.7** Count cubes systematically to identify the number of cubes needed to pack the whole or half of a three-dimensional structure. **3.GM.2.8** Find the area of two-dimensional figures by counting total number of same size unit squares that fill the shape without gaps or overlaps.	**4.GM.2 Understand angle, length, and area as measurable attributes of real-world and mathematical objects. Use various tools to measure angles, length, area, and volume.** **4.GM.2.1** Measure angles in geometric figures and real-world objects with a protractor or angle ruler. **4.GM.2.2** Find the area of polygons that can be decomposed into rectangles. **4.GM.2.3** Using a variety of tools and strategies, develop the concept that the volume of rectangular prisms with whole-number edge lengths can be found by counting the total number of same-sized unit cubes that fill a shape without gaps or overlaps. Use appropriate measurements such as cm^3. **4.GM.2.4** Choose an appropriate instrument and measure the length of an object to the nearest whole centimeter or quarter-inch. **4.GM.2.5** Solve problems that deal with measurements of length, when to use liquid volumes, when to use mass, temperatures above zero and money using addition, subtraction, multiplication, or division as appropriate (customary and metric).

Geometry & Measurement (GM)			
Topic	**Second Grade (2)**	**Third Grade (3)**	**Fourth Grade (4)**
Time	**2.GM.3 Tell time to the quarter hour.** **2.GM.3.1** Read and write time to the quarter-hour on an analog and digital clock. Distinguish between a.m. and p.m.	**3.GM.3 Tell time to the nearest 5-minutes and solve problems.** **3.GM.3.1** Read and write time to the nearest 5-minute (analog and digital). **3.GM.3.2** Determine the solutions to problems involving addition and subtraction of time in intervals of 5 minutes, up to one hour, using pictorial models, number line diagrams, or other tools.	**4.GM.3 Determine elapsed time and convert between units of time.** **4.GM.3.1** Determine elapsed time. **4.GM.3.2** Solve problems involving the conversion of one measure of time to another.

Data & Probability (D)			
Topic	**Second Grade (2)**	**Third Grade (3)**	**Fourth Grade (4)**
Data Analysis	**2.D.1 Collect, organize, and interpret data.** **2.D.1.1** Explain that the length of a bar in a bar graph or the number of objects in a picture graph represents the number of data points for a given category. **2.D.1.2** Organize a collection of data with up to four categories using pictographs and bar graphs with intervals of 1s, 2s, 5s or 10s. **2.D.1.3** Write and solve one-step word problems involving addition or subtraction using data represented within pictographs and bar graphs with intervals of one. **2.D.1.4** Draw conclusions and make predictions from information in a graph.	**3.D.1 Summarize, construct, and analyze data.** **3.D.1.1** Summarize and construct a data set with multiple categories using a frequency table, line plot, pictograph, and/or bar graph with scaled intervals. **3.D.1.2** Solve one- and two-step problems using categorical data represented with a frequency table, pictograph, or bar graph with scaled intervals.	**4.D.1 Collect, organize, and analyze data.** **4.D.1.1** Represent data on a frequency table or line plot marked with whole numbers and fractions using appropriate titles, labels, and units. **4.D.1.2** Use tables, bar graphs, timelines, and Venn diagrams to display data sets. The data may include benchmark fractions or decimals ($\frac{1}{4}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$, 0.25, 0.50, 0.75). **4.D.1.3** Solve one- and two-step problems using data in whole number, decimal, or fraction form in a frequency table and line plot.

Number & Operations (N)			
Fifth Grade (5)	**Sixth Grade (6)**	**Seventh Grade (7)**	**Pre-Algebra (PA)**
5.N.1 Divide multi-digit numbers and solve real-world and mathematical problems using arithmetic. **5.N.1.1** Estimate solutions to division problems in order to assess the reasonableness of results. **5.N.1.2** Divide multi-digit numbers, by one- and two-digit divisors, using efficient and generalizable procedures, based on knowledge of place value, including standard algorithms. **5.N.1.3** Recognize that quotients can be represented in a variety of ways, including a whole number with a remainder, a fraction or mixed number, or a decimal and consider the context in which a problem is situated to select and interpret the most useful form of the quotient for the solution. **5.N.1.4** Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers. Use various strategies, including the inverse relationships between operations, the use of technology, and the context of the problem to assess the reasonableness of results. **5.N.2 Read, write, represent, and compare fractions and decimals; recognize and write equivalent fractions; convert between fractions and decimals; use fractions and decimals in real-world and mathematical situations.** **5.N.2.1** Represent decimal fractions (e.g., $\frac{1}{10}, \frac{1}{100}$) using a variety of models (e.g., 10 by 10 grids, rational number wheel, base-ten blocks, meter stick) and make connections between fractions and decimals.	**6.N.1 Read, write, and represent integers and rational numbers expressed as fractions, decimals, percents, and ratios; write positive integers as products of factors; use these representations in real-world and mathematical situations**. **6.N.1.1** Represent integers with counters and on a number line and rational numbers on a number line, recognizing the concepts of opposites, direction, and magnitude; use integers and rational numbers in real-world and mathematical situations, explaining the meaning of 0 in each situation. **6.N.1.2** Compare and order positive rational numbers, represented in various forms, or integers using the symbols <, >, and =. **6.N.1.3** Explain that a percent represents parts "out of 100" and ratios "to 100." **6.N.1.4** Determine equivalencies among fractions, decimals, and percents. Select among these representations to solve problems. **6.N.1.5** Factor whole numbers and express prime and composite numbers as a product of prime factors with exponents. **6.N.1.6** Determine the greatest common factors and least common multiples. Use common factors and multiples to calculate with fractions, find equivalent fractions, and express the sum of two-digit numbers with a common factor using the distributive property. **6.N.2 Add and subtract integers in order to solve real-world and mathematical problems.** **6.N.2.1** Estimate solutions to addition and subtraction of integers problems in order to assess the reasonableness of results.	**7.N.1 Read, write, represent, and compare rational numbers, expressed as integers, fractions, and decimals.** **7.N.1.1** Know that every rational number can be written as the ratio of two integers or as a terminating or repeating decimal. **7.N.1.2** Compare and order rational numbers expressed in various forms using the symbols <, >, and =. **7.N.1.3** Recognize and generate equivalent representations of rational numbers, including equivalent fractions. **7.N.2 Calculate with integers and rational numbers, with and without positive integer exponents, to solve real-world and mathematical problems; explain the relationship between absolute value of a rational number and the distance of that number from zero.** **7.N.2.1** Estimate solutions to multiplication and division of integers in order to assess the reasonableness of results. **7.N.2.2** Illustrate multiplication and division of integers using a variety of representations. **7.N.2.3** Solve real-world and mathematical problems involving addition, subtraction, multiplication and division of rational; use efficient and generalizable procedures including but not limited to standard algorithms. **7.N.2.4** Raise integers to positive integer exponents. **7.N.2.5** Solve real-world and mathematical problems involving calculations with rational numbers and positive integer exponents. **7.N.2.6** Explain the relationship between the absolute value of a rational number	**PA.N.1 Read, write, compare, classify, and represent real numbers and use them to solve problems in various contexts.** **PA.N.1.1** Develop and apply the properties of integer exponents, including $a^0 = 1$ (with $a \neq 0$), to generate equivalent numerical and algebraic expressions. **PA.N.1.2** Express and compare approximations of very large and very small numbers using scientific notation. **PA.N.1.3** Multiply and divide numbers expressed in scientific notation, express the answer in scientific notation. **PA.N.1.4** Classify real numbers as rational or irrational. Explain why the rational number system is closed under addition and multiplication and why the irrational system is not. Explain why the sum of a rational number and an irrational number is irrational; and the product of a non-zero rational number and an irrational number is irrational. **PA.N.1.5** Compare real numbers; locate real numbers on a number line. Identify the square root of a perfect square to 400 or, if it is not a perfect square root, locate it as an irrational number between two consecutive positive integers.

5.N.2.2 Represent, read and write decimals using place value to describe decimal numbers including fractional numbers as small as thousandths and whole numbers as large as millions. **5.N.2.3** Compare and order fractions and decimals, including mixed numbers and fractions less than one, and locate on a number line. **5.N.2.4** Recognize and generate equivalent decimals, fractions, mixed numbers, and fractions less than one in various contexts. **5.N.3 Add and subtract fractions with like and unlike denominators, mixed numbers and decimals to solve real-world and mathematical problems.** **5.N.3.1** Estimate sums and differences of fractions with like and unlike denominators, mixed numbers, and decimals to assess the reasonableness of the results. **5.N.3.2** Illustrate addition and subtraction of fractions with like and unlike denominators, mixed numbers, and decimals using a variety of representations (e.g., fraction strips, area models, number lines, fraction rods). **5.N.3.3** Add and subtract fractions with like and unlike denominators, mixed numbers, and decimals, using efficient and generalizable procedures, including but not limited to standard algorithms in order to solve real-world and mathematical problems including those involving money, measurement, geometry, and data. **5.N.3.4** Find 0.1 more than a number and 0.1 less than a number. Find 0.01 more than a number and 0.01 less than a	**6.N.2.2** Illustrate addition and subtraction integers using a variety of representations. **6.N.2.3** Add and subtract integers; use efficient and generalizable procedures including but not limited to standard algorithms. **6.N.3 Understand the concept of ratio and its relationship to fractions and percents and to the multiplication and division of whole numbers. Use ratios to solve real-world and mathematical problems.** **6.N.3.1** Identify and use ratios to compare quantities. Recognize that multiplicative comparison and additive comparison are different. **6.N.3.2** Determine the unit rate for ratios. **6.N.3.3** Apply the relationship between ratios, equivalent fractions and percents to solve problems in various contexts, including those involving mixture and concentrations. **6.N.3.4** Use multiplicative reasoning and representations to solve ratio and unit rate problems. **6.N.4 Multiply and divide decimals, fractions, and mixed numbers; solve real-world and mathematical problems with rational numbers.** **6.N.4.1** Estimate solutions to problems with whole numbers, decimals, fractions, and mixed numbers and use the estimates to assess the reasonableness of results in the context of the problem. **6.N.4.2** Illustrate multiplication and division of fractions and decimals to show connections to fractions, whole number multiplication, and inverse relationships. **6.N.4.3** Multiply and divide fractions and decimals, using efficient and generalizable	and the distance of that number from zero on a number line. Use the symbol for absolute value.	

number. Find 0.001 more than a number and 0.001 less than a number.	procedures. **6.N.4.4** Solve and interpret real-world and mathematical problems including those involving money, measurement, geometry, and data requiring arithmetic with decimals, fractions and mixed numbers.		

Algebraic Reasoning & Algebra (A)			
Fifth Grade (5)	**Sixth Grade (6)**	**Seventh Grade (7)**	**Pre-Algebra (PA)**
5.A.1 Describe and graph patterns of change created through numerical patterns. **5.A.1.1** Use tables and rules of up to two operations to describe patterns of change and make predictions and generalizations about real-world and mathematical problems. **5.A.1.2** Use a rule or table to represent ordered pairs of whole numbers and graph these ordered pairs on a coordinate plane, identifying the origin and axes in relation to the coordinates. **5.A.2 Understand and interpret expressions, equations, and inequalities involving variables and whole numbers, and use them to represent and evaluate real-world and mathematical problems.** **5.A.2.1** Generate equivalent numerical expressions and solve problems involving whole numbers by applying the commutative, associative, and distributive properties and order of operations (no exponents). **5.A.2.2** Determine whether an equation or inequality involving a variable is true or false for a given value of the variable.	**6.A.1 Recognize and represent relationships between varying quantities; translate from one representation to another; use patterns, tables, graphs and rules to solve real-world and mathematical problems.** **6.A.1.1** Plot integer- and rational-valued (limited to halves and fourths) ordered-pairs as coordinates in all four quadrants and recognize the reflective relationships among coordinates that differ only by their signs. **6.A.1.2** Represent relationships between two varying quantities involving no more than two operations with rules, graphs, and tables; translate between any two of these representations. **6.A.1.3** Use and evaluate variables in expressions, equations, and inequalities that arise from various contexts, including determining when or if, for a given value of the variable, an equation or inequality involving a variable is true or false. **6.A.2 Use properties of arithmetic to generate equivalent numerical expressions and evaluate expressions involving positive rational numbers.** **6.A.2.1** Generate equivalent expressions and evaluate expressions involving	**7.A.1 Understand the concept of proportionality in real-world and mathematical situations, and distinguish between proportional and other relationships.** **7.A.1.1** Describe that the relationship between two variables, x and y, is proportional if it can be expressed in the form $\frac{y}{x} = k$ or $y = kx$; distinguish proportional relationships from other relationships, including inversely proportional relationships ($xy = k$ or $y = \frac{k}{x}$). **7.A.1.2** Recognize that the graph of a proportional relationship is a line through the origin and the coordinate $(1, r)$, where both r and the slope are the unit rate (constant of proportionality, k). **7.A.2 Recognize proportional relationships in real-world and mathematical situations; represent these and other relationships with tables, verbal descriptions, symbols, and graphs; solve problems involving proportional relationships and interpret results in the original context.** **7.A.2.1** Represent proportional relationships with tables, verbal descriptions, symbols, and graphs;	**PA.A.1 Understand the concept of function in real-world and mathematical situations, and distinguish between linear and nonlinear functions.** **PA.A.1.1** Recognize that a function is a relationship between an independent variable and a dependent variable in which the value of the independent variable determines the value of the dependent variable. **PA.A.1.2** Use linear functions to represent and explain real-world and mathematical situations. **PA.A.1.3** Identify a function as linear if it can be expressed in the form $y = mx + b$ or if its graph is a straight line. **PA.A.2 Recognize linear functions in real-world and mathematical situations; represent linear functions and other function with tables, verbal descriptions, symbols, and graphs; solve problems involving linear functions and interpret results in the original context.** **PA.A.2.1** Represent linear functions with tables, verbal descriptions, symbols, and graphs; translate from one representation to another. **PA.A.2.2** Identify, describe, and analyze linear relationships between two variables.

Algebraic Reasoning & Algebra (A)			
Fifth Grade (5)	**Sixth Grade (6)**	**Seventh Grade (7)**	**Pre-Algebra (PA)**
5.A.2.3 Evaluate expressions involving variables when values for the variables are given.	positive rational numbers by applying the commutative, associative, and distributive properties and order of operations to solve real-world and mathematical problems. **6.A.3 Use equations and inequalities to represent real-world and mathematical problems and use the idea of maintaining equality to solve equations. Interpret solutions in the original context.** **6.A.3.1** Represent real-world or mathematical situations using expressions, equations and inequalities involving variables and rational numbers. **6.A.3.2** Use number sense and properties of operations and equality to solve real-world and mathematical problems involving equations in the form $x + p = q$ and $px = q$, where x, p, and q are nonnegative rational numbers. Graph the solution on a number line, interpret the solution in the original context, and assess the reasonableness of the solution.	translate from one representation to another. Determine and compare the unit rate (constant of proportionality, slope, or rate of change) given any of these representations. **7.A.2.2** Solve multi-step problems involving proportional relationships involving distance-time, percent increase or decrease, discounts, tips, unit pricing, similar figures, and other real-world and mathematical situations. **7.A.2.3** Use proportional reasoning to solve real-world and mathematical problems involving ratios. **7.A.2.4** Use proportional reasoning to assess the reasonableness of solutions. **7.A.3 Represent and solve linear equations and inequalities.** **7.A.3.1** Write and solve problems leading to linear equations with one variable in the form $px + q = r$ and $p(x+q) = r$, where p,q,and r are rational numbers. **7.A.3.2** Represent, write, solve, and graph problems leading to linear inequalities with one variable in the form $x+p>q$ and $x+p<q$, where p, and q are nonnegative rational numbers. **7.A.3.3** Represent real-world or mathematical situations using equations and inequalities involving variables and rational numbers. **7.A.4 Use order of operations and properties to generate equivalent numerical and algebraic expressions containing rational numbers and grouping symbols; evaluate such expressions.** **7.A.4.1** Use properties of operations (limited to associative, commutative, and distributive) to generate equivalent	**PA.A.2.3** Identify graphical properties of linear functions including slope and intercepts. Know that the slope equals the rate of change, and that the *y*-intercept is zero when the function represents a proportional relationship. **PA.A.2.4** Predict the effect on the graph of a linear function when the slope or *y*-intercept changes. Use appropriate tools to examine these effects. **PA.A.2.5** Solve problems involving linear functions and interpret results in the original context. **PA.A.3 Generate equivalent numerical and algebraic expressions and use algebraic properties to evaluate expressions**. **PA.A.3.1** Use substitution to simplify and evaluate algebraic expressions. **PA.A.3.2** Justify steps in generating equivalent expressions by identifying the properties used, including the properties of operations (associative, commutative, and distributive laws) and the order of operations, including grouping symbols. **PA.A.4 Represent real-world and mathematical problems using equations and inequalities involving linear expressions. Solve and graph equations and inequalities symbolically and graphically. Interpret solutions in the original context.** **PA.A.4.1** Illustrate, write, and solve mathematical and real-world problems using linear equations with one variable with one solution, infinitely many solutions, or no solutions. Interpret solutions in the original context. **PA.A.4.2** Represent, write, solve, and graph problems leading to linear

		numerical and algebraic expressions containing rational numbers, grouping symbols and whole number exponents. **7.A.4.2** Apply understanding of order of operations and grouping symbols when using calculators and other technologies.	inequalities with one variable in the form $px + q > r$ and $px + q < r$, where p, q, and r are rational numbers. **PA.A.4.3** Represent real-world situations using equations and inequalities involving one variable.

Geometry & Measurement (GM)

Fifth Grade (5)	Sixth Grade (6)	Seventh Grade (7)	Pre-Algebra (PA)
5.GM.1 Describe, classify, and draw representations of two- and three-dimensional figures. **5.GM.1.1** Describe, classify and construct triangles, including equilateral, right, scalene, and isosceles triangles. Recognize triangles in various contexts. **5.GM.1.2** Describe and classify three-dimensional figures including cubes, rectangular prisms, and pyramids by the number of edges, faces or vertices as well as the shapes of faces. **5.GM.1.3** Recognize and draw a net for a three-dimensional figure (e.g., cubes, rectangular prisms, pyramids). **5.GM.2 Understand how the volume of rectangular prisms and surface area of shapes with polygonal faces are determined by the dimensions of the object and that shapes with varying dimensions can have equivalent values of surface area or volume.** **5.GM.2.1** Recognize that the volume of rectangular prisms can be determined by the number of cubes (n) and by the product of the dimensions of the prism ($a \times b \times c = n$). Know that rectangular prisms of different dimensions (p, q, and r) can have the same volume if $a \times b \times c = p \times q \times r = n$.	**6.GM.1 Calculate area of squares, parallelograms, and triangles to solve real-world and mathematical problems.** **6.GM.1.1** Develop and use formulas for the area of squares and parallelograms using a variety of methods including but not limited to the standard algorithm. **6.GM.1.2** Develop and use formulas to determine the area of triangles. **6.GM.1.3** Find the area of right triangles, other triangles, special quadrilaterals, and polygons that can be decomposed into triangles and other shapes to solve real-world and mathematical problems. **6.GM.2 Understand and use relationships between angles in geometric figures**. **6.GM.2.1** Solve problems using the relationships between the angles (vertical, complementary, and supplementary) formed by intersecting lines. **6.GM.2.2** Develop and use the fact that the sum of the interior angles of a triangle is 180° to determine missing angle measures in a triangle. **6.GM.3 Choose appropriate units of measurement and use ratios to convert within measurement systems to solve real-world and mathematical problems.** **6.GM.3.1** Estimate weights, capacities	**7.GM.1 Develop and understand the concept of surface area and volume of rectangular prisms.** **7.GM.1.1** Using a variety of tools and strategies, develop the concept that surface area of a rectangular prism with rational-valued edge lengths can be found by wrapping the figure with same-sized square units without gaps or overlap. Use appropriate measurements such as cm^2. **7.GM.1.2** Using a variety of tools and strategies, develop the concept that the volume of rectangular prisms with rational-valued edge lengths can be found by counting the total number of same-sized unit cubes that fill a shape without gaps or overlaps. Use appropriate measurements such as cm^3. **7.GM.2 Determine the area of trapezoids and area and perimeter of composite figures.** **7.GM.2.1** Develop and use the formula to determine the area of a trapezoid to solve problems. **7.GM.2.2** Find the area and perimeter of composite figures to solve real-world and mathematical problems. **7.GM.3 Use reasoning with proportions**	**PA.GM.1 Solve problems involving right triangles using the Pythagorean Theorem**. **PA.GM.1.1** Informally justify the Pythagorean Theorem using measurements, diagrams or dynamic software and use the Pythagorean Theorem to solve problems in two and three dimensions involving right triangles. **PA.GM.1.2** Use the Pythagorean Theorem to find the distance between any two points in a coordinate plane. **PA.GM.2 Calculate surface area and volume of three-dimensional figures.** **PA.GM.2.1** Calculate the surface area of a rectangular prism using decomposition or nets. Use appropriate measurements such as cm^2. **PA.GM.2.2** Calculate the surface area of a cylinder, in terms of π and using approximations for π, using decomposition or nets. Use appropriate measurements such as cm^2. **PA.GM.2.3** Develop and use the formulas $V = lwh$ and $V = Bh$ to determine the volume of rectangular prisms. Justify why base area (B) and height (h) are multiplied to find the volume of a rectangular prism. Use appropriate measurements such as cm^3. **PA.GM.2.4** Develop and use the formulas

Geometry & Measurement (GM)			
Fifth Grade (5)	**Sixth Grade (6)**	**Seventh Grade (7)**	**Pre-Algebra (PA)**
5.GM.2.2 Recognize that the surface area of a three-dimensional figure with rectangular faces with whole numbered edges can be found by finding the area of each component of the net of that figure. Know that three-dimensional shapes of different dimensions can have the same surface area. **5.GM.2.3** Find the perimeter of polygons and create arguments for reasonable values for the perimeter of shapes that include curves. **5.GM.3 Understand angle and length as measurable attributes of real-world and mathematical objects. Use various tools to measure angles and lengths.** **5.GM.3.1** Measure and compare angles according to size. **5.GM.3.2** Choose an appropriate instrument and measure the length of an object to the nearest whole centimeter or 1/16-inch. **5.GM.3.3** Recognize and use the relationship between inches, feet, and yards to measure and compare objects. **5.GM.3.4** Recognize and use the relationship between millimeters, centimeters, and meters to measure and compare objects.	and geometric measurements using benchmarks in customary and metric measurement systems with appropriate units. **6.GM.3.2** Solve problems in various real-world and mathematical contexts that require the conversion of weights, capacities, geometric measurements, and time within the same measurement systems using appropriate units. **6.GM.4 Use translations, reflections, and rotations to establish congruency and understand symmetries.** **6.GM.4.1** Predict, describe, and apply translations (slides), reflections (flips), and rotations (turns) to a two-dimensional figure. **6.GM.4.2** Recognize that translations, reflections, and rotations preserve congruency and use them to show that two figures are congruent. **6.GM.4.3** Use distances between two points that are either vertical or horizontal to each other (not requiring the distance formula) to solve real-world and mathematical problems about congruent two-dimensional figures. **6.GM.4.4** Identify and describe the line(s) of symmetry in two-dimensional shapes.	**and ratios to determine measurements, justify formulas, and solve real-world and mathematical problems involving circles and related geometric figures.** **7.GM.3.1** Demonstrate an understanding of the proportional relationship between the diameter and circumference of a circle and that the unit rate (constant of proportionality) is π and can be approximated by rational numbers such as $\frac{22}{7}$ and 3.14. **7.GM.3.2** Calculate the circumference and area of circles to solve problems in various contexts, in terms of π and using approximations for π. **7.GM.4 Analyze the effect of dilations, translations, and reflections on the attributes of two-dimensional figures on and off the coordinate plane.** **7.GM.4.1** Describe the properties of similarity, compare geometric figures for similarity, and determine scale factors resulting from dilations. **7.GM.4.2** Apply proportions, ratios, and scale factors to solve problems involving scale drawings and determine side lengths and areas of similar triangles and rectangles. **7.GM.4.3** Graph and describe translations and reflections of figures on a coordinate plane and determine the coordinates of the vertices of the figure after the transformation.	$V = \pi r^2 h$ and $V = Bh$ to determine the volume of right cylinders, in terms of π and using approximations for π. Justify why base area (B) and height (h) are multiplied to find the volume of a right cylinder. Use appropriate measurements such as cm^3.

Data & Probability (D)			
Fifth Grade (5)	**Sixth Grade (6)**	**Seventh Grade (7)**	**Pre-Algebra (PA)**
5.D.1 Display and analyze data to find the range and measures of central tendency (mean, median, and mode). **5.D.1.1** Find the measures of central tendency (mean, median, or mode) and range of a set of data. Understand that the mean is a "leveling out" or central balance point of the data. **5.D.1.2** Create and analyze line and double-bar graphs with whole numbers, fractions, and decimals increments.	**6.D.1 Display and analyze data.** **6.D.1.1** Calculate the mean, median, and mode for a set of real-world data. **6.D.1.2** Explain and justify which measure of central tendency (mean, median, or mode) would provide the most descriptive information for a given set of data. **6.D.1.3** Create and analyze box and whisker plots observing how each segment contains one quarter of the data. **6.D.2 Use probability to solve real-world and mathematical problems; represent probabilities using fractions and decimals.** **6.D.2.1** Represent possible outcomes using a probability continuum from impossible to certain. **6.D.2.2** Determine the sample space for a given experiment and determine which members of the sample space are related to certain events. Sample space may be determined by the use of tree diagrams, tables or pictorial representations. **6.D.2.3** Demonstrate simple experiments in which the probabilities are known and compare the resulting relative frequencies with the known probabilities, recognizing that there may be differences between the two results.	**7.D.1 Display and analyze data in a variety of ways.** **7.D.1.1** Design simple experiments, collect data and calculate measures of central tendency (mean, median, and mode) and spread (range). Use these quantities to draw conclusions about the data collected and make predictions. **7.D.1.2** Use reasoning with proportions to display and interpret data in circle graphs (pie charts) and histograms. Choose the appropriate data display and know how to create the display using a spreadsheet or other graphing technology. **7.D.2 Calculate probabilities and reason about probabilities using proportions to solve real-world and mathematical problems.** **7.D.2.1** Determine the theoretical probability of an event using the ratio between the size of the event and the size of the sample space; represent probabilities as percents, fractions and decimals between 0 and 1. **7.D.2.2** Calculate probability as a fraction of sample space or as a fraction of area. Express probabilities as percents, decimals and fractions. **7.D.2.3** Use proportional reasoning to draw conclusions about and predict relative frequencies of outcomes based on probabilities.	**PA.D.1 Display and interpret data in a variety of ways, including using scatterplots and approximate lines of best fit. Use line of best fit and average rate of change to make predictions and draw conclusions about data.** **PA.D.1.1** Describe the impact that inserting or deleting a data point has on the mean and the median of a data set. Know how to create data displays using a spreadsheet and use a calculator to examine this impact. **PA.D.1.2** Explain how outliers affect measures of central tendency. **PA.D.1.3** Collect, display and interpret data using scatterplots. Use the shape of the scatterplot to informally estimate a line of best fit, make statements about average rate of change, and make predictions about values not in the original data set. Use appropriate titles, labels and units. **PA.D.2 Calculate experimental probabilities and reason about probabilities to solve real-world and mathematical problems.** **PA.D.2.1** Calculate experimental probabilities and represent them as percents, fractions and decimals between 0 and 1 inclusive. Use experimental probabilities to make predictions when actual probabilities are unknown. **PA.D.2.2** Determine how samples are chosen (random, limited, biased) to draw and support conclusions about generalizing a sample to a population. **PA.D.2.3** Compare and contrast dependent and independent events.

Number & Operations (N)

Pre-Algebra (PA)	Algebra 1 (A1)	Algebra 2 (A2)
PA.N.1 Read, write, compare, classify, and represent real numbers and use them to solve problems in various contexts. **PA.N.1.1** Develop and apply the properties of integer exponents, including $a^0 = 1$ (with $a \neq 0$), to generate equivalent numerical and algebraic expressions. **PA.N.1.2** Express and compare approximations of very large and very small numbers using scientific notation. **PA.N.1.3** Multiply and divide numbers expressed in scientific notation, express the answer in scientific notation. **PA.N.1.4** Classify real numbers as rational or irrational. Explain why the rational number system is closed under addition and multiplication and why the irrational system is not. Explain why the sum of a rational number and an irrational number is irrational; and the product of a non-zero rational number and an irrational number is irrational. **PA.N.1.5** Compare real numbers; locate real numbers on a number line. Identify the square root of a perfect square to 400 or, if it is not a perfect square root, locate it as an irrational number between two consecutive positive integers.	**A1.N.1 Extend the understanding of number and operations to include square roots and cube roots.** **A1.N.1.1** Write square roots and cube roots of monomial algebraic expressions in simplest radical form. **A1.N.1.2** Add, subtract, multiply, and simplify square roots of monomial algebraic expressions and divide square roots of whole numbers, rationalizing the denominator when necessary.	**A2.N.1 Extend the understanding of number and operations to include complex numbers, matrices, radical expressions, and expressions written with rational exponents.** **A2.N.1.1** Find the value of i^n for any whole number n. **A2.N.1.2** Simplify, add, subtract, multiply, and divide complex numbers. **A2.N.1.3** Use matrices to organize and represent data. Identify the order (dimension) of a matrix, add and subtract matrices of appropriate dimensions, and multiply a matrix by a scalar to create a new matrix to solve problems. **A2.N.1.4** Understand and apply the relationship of rational exponents to integer exponents and radicals to solve problems.

Algebraic Reasoning & Algebra (A)

Pre-Algebra (PA)	Algebra 1 (A1)	Algebra 2 (A2)
PA.A.1 Understand the concept of function in real-world and mathematical situations, and distinguish between linear and nonlinear functions. **PA.A.1.1** Recognize that a function is a relationship between an independent variable and a dependent variable in which the value of the independent variable determines the value of the dependent variable. **PA.A.1.2** Use linear functions to represent and explain real-world and mathematical situations. **PA.A.1.3** Identify a function as linear if it can be expressed in the form $y = mx + b$ or if its graph is a straight line. **PA.A.2 Recognize linear functions in real-world and mathematical situations; represent linear functions and other function with tables, verbal descriptions, symbols, and graphs; solve problems involving linear functions and interpret results in the original context.**	**A1.A.1 Represent and solve mathematical and real-world problems using linear equations, absolute value equations, and systems of equations; interpret solutions in the original context.** **A1.A.1.1** Use knowledge of solving equations with rational values to represent and solve mathematical and real-world problems (e.g., angle measures, geometric formulas, science, or statistics) and interpret the solutions in the original context. **A1.A.1.2** Solve absolute value equations and interpret the solutions in the original context. **A1.A.1.3** Analyze and solve real-world and mathematical problems involving systems of linear equations with a maximum of two variables by graphing (may include graphing calculator or other appropriate technology), substitution, and elimination. Interpret the solutions in the original context.	**A2.A.1 Represent and solve mathematical and real-world problems using nonlinear equations and systems of linear equations; interpret the solutions in the original context.** **A2.A.1.1** Represent real-world or mathematical problems using quadratic equations and solve using various methods (including graphing calculator or other appropriate technology), factoring, completing the square, and the quadratic formula. Find non-real roots when they exist. **A2.A.1.2** Represent real-world or mathematical problems using exponential equations, such as compound interest, depreciation, and population growth, and solve these equations graphically (including graphing calculator or other appropriate technology) or algebraically. **A2.A.1.3** Solve one-variable rational equations and check for extraneous solutions. **A2.A.1.4** Solve polynomial equations with real roots using

Algebraic Reasoning & Algebra (A)

Pre-Algebra (PA)

PA.A.2.1 Represent linear functions with tables, verbal descriptions, symbols, and graphs; translate from one representation to another.
PA.A.2.2 Identify, describe, and analyze linear relationships between two variables.
PA.A.2.3 Identify graphical properties of linear functions including slope and intercepts. Know that the slope equals the rate of change, and that the *y*-intercept is zero when the function represents a proportional relationship.
PA.A.2.4 Predict the effect on the graph of a linear function when the slope or *y*-intercept changes. Use appropriate tools to examine these effects.
PA.A.2.5 Solve problems involving linear functions and interpret results in the original context.

PA.A.3 Generate equivalent numerical and algebraic expressions and use algebraic properties to evaluate expressions.
PA.A.3.1 Use substitution to simplify and evaluate algebraic expressions.
PA.A.3.2 Justify steps in generating equivalent expressions by identifying the properties used, including the properties of operations (associative, commutative, and distributive laws) and the order of operations, including grouping symbols.

PA.A.4 Represent real-world and mathematical problems using equations and inequalities involving linear expressions. Solve and graph equations and inequalities symbolically and graphically. Interpret solutions in the original context.
PA.A.4.1 Illustrate, write, and solve mathematical and real-world problems using linear equations with one variable with one solution, infinitely many solutions, or no solutions. Interpret solutions in the original context.
PA.A.4.2 Represent, write, solve, and graph problems leading to linear inequalities with one variable in the form $px + q > r$ and $px + q < r$, where p, q, and r are rational numbers.
PA.A.4.3 Represent real-world situations using equations and inequalities involving one variable.

Algebra 1 (A1)

A1.A.2 Represent and solve real-world and mathematical problems using linear inequalities, compound inequalities and systems of linear inequalities; interpret solutions in the original context.
A1.A.2.1 Represent relationships in various contexts with linear inequalities; solve the resulting inequalities, graph on a coordinate plane, and interpret the solutions.
A1.A.2.2 Represent relationships in various contexts with compound and absolute value inequalities and solve the resulting inequalities by graphing, and interpreting the solutions on a number line.
A1.A.2.3 Solve systems of linear inequalities with a maximum of two variables; graph and interpret the solutions on a coordinate plane.

A1.A.3 Generate equivalent algebraic expressions and use algebraic properties to evaluate expressions and arithmetic and geometric sequences.
A1.A.3.1 Solve equations involving several variables for one variable in terms of the others.
A1.A.3.2 Simplify polynomial expressions by adding, subtracting, or multiplying.
A1.A.3.3 Factor common monomial factors from polynomial expressions and factor quadratic expressions with a leading coefficient of 1.
A1.A.3.4 Evaluate linear, absolute value, rational, and radical expressions. Include applying a nonstandard operation such as $a \odot b = 2a + b$.
A1.A.3.5 Recognize that arithmetic sequences are linear using equations, tables, graphs, and verbal descriptions. Using the pattern, find the next term.
A1.A.3.6 Recognize that geometric sequences are exponential using equations, tables, graphs and verbal descriptions. Given the formula $f(x) = a(r)^x$, find the next term and define the meaning of a and r within the context of the problem.

A1.A.4 Analyze mathematical change involving linear equations in real-world and mathematical problems.
A1.A.4.1 Calculate and interpret slope and the *x*- and *y*-intercepts of a line using a graph, an equation, two points, or a set of data points to solve real-world and mathematical

Algebra 2 (A2)

various methods and tools that may include factoring, polynomial division, synthetic division, graphing calculators or other appropriate technology.
A2.A.1.5 Solve square root equations with one variable and check for extraneous solutions.
A2.A.1.6 Solve common and natural logarithmic equations using the properties of logarithms.
A2.A.1.7 Solve real-world and mathematical problems that can be modeled using arithmetic or finite geometric sequences or series given the n^{th} terms and sum formulas. Graphing calculators or other appropriate technology may be used.
A2.A.1.8 Represent real-world or mathematical problems using systems of linear equations with a maximum of three variables and solve using various methods that may include substitution, elimination, and graphing (may include graphing calculators or other appropriate technology).
A2.A.1.9 Solve systems of equations containing one linear equation and one quadratic equation using tools that may include graphing calculators or other appropriate technology.

A2.A.2 Represent and analyze mathematical situations and structures using algebraic symbols using various strategies to write equivalent forms of expressions.
A2.A.2.1 Factor polynomial expressions including but not limited to trinomials, differences of squares, sum and difference of cubes, and factoring by grouping using a variety of tools and strategies.
A2.A.2.2 Add, subtract, multiply, divide, and simplify polynomial and rational expressions.
A2.A.2.3 Recognize that a quadratic function has different equivalent representations [$f(x) = ax^2 + bx + c$, $f(x) = a(x-h)^2 + k$, and $f(x) = (x-h)(x-k)$]. Identify and use the representation that is most appropriate to solve real-world and mathematical problems.
A2.A.2.4 Rewrite expressions involving radicals and rational exponents using the properties of exponents.

	problems. **A1.A.4.2** Solve mathematical and real-world problems involving lines that are parallel, perpendicular, horizontal, or vertical. **A1.A.4.3** Express linear equations in slope-intercept, point-slope, and standard forms and convert between these forms. Given sufficient information (slope and *y*-intercept, slope and one-point on the line, two points on the line, *x*- and *y*-intercept, or a set of data points), write the equation of a line. **A1.A.4.4** Translate between a graph and a situation described qualitatively.	

Functions (F)		
Pre-Algebra (PA)	**Algebra 1 (A1)**	**Algebra 2 (A2)**
Strand addressed at other grade levels.	**A1.F.1 Understand functions as descriptions of covariation (how related quantities vary together) in real-world and mathematical problems.** **A1.F.1.1** Distinguish between relations and functions. **A1.F.1.2** Identify the dependent and independent variables as well as the domain and range given a function, equation, or graph. Identify restrictions on the domain and range in real-world contexts. **A1.F.1.3** Write linear functions, using function notation, to model real-world and mathematical situations. **A1.F.1.4** Given a graph modeling a real-world situation, read and interpret the linear piecewise function (excluding step functions). **A1.F.2 Recognize functions and understand that families of functions are characterized by their rate of change.** **A1.F.2.1** Distinguish between linear and nonlinear (including exponential) functions arising from real-world and mathematical situations that are represented in tables, graphs, and equations. Understand that linear functions grow by equal intervals and that exponential functions grow by equal factors over equal intervals. **A1.F.2.2** Recognize the graph of the functions $f(x) = x$ and $f(x) = \|x\|$ and predict the effects of transformations [$f(x+c)$ and $f(x)+c$, where c is a positive or negative constant] algebraically and graphically using various	**A2.F.1 Understand functions as descriptions of covariation (how related quantities vary together).** **A2.F.1.1** Use algebraic, interval, and set notations to specify the domain and range of functions of various types and evaluate a function at a given point in its domain. **A2.F.1.2** Recognize the graphs of exponential, radical (square root and cube root only), quadratic, and logarithmic functions. Predict the effects of transformations [$f(x+c)$, $f(x)+c$, $f(cx)$, and $cf(x)$, where c is a positive or negative real-valued constant] algebraically and graphically, using various methods and tools that may include graphing calculators or other appropriate technology. **A2.F.1.3** Graph a quadratic function. Identify the *x*- and *y*-intercepts, maximum or minimum value, axis of symmetry, and vertex using various methods and tools that may include a graphing calculator o appropriate technology. **A2.F.1.4** Graph exponential and logarithmic functions. Identify asymptotes and *x*- and *y*-intercepts using various methods and tools that may include graphing calculators or other appropriate technology. Recognize exponential decay and growth graphically and algebraically. **A2.F.1.5** Analyze the graph of a polynomial function by identifying the domain, range, intercepts, zeros, relative maxima, relative minima, and intervals of increase and

	methods and tools that may include graphing calculators. **A1.F.3 Represent functions in multiple ways and use the representation to interpret real-world and mathematical problems.** **A1.F.3.1** Identify and generate equivalent representations of linear equations, graphs, tables, and real-world situations. **A1.F.3.2** Use function notation; evaluate a function, including nonlinear, at a given point in its domain algebraically and graphically. Interpret the results in terms of real-world and mathematical problems. **A1.F.3.3** Add, subtract, and multiply functions using function notation.	decrease. **A2.F.1.6** Graph a rational function and identify the *x*- and *y*-intercepts, vertical and horizontal asymptotes, using various methods and tools that may include a graphing calculator or other appropriate technology. (Excluding slant or oblique asymptotes and holes.) **A2.F.1.7** Graph a radical function (square root and cube root only) and identify the *x*- and *y*-intercepts using various methods and tools that may include a graphing calculator or other appropriate technology. **A2.F.1.8** Graph piecewise functions with no more than three branches (including linear, quadratic, or exponential branches) and analyze the function by identifying the domain, range, intercepts, and intervals for which it is increasing, decreasing, and constant. **A2.F.2 Analyze functions through algebraic combinations, compositions, and inverses, if they exist.** **A2.F.2.1** Add, subtract, multiply, and divide functions using function notation and recognize domain restrictions. **A2.F.2.2** Combine functions by composition and recognize that $g(x) = f^{-1}(x)$, the inverse function of $f(x)$, if and only if $f\big(g(x)\big) = g\big(f(x)\big) = x$. **A2.F.2.3** Find and graph the inverse of a function, if it exists, in real-world and mathematical situations. Know that the domain of a function f is the range of the inverse function f^{-1}, and the range of the function f is the domain of the inverse function f^{-1}. **A2.F.2.4** Apply the inverse relationship between exponential and logarithmic functions to convert from one form to another.

Data & Probability (D)

Pre-Algebra (PA)	Algebra 1 (A1)	Algebra 2 (A2)
PA.D.1 Display and interpret data in a variety of ways, including using scatterplots and approximate lines of best fit. Use line of best fit and average rate of change to make predictions and draw conclusions about data. **PA.D.1.1** Describe the impact that inserting or deleting a data point has on the mean and the median of a data set. Know how to create data displays using a spreadsheet and	**A1.D.1 Display, describe, and compare data. For linear relationships, make predictions and assess the reliability of those predictions.** **A1.D.1.1** Describe a data set using data displays, describe and compare data sets using summary statistics, including measures of central tendency, location, and spread. Know how to use calculators, spreadsheets, or other appropriate	**A2.D.1 Display, describe, and compare data. For linear and nonlinear relationships, make predictions and assess the reliability of those predictions.** **A2.D.1.1** Use the mean and standard deviation of a data set to fit it to a normal distribution (bell-shaped curve). **A2.D.1.2** Collect data and use scatterplots to analyze patterns and describe linear, exponential or quadratic

Data & Probability (D)		
Pre-Algebra (PA)	**Algebra 1 (A1)**	**Algebra 2 (A2)**
use a calculator to examine this impact. **PA.D.1.2** Explain how outliers affect measures of central tendency. **PA.D.1.3** Collect, display and interpret data using scatterplots. Use the shape of the scatterplot to informally estimate a line of best fit, make statements about average rate of change, and make predictions about values not in the original data set. Use appropriate titles, labels and units. **PA.D.2 Calculate experimental probabilities and reason about probabilities to solve real-world and mathematical problems.** **PA.D.2.1** Calculate experimental probabilities and represent them as percents, fractions and decimals between 0 and 1 inclusive. Use experimental probabilities to make predictions when actual probabilities are unknown. **PA.D.2.2** Determine how samples are chosen (random, limited, biased) to draw and support conclusions about generalizing a sample to a population. **PA.D.2.3** Compare and contrast dependent and independent events.	technology to display data and calculate summary statistics. **A1.D.1.2** Collect data and use scatterplots to analyze patterns and describe linear relationships between two variables. Using graphing technology, determine regression lines and correlation coefficients; use regression lines to make predictions and correlation coefficients to assess the reliability of those predictions. **A1.D.1.3** Interpret graphs as being discrete or continuous. **A1.D.2 Calculate probabilities and apply probability concepts.** **A1.D.2.1** Select and apply counting procedures, such as the multiplication and addition principles and tree diagrams, to determine the size of a sample space (the number of possible outcomes) and to calculate probabilities. **A1.D.2.2** Describe the concepts of intersections, unions, and complements using Venn diagrams to evaluate probabilities. Understand the relationships between these concepts and the words AND, OR, and NOT. **A1.D.2.3** Calculate experimental probabilities by performing simulations or experiments involving a probability model and using relative frequencies of outcomes. **A1.D.2.4** Apply probability concepts to real-world situations to make informed decisions.	relationships between two variables. Using graphing calculators or other appropriate technology, determine regression equation and correlation coefficients; use regression equations to make predictions and correlation coefficients to assess the reliability of those predictions. **A2.D.1.3** Based upon a real-world context, recognize whether a discrete or continuous graphical representation is appropriate and then create the graph. **A2.D.2 Analyze statistical thinking to draw inferences, make predictions, and justify conclusions.** **A2.D.2.1** Evaluate reports based on data published in the media by identifying the source of the data, the design of the study, and the way the data are analyzed and displayed. Given spreadsheets, tables, or graphs, recognize and analyze distortions in data displays. Show how graphs and data can be distorted to support different points of view. **A2.D.2.2** Identify and explain misleading uses of data. Recognize when arguments based on data confuse correlation and causation.

Reasoning & Logic (G.RL)		
Seventh Grade (7)	**Pre-Algebra (PA)**	**Geometry (G)**
Topic addressed at other grade levels.	Topic addressed at other grade levels.	**G.RL.1 Use appropriate tools and logic to evaluate mathematical arguments.** **G.RL.1.1** Understand the use of undefined terms, definitions, postulates, and theorems in logical arguments/proofs. **G.RL.1.2** Analyze and draw conclusions based on a set of conditions using inductive and deductive reasoning. Recognize the logical relationships between a conditional statement and its inverse, converse, and contrapositive. **G.RL.1.3** Assess the validity of a logical argument and give counterexamples to disprove a statement.

Two Dimensional Shapes (G.2D)		
Seventh Grade (7)	**Pre-Algebra (PA)**	**Geometry (G)**
7.GM.2 Determine the area of trapezoids and area and perimeter of composite figures. **7.GM.2.1** Develop and use the formula to determine the area of a trapezoid to solve problems. **7.GM.2.2** Find the area and perimeter of composite figures to solve real-world and mathematical problems. **7.GM.4 Analyze the effect of dilations, translations, and reflections on the attributes of two-dimensional figures on and off the coordinate plane**. **7.GM.4.1** Describe the properties of similarity, compare geometric figures for similarity, and determine scale factors resulting from dilations. **7.GM.4.2** Apply proportions, ratios, and scale factors to solve problems involving scale drawings and determine side lengths and areas of similar triangles and rectangles. **7.GM.4.3** Graph and describe translations and reflections of figures on a coordinate plane and determine the coordinates of the vertices of the figure after the transformation.	Topic addressed at other grade levels.	**G.2D.1 Discover, evaluate, and analyze the relationships between lines, angles, and polygons to solve real-world and mathematical problems; express proofs in a form that clearly justifies the reasoning, such as two-column proofs, paragraph proofs, flow charts, or illustrations.** **G.2D.1.1** Apply the properties of parallel and perpendicular lines, including properties of angles formed by a transversal, to solve real-world and mathematical problems and determine if two lines are parallel, using algebraic reasoning and proofs. **G.2D.1.2** Apply the properties of angles, including corresponding, exterior, interior, vertical, complementary, and supplementary angles to solve real-world and mathematical problems using algebraic reasoning and proofs. **G.2D.1.3** Apply theorems involving the interior and exterior angle sums of polygons and use them to solve real-world and mathematical problems using algebraic reasoning and proofs. **G.2D.1.4** Apply the properties of special quadrilaterals (square, rectangle, trapezoid, isosceles trapezoid, rhombus, kite, parallelogram) and use them to solve real-world and mathematical problems involving angle measures and segment lengths using algebraic reasoning and proofs. **G.2D.1.5** Use coordinate geometry to represent and

		analyze line segments and polygons, including determining lengths, midpoints, and slopes of line segments. **G.2D.1.6** Apply the properties of polygons to solve real-world and mathematical problems involving perimeter and area (e.g., triangles, special quadrilaterals, regular polygons up to 12 sides, composite figures). **G.2D.1.7** Apply the properties of congruent or similar polygons to solve real-world and mathematical problems using algebraic and logical reasoning. **G.2D.1.8** Construct logical arguments to prove triangle congruence (SSS, SAS, ASA, AAS and HL) and triangle similarity (AA, SSS, SAS). **G.2D.1.9** Use numeric, graphic and algebraic representations of transformations in two dimensions, such as reflections, translations, dilations, and rotations about the origin by multiples of 90˚, to solve problems involving figures on a coordinate plane and identify types of symmetry.
Three Dimensional Shapes (G.3D)		
Seventh Grade (7)	**Pre-Algebra (PA)**	**Geometry (G)**
7.GM.1 Develop and understand the concept of surface area and volume of rectangular prisms. **7.GM.1.1** Using a variety of tools and strategies, develop the concept that surface area of a rectangular prism with rational-valued edge lengths can be found by wrapping the figure with same-sized square units without gaps or overlap. Use appropriate measurements such as cm^2. **7.GM.1.2** Using a variety of tools and strategies, develop the concept that the volume of rectangular prisms with rational-valued edge lengths can be found by counting the total number of same-sized unit cubes that fill a shape without gaps or overlaps. Use appropriate measurements such as cm^3.	**PA.GM.2 Calculate surface area and volume of three-dimensional figures.** **PA.GM.2.1** Calculate the surface area of a rectangular prism using decomposition or nets. Use appropriate measurements such as cm^2. **PA.GM.2.2** Calculate the surface area of a cylinder, in terms of π and using approximations for π, using decomposition or nets. Use appropriate measurements such as cm^2. **PA.GM.2.3** Develop and use the formulas $V = lwh$ and $V = Bh$ to determine the volume of rectangular prisms. Justify why base area (B) and height (h) are multiplied to find the volume of a rectangular prism. Use appropriate measurements such as cm^3. **PA.GM.2.4** Develop and use the formulas $V = \pi r^2 h$ and $V = Bh$ to determine the volume of right cylinders, in terms of π and using approximations for π. Justify why base area (B) and height (h) are multiplied to find the volume of a right cylinder. Use appropriate measurements such as cm^3.	**G.3D.1 Solve real-world and mathematical problems involving three-dimensional figures.** **G.3D.1.1** Solve real-world and mathematical problems using the surface area and volume of prisms, cylinders, pyramids, cones, spheres, and composites of these figures. Use nets, measuring devices, or formulas as appropriate. **G.3D.1.2** Use ratios derived from similar three-dimensional figures to make conjectures, generalize, and to solve for unknown values such as angles, side lengths, perimeter or circumference of a face, area of a face, and volume.

Circles (G.C)		
Seventh Grade (7)	**Pre-Algebra (PA)**	**Geometry (G)**
7.GM.3 Use reasoning with proportions and ratios to determine measurements, justify formulas, and solve real-world and mathematical problems involving circles and related geometric figures. **7.GM.3.1** Demonstrate an understanding of the proportional relationship between the diameter and circumference of a circle and that the unit rate (constant of proportionality) is π and can be approximated by rational numbers such as $\frac{22}{7}$ and 3.14. **7.GM.3.2** Calculate the circumference and area of circles to solve problems in various contexts, in terms of π and using approximations for π.	Topic addressed at other grade levels.	**G.C.1 Solve real-world and mathematical problems using the properties of circles.** **G.C.1.1** Apply the properties of circles to solve problems involving circumference and area, approximate values and in terms of π, using algebraic and logical reasoning. **G.C.1.2** Apply the properties of circles and relationships among angles; arcs; and distances in a circle among radii, chords, secants and tangents to solve problems using algebraic and logical reasoning. **G.C.1.3** Recognize and write the radius r, center (h, k), and standard form of the equation of a circle $(x-h)^2 + (y-k)^2 = r^2$ with and without graphs. **G.C.1.4** Apply the distance and midpoint formula, where appropriate, to develop the equation of a circle in standard form.

Right Triangle Trigonometry (G.RT)		
Seventh Grade (7)	**Pre-Algebra (PA)**	**Geometry (G)**
Topic addressed at other grade levels.	**PA.GM.1 Solve problems involving right triangles using the Pythagorean Theorem.** **PA.GM.1.1** Informally justify the Pythagorean Theorem using measurements, diagrams, or dynamic software and use the Pythagorean Theorem to solve problems in two and three dimensions involving right triangles. **PA.GM.1.2** Use the Pythagorean Theorem to find the distance between any two points in a coordinate plane.	**G.RT.1 Develop and verify mathematical relationships of right triangles and trigonometric ratios to solve real-world and mathematical problems.** **G.RT.1.1** Apply the distance formula and the Pythagorean Theorem and its converse to solve real-world and mathematical problems, as approximate and exact values, using algebraic and logical reasoning (include Pythagorean Triples). **G.RT.1.2** Verify and apply properties of right triangles, including properties of 45-45-90 and 30-60-90 triangles, to solve problems using algebraic and logical reasoning. **G.RT.1.3** Use the definition of the trigonometric functions to determine the sine, cosine, and tangent ratio of an acute angle in a right triangle. Apply the inverse trigonometric functions to find the measure of an acute angle in right triangles. **G.RT.1.4** Apply the trigonometric functions as ratios (sine, cosine, and tangent) to find side lengths in right triangles in real-world and mathematical problems.

Oklahoma Academic Standards

SCIENCE

OKLAHOMA Education

Table of Contents

Introduction

The 2020 Oklahoma Academic Standards for Science are the result of the contributions of hundreds of science educators, representatives of higher education, and community members. This document reflects the collaborative work of all members of the Draft Oklahoma Academic Standards for Science Writing and Draft Committees.

The standards specify what students should know and be able to do as learners of science at the end of each grade level or science course. The order of the standards at any grade level is not meant to imply a sequence of topics and should be considered flexible for the organization of any course. The Oklahoma Academic Standards describe the specific areas of student learning that are considered the most important for proficiency in the discipline at a particular level and provide a basis for the development of local curricula and statewide assessments.

The standards are not a curriculum and they do not represent a scope, sequence, or curriculum guide. They provide a framework for schools and teachers to develop an aligned science curriculum. They are also designed as coherent progressions of learning in grades PreK-12, intended to be used as a whole, ensuring all students are provided opportunities to experience science at each grade K-8 and various courses at high school. Although instruction may go beyond standards, using only a portion of the standards will leave gaps in the scientific understanding and practices of students.

The 2020 Oklahoma Academic Standards for Science were informed by the 2014 Oklahoma Academic Standards for Science, The Framework for K-12 Science Education (National Academies of Science, 2010), the Next Generation Science Standards (Achieve, Inc., 2012), and other states' standards documents.

Science is a way of knowing, a process of using observations and investigations to gain knowledge and understanding of the physical and natural world. The PreK-12 Oklahoma Academic Standards for Science place an emphasis on students being active learners. They showcase that it is not enough for students to read about science; they must do science. Students must engage in planning and carrying out investigations, making observations, asking questions, analyzing data, constructing explanations, engaging in argument from evidence, and obtaining, evaluating, and communicating information to gain the science knowledge and skills to be college, career, and citizen ready upon graduation from high school.

Science Strands Overview

The Oklahoma Academic Standards for Science, K-12, are three-dimensional performance expectations representing the things students should know, understand, and be able to do to be proficient in science and engineering. Performance expectations are considered standards and include a science and engineering practice (everyday skills of scientists and engineers), disciplinary core ideas (science ideas used by scientists and engineers), and crosscutting concepts (ways of thinking like scientists and engineers).
The PreK standards emphasize one dimension, the science and engineering practices. This provides early learners with ample time for exploratory play and background experiences that will inform learning experiences K-12.

Performance Expectation:
Each Performance Expectation is built upon recommendations in *A Framework for K-12 Science Education* and the three dimensions of science.

1. Science and Engineering Practices
2. Disciplinary Core Ideas
3. Crosscutting Concepts (NRC, 2012, p. 2)

The following additional components in the standard documents serve as support for instructors in providing clarity and further guidance for each Performance Expectation.

Clarification Statement:
Where needed, a Clarification Statement accompanies a Performance Expectation. The aim of a Clarification Statement is to provide further explanation or examples to better support educators in understanding the aim of the Performance Expectation.

Assessment Boundary:
Where applicable, an Assessment Boundary accompanies a Performance Expectation in order to provide additional support for educators in understanding the intent of the Performance Expectation and its relation to other Performance Expectations in the learning progression. Teachers should utilize the Assessment Boundaries as tools for developing curriculum and local assessments. For 5th grade, 8th grade, Biology, and Physical Science(s) the Assessement Boundaries will be utilized to inform the development of the state summative academic achievement assessments.

Dimension 1: Science and Engineering Practices

The Science and Engineering Practices describe the major practices that scientists employ as they investigate and build models and theories about the world, and a key set of engineering practices that engineers use as they design and build systems. Performance Expectations that emphasize engineering are designated with an asterisk *. The eight science and engineering practices are:

Asking Questions and Defining Problems

A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world(s) works. Engineering questions clarify problems to determine criteria for successful solutions.

Developing and Using Models

A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations.

Planning and Carrying Out Investigations

Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters.

Analyzing and Interpreting Data

Scientific investigations produce data that must be analyzed in order to derive meaning, and engineering investigations include analysis of data collected in the tests of designs.

Using Mathematics and Computational Thinking

In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for constructing simulations, solving equations exactly or approximately, and recognizing, expressing, and applying quantitative relationships.

Constructing Explanations and Designing Solutions

End products of science are explanations, and end products of engineering are solutions. The construction of theories provides explanatory accounts of the world, and scientific knowledge is utilized in the development of solution to problems.

Engaging in Scientific Argument from Evidence

Argumentation is the process by which evidence-based conclusions and solutions are reached. In science and engineering, reasoning and argument based on evidence are essential to identifying the best explanation for a natural phenomenon or the best solution to a design problem.

Obtaining, Evaluating, and Communicating Information

Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate.
Critiquing and communicating ideas individually and in groups is a critical professional activity.

Dimension 2: Disciplinary Core Ideas

Disciplinary Core Ideas represent a set of science and engineering ideas for K-12 science education that have broad importance across multiple sciences or engineering disciplines; provide a key tool for understanding or investigating more complex ideas and solving problems; relate to the interests and life experiences of students; and are teachable and learnable over multiple grades at increasing levels of sophistication. (NRC, 2012, p. 31) Disciplinary Core Ideas are grouped into four domains:

Domain 1: Physical Science (PS)
Most systems or processes depend at some level on physical and chemical subprocesses, whether the system is a star, Earth's atmosphere, a river, a bicycle, or a living cell. To understand the physical and chemical basis of a system, students must understand the structure of matter, the forces between objects, the related energy transfers, and their consequences. In this way, the underlying principles of physical science, chemistry, and physics allow students to understand all natural and human-created phenomena.

Domain 2: Life Science (LS)
The life sciences focus on patterns, processes, and relationships of living organisms. The study of life ranges over scales from single molecules, organisms and ecosystems, to the entire biosphere. A core principle of the life sciences is that organisms are related through common ancestry and that processes of natural selection have led to the tremendous diversity of the biosphere. Through courses like Biology and Environmental Science, students explore all aspects of living things and the environments they live in.

Domain 3: Earth and Space Science (ESS)
Through Earth and Space Sciences (ESS), students investigate processes that operate on Earth and also address Earth's place in the solar system and the galaxy. ESS involve phenomena that range in scale from unimaginably large to invisibly small and provide students opportunities to understand how the atmosphere, geosphere, and biosphere are connected.

Domain 4: Engineering, Technology, and Applications of Science (ETS)
The applications of science knowledge and practices to engineering have contributed to the technologies and the systems that serve people today. Insights gained from scientific discovery have altered the ways in which buildings, bridges, and cities are constructed; changed the operations of factories; led to new methods of generating and distributing energy; and created new modes of travel and communication. An overarching goal of ETS is for students to explore links among engineering, technology, science, and society throughout the physical, life, and Earth and space sciences.

Dimension 3: Crosscutting Concepts

The Crosscutting Concepts represent common threads or themes that span across science disciplines (biology, chemistry, physics, environmental science, Earth/space science) and have value to both scientists and engineers because they identify universal properties and processes found in all disciplines. These Crosscutting Concepts are:

Patterns
Observed patterns of forms and events guide organization and classification. Patterns prompt questions about the factors that influence cause and effect relationships. Patterns are useful as evidence to support explanations and arguments.

Cause and Effect
Events have causes, sometimes simple, sometimes multifaceted and complex. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.

Scale, Proportion, Quantity
In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.

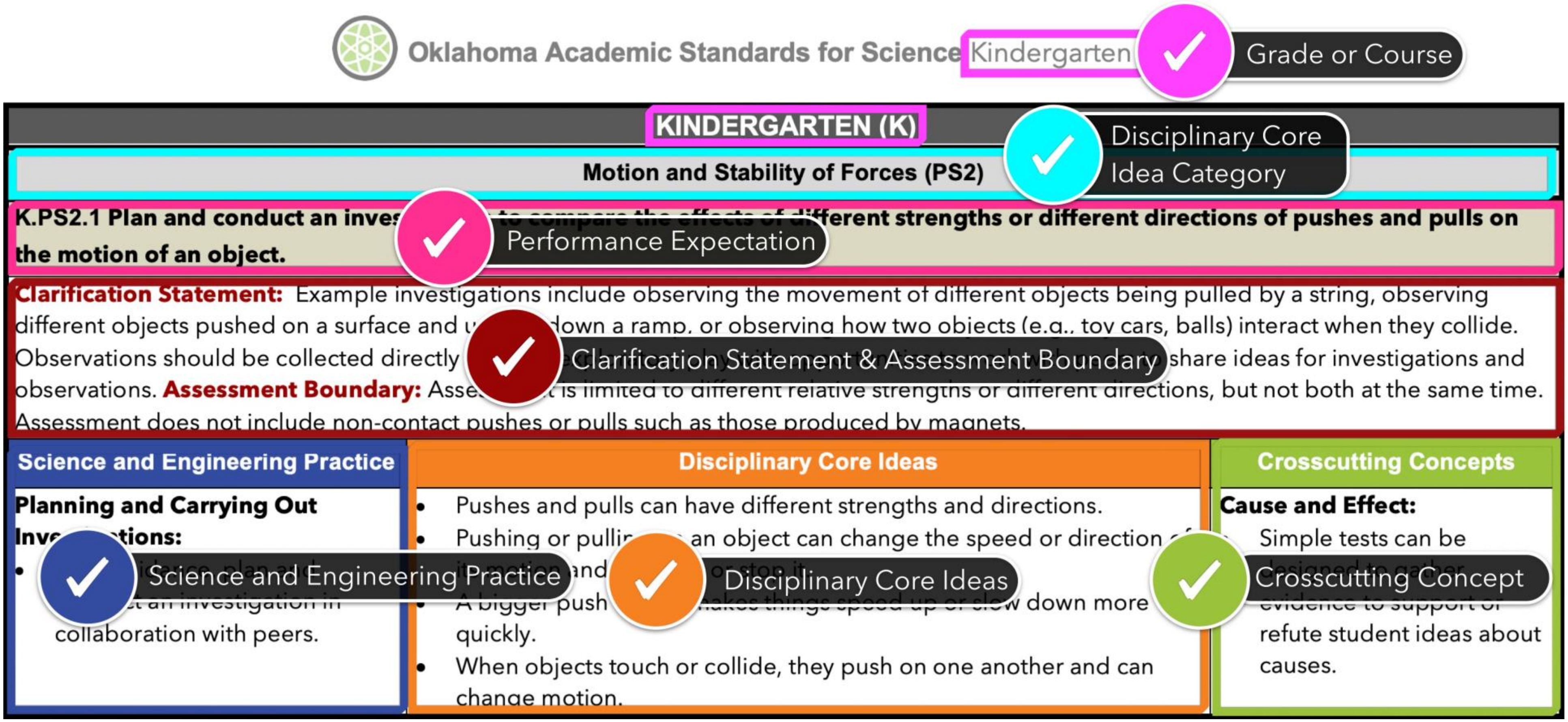
Systems and System Models
Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.

Energy and Matter
Tracking fluxes of energy and matter into, out of, and within systems helps one understand the system's possibilities and limitations.

Structure and Function
An object's structure and shape determine many of its properties and functions. The structures, shapes, and substructures of living organisms determine how the organism functions to meet its needs within an environment.

Stability and Change
For natural and built systems alike, conditions of stability and rates of change provide the focus for understanding how the system operates and causes for changes in syste

Reading the Oklahoma Academic Standards for Science



PREKINDERGARTEN (PK)	
Science Exploration (S)	
PK.S.1 Engage in play to explore the physical and natural world.	**Clarification Statement:** Exploration-based play should include playing inside the classroom (e.g., building towers with blocks, interacting with a balloon, mixing water colors, placing different objects in water) and outside the classroom (e.g., swinging at different speeds, kicking a ball in different ways, rolling round objects down a hill, digging in the dirt). Emphasis is on basic play as a means of exploration.
PK.S.2 Make observations of the physical and natural world.	**Clarification Statement:** Observations should focus on what things look, feel, hear, or smell like, how they might operate or function, and similarities and differences among things inside classroom (e.g., pencils, markers, and highlighters make different marks on paper) and outside a classroom (e.g., leaves look different at different times of year, sticks in different areas of the school yard are different shapes and sizes, it is cooler in the morning than at lunch). Explanations for why things inside and outside the classroom look, feel, or smell the way they do are not expected.
PK.S.3 Notice and describe similarities and differences among plants, animals, and objects.	**Clarification Statement:** Similarities and differences might include grouping like plants, animals, or objects based on observations. Descriptions of groupings might be based on how plants, animals, or objects look, feel, or smell.
PK.S.4 Share noticings and wonderings about the physical and natural world.	**Clarification Statement:** Sharing could include drawing, writing, building models, or other creative expressions, such as drama or creative movement. Sharing could include retelling, verbal descriptions, or talking with others. Wonderings might include “why,” “how,” and “what if” statements. Respect for the noticings and wondering of others should be emphasized, but explanations for noticings and wonderings are not emphasized or expected.
PK.S.5 Ask questions based on curiosity about the physical and natural world.	**Clarification Statement:** Questions may arise through observations, play, interests, events in the classroom, text, media, or other experiences of the natural and physical world.
PK.S.6 Engage in investigations based on curiosity and wondering about the physical and natural world.	**Clarification Statement:** Opportunities for investigation or further investigation could arise from opportunities to engage in play inside and outside the classroom, curiosities and wonderings of the student from school or out of school experiences. Emphasis is on providing opportunities for investigations to arise from student curiosities, wonderings, or questions.

KINDERGARTEN (K)

Motion and Stability of Forces (PS2)

K.PS2.1 Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

Clarification Statement: Example investigations include observing the movement of different objects being pulled by a string, observing different objects pushed on a surface and up and down a ramp, or observing how two objects (e.g., toy cars, balls) interact when they collide. Observations should be collected directly through exploratory play with opportunities to work with peers to share ideas for investigations and observations. **Assessment Boundary:** Assessment is limited to different relative strengths or different directions, but not both at the same time.
Assessment does not include non-contact pushes or pulls such as those produced by magnets.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations: • With guidance, plan and conduct an investigation in collaboration with peers.	• Pushes and pulls can have different strengths and directions. • Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. • A bigger push or pull makes things speed up or slow down more quickly. • When objects touch or collide, they push on one another and can change motion.	**Cause and Effect:** • Simple tests can be designed to gather evidence to support or refute student ideas about causes.

K.PS2.2 Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or pull.*

Clarification Statement: Data should be limited to observational data collected through exploration-based play of simple design solutions to address problems. Example problems include having an object (e.g., toy car or ball) move a certain distance, follow a particular path, or knock down other objects. Designed solutions could include using or building a ramp to increase the speed of the object, using objects that would cause an object like a toy car or ball to follow a particular path. Emphasis is on basic play as a means to develop a designed solution and test that design. **Assessment Boundary:** Assessment does not include friction as a mechanism for change in speed.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing Data: • Analyze data from tests of an object or tool to determine if it works as intended.	• Pushes and pulls can have different strengths and directions. • Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. • A situation that people want to change or create can be approached as a problem to be solved through engineering. • Such problems may have many acceptable solutions.	**Cause and Effect:** • Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Energy (PS3)

K.PS3.1 Make observations to determine the effect of sunlight on Earth's surface.

Clarification Statement: Making observations should include opportunities to directly observe surfaces (e.g. sand, soil, rocks, or playground equipment) in direct sunlight, partial sunlight and shade with opportunities to explore and discuss observed patterns of the Sun's impact on those surfaces. Opportunities to share noticings and wonderings should be encouraged. **Assessment Boundary:** Assessment of temperature is limited to relative measures such as warmer/cooler.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations: • Make observations (firsthand or from media) to collect data that can be used to make comparisons.	• Sunlight warms the Earth's surface.	**Cause and Effect:** • Events have causes that generate observable patterns.

K.PS3.2 Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.*

Clarification Statement: Examples of structures could include forms of umbrellas, canopies, and tents developed through exploratory play with a variety of materials allowing opportunities to build and test how designed structures might minimize the warming effect of the Sun.
Effectiveness can be determined by placing rocks or sand under the structure and observing the warmth or coolness of the object. **Assessment Boundary:** Assessment of temperature is limited to relative measures such as warmer/cooler.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Designing Solutions: • Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem.	• Sunlight warms the Earth's surface.	**Cause and Effect:** • Events have causes that generate observable patterns.

From Molecules to Organisms: Structure and Function (LS1)

K.LS1.1 Use observations to describe patterns of what plants and animals (including humans) need to survive.

Clarification Statement: Examples of observable patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and that all living things need water. Observations could be collected through nature walks around the playground and videos. Patterns of similarities and differences among different animals or between plants and animals should be discussed.
Assessment Boundary: Assessment is limited to observations and not how plants use light (photosynthesis).

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data: • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.	• All animals need food in order to live and grow. • Animals obtain their food from plants or from other animals. • Plants need water and light to live and grow.	**Patterns:** • Patterns in the natural and human designed world can be observed and used as evidence.

Earth Systems (ESS2)

K.ESS2.1 Use and share observations of local weather conditions to describe patterns over time.

Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.

Assessment Boundary: Assessment of temperature is limited to whole numbers for patterns, and relative measures such as warmer/cooler for temperatures.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data: • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.	• Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. • People measure these conditions to describe and record the weather and to notice patterns over time.	**Patterns:** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Earth Systems (ESS2)		
K.ESS2.2 Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.		
Clarification Statement: Arguments center on sharing examples of how plants and animals change their environments and discussing ideas as to why those changes meet a need of plants and animals (e.g., shelter, food, room to grow). Examples of arguments could include squirrels digging in the ground to hide food, tree roots breaking sidewalks, birds building a nest to protect their young. **Assessment Boundary:** Arguments should be based on qualitative not quantitative evidence.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Construct an argument with evidence to support a claim.	• Plants and animals can change their environment. • Things that people do to live comfortably can affect the world around them.	**Systems and System Models:** • Systems in the natural and designed world have parts that work together.

Earth and Human Activity (ESS3)		
K.ESS3.1 Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.		
Clarification Statement: Models could include drawings, physical replicas, or dramatizations that show relationships between plants or animals and their surroundings. Examples of relationships could include that squirrels eat nuts and seeds, and therefore, they usually live near trees; and grasses need sunlight, so they often grow in meadows with no or few trees. Opportunities to share noticings and wondering should be encouraged. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Use a model to represent relationships in the natural world.	• Living things need water, air, and resources from the land, and they live in places that have the things they need. • Humans use natural resources for everything they do.	**Systems and System Models:** • Systems in the natural and designed world have parts that work together.

Earth and Human Activity (ESS3)

K.ESS3.2 Ask questions to understand the purpose of weather forecasting to prepare for and respond to severe weather.*

Clarification Statement: Questions may arise or be encouraged through observations, interests, text, or media. Emphasis is on weather forecasting of local weather and how weather forecasting can help people plan for, and respond to, specific types of local weather (e.g., staying indoors during severe weather, going to cool places during heat waves). **Assessment Boundary:** Assessment does not include causes for severe weather.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions: • Asking questions, making observations, and gathering information are helpful in thinking about problems.	• Some kinds of severe weather are more likely than others in a given region. • Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. • People depend on various technologies in their lives; human life would be very different without technology. • People encounter questions about the natural world every day.	**Cause and Effects:** • Events have causes that generate observable patterns.

1st Grade (1)

Waves and Their Applications in Technologies for Information Transfer (PS4)

1.PS4.1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

Clarification Statement: Examples of vibrating materials that make sound could include tuning forks, kazoos, plucking a stretched string or rubber band, and stringed instruments. Examples of sound making matter vibrate could include holding a piece of paper near a speaker making sound, placing hand on personal larynx or mouth while humming, and holding an object near a vibrating tuning fork. **Assessment Boundary:** N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations: • Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question.	• Sound can make matter vibrate, and vibrating matter can make sound.	**Cause and Effect:** • Simple tests can be designed to gather evidence to support or refute student ideas about causes.

1.PS4.2 Make observations to construct an evidence-based account that objects can be seen only when illuminated.

Clarification Statement: Examples of observations could include those made in a completely dark room or those made in a dark room with the door opened slightly. Illumination could be from an external light source or an object giving off its own light. This can be explored with string lights, mirrors, projectors, and flashlights. **Assessment Boundary:** N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations: • Make observations (firsthand or from media) to construct an evidence- based account for natural phenomena.	• Objects can be seen if light is available to illuminate them or if they give off their own light.	**Cause and Effect:** • Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Waves and Their Applications in Technologies for Information Transfer (PS4)

1.PS4.3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.

Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror). **Assessment Boundary:** Assessment does not include the speed of light or assessment of descriptive words like transparent, translucent, opaque, or reflective.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations: • Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question.	• Some materials allow light to pass through them, others allow only some light through, and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. • Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.)	**Cause and Effect:** • Simple tests can be designed to gather evidence to support or refute student ideas about causes.

1.PS4.4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*

Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drum beats. **Assessment Boundary:** Assessment does not include technological details for how communication devices work.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Designing Solutions: • Use tools and materials provided to design a device that solves a specific problem.	• People also use a variety of devices to communicate (send and receive information) over long distances. • People depend on various technologies in their lives; human life would be very different without technology.	**Structure and Function:** • The shape and stability of structures of natural and designed objects are related to their functions.

From Molecules to Organisms: Structure and Function (LS1)		
1.LS1.1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.*		
Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and detecting intruders by mimicking eyes and ears. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Designing Solutions: • Use tools and materials provided to design a device that solves a problem.	• All organisms have external parts. • Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air. • Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. • Animals have body parts that capture and convey different kinds of information needed for growth and survival. • Plants also respond to some external inputs. • Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.	**Structure and Function:** • The shape and stability of structures of natural and designed objects are related to their functions.

From Molecules to Organisms: Structure and Function (LS1)		
1.LS1.2 Obtain information from media and/or text to determine patterns in the behavior of parents and offspring that help offspring survive.		
Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring). Information may be obtained through observations, media, and/or text. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Obtaining, Evaluating, and Communicating Information: • Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world.	• Adult plants and animals can have young. • In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.	**Patterns:** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Heredity: Inheritance and Variation of Traits (LS3)		
1.LS3.1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.		
Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include that leaves from the same kind of plant are the same shape but can differ in size; and that particular breed of dog looks like its parents but is not exactly the same. **Assessment Boundary:** Assessment does not include inheritance, animals that undergo metamorphosis or hybrids.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.	• Young animals are very much, but not exactly like, their parents. • Plants also are very much, but not exactly, like their parents. • Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.	**Patterns:** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Earth's Place in the Universe (ESS1)		
1.ESS1.1 Use observations of the Sun, Moon, and stars to describe patterns that can be predicted.		
Clarification Statement: Examples of patterns could include that the Sun and Moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our Sun are visible at night but not during the day. **Assessment Boundary:** Assessment of star patterns is limited to stars being seen at night and not during the day.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Analyzing and Interpreting Data: • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.	• Patterns of the motion of the Sun, Moon, and stars in the sky can be observed, described, and predicted.	**Patterns:** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.
1.ESS1.2 Make observations at different times of year to relate the amount of daylight and relative temperature to the time of year.		
Clarification Statement: Emphasis is on relative comparisons of the amount of daylight and temperature in the winter to the amount in the spring, fall, or summer. **Assessment Boundary:** Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Make observations (firsthand or from media) to collect data that can be used to make comparisons.	• Seasonal patterns of sunrise and sunset can be observed, described, and predicted.	**Patterns:** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Earth and Human Activity (ESS3)		
1.ESS3.1 Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.*		
Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Obtaining, Evaluating and Communicating Information: • Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas.	• Things that people do to live comfortably can affect the world around them. But, they can make choices that reduce their impacts on the land, water, air, and other living things. • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.	**Cause and Effect:** • Events have causes that generate observable patterns.

2nd GRADE (2)

Matter and Its Interactions (PS1)

2.PS1.1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share. Investigations could include ice and snow melting or frozen objects thawing. **Assessment Boundary:** N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations: • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.	• Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. • Matter can be described and classified by its observable properties. • Different properties are suited to different purposes.	**Patterns:** • Patterns in the natural and human-designed world can be observed.

2.PS1.2 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for the intended purpose.*

Clarification Statement: Examples of properties could include strength, flexibility, hardness, texture, and absorbency (e.g. paper towels could be utilized to measure absorbency and strength). **Assessment Boundary:** Assessment of quantitative measurements is limited to length.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data: • Analyze data from tests of an object or tool to determine if it works as intended.	• Different properties are suited to different purposes. • Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.	**Cause and Effect:** • Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Matter and Its Interactions (PS1)		
2.PS1.3 Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.		
Clarification Statement: Examples of pieces could include building blocks, or other assorted small objects. Provide students with the same number of pieces to create a different object. **Assessment Boundary:** Do not introduce terminology associated with the Law of Conservation of Matter just concepts. Chemical change is outside of this performance expectation.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.	• A great variety of objects can be built up from a small set of pieces. • Different properties are suited to different purposes.	**Energy and Matter:** • Objects may break into smaller pieces and be put together into larger pieces, or change shapes.
2.PS1.4 Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.		
Clarification Statement: Demonstrations of reversible changes could include materials such as water, butter, or crayons at different temperatures. Demonstrations of irreversible changes could include cooking an egg, freezing a plant leaf, or heating paper. Arguments center on using first-hand observations as evidence to support a claim that a material can change and go back to its original form through heating and cooling. **Assessment Boundary:** Students should not be expected to identify or explain physical and chemical changes.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Construct an argument with evidence to support a claim.	• Heating or cooling a substance may cause changes that can be observed. • Sometimes these changes are reversible, and sometimes they are not.	**Cause and Effect:** • Events have causes that generate observable patterns.

<table>
<tr><th colspan="3">Ecosystems: Interactions, Energy and Dynamics (LS2)</th></tr>
<tr><td colspan="3">2.LS2.1 Plan and conduct an investigation to determine if plants need sunlight and water to grow.</td></tr>
<tr><td colspan="3">Clarification Statement: Investigations should be limited to testing one variable at a time. Assessment Boundary: Assessment is limited to testing one variable at a time, although students are not expected to understand the term variable at this time.</td></tr>
<tr><th>Science and Engineering Practice</th><th>Disciplinary Core Ideas</th><th>Crosscutting Concepts</th></tr>
<tr><td>Planning and Carrying Out Investigations:
Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.</td><td>Plants depend on water and light to grow.</td><td>Cause and Effect:
Events have causes that generate observable patterns.</td></tr>
<tr><td colspan="3">2.LS2.2 Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*</td></tr>
<tr><td colspan="3">Clarification Statement: Examples include: placing socks on the outside of students' shoes and walking outside allows socks to gather seeds, plant sock(s) to see what grows, use a pipe cleaner to move powder (like flour) from one place to another emulating flowers being pollinated by bees or other insects. Assessment Boundary: N/A</td></tr>
<tr><th>Science and Engineering Practice</th><th>Disciplinary Core Ideas</th><th>Crosscutting Concepts</th></tr>
<tr><td>Developing and Using Models:
Develop a simple model based on evidence to represent a proposed object or tool.</td><td>Plants depend on animals for pollination or to move their seeds around.
Designs can be conveyed through sketches, drawings, or physical models.
These representations are useful in communicating ideas for a problem's solutions to other people.</td><td>Structure and Function:
The shape and stability of structures of natural and designed objects are related to their function(s).</td></tr>
</table>

Biological Unity and Diversity (LS4)		
2.LS4.1 Make observations of plants and animals to compare the diversity of life in different habitats.		
Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats. Students could explore different habitats such as a neighborhood park, ponds, and the school playground. **Assessment Boundary:** Assessment does not include specific animal and plant names in specific habitats.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Make observations (firsthand or from media) to collect data which can be used to make comparisons.	• There are many different kinds of living things in any area, and they exist in different places on land and in water.	**Systems and System Models:** • A system is an organized group of related objects or components.

Earth's Place in the Universe (ESS1)		
2.ESS1.1 Use information from several sources to provide evidence that Earth events can occur quickly or slowly.		
Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly, and erosion of rocks, which occurs slowly. **Assessment Boundary:** Assessment does not include quantitative measurements of timescales.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Make observations from several sources to construct an evidence-based account for natural phenomena.	• Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe.	**Stability and Change:** • Things may change slowly or rapidly.

Earth's Systems (ESS2)		
2.ESS2.1 Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.*		
Clarification Statement: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land. Students could explore these ideas with sand tables or soil and water in large containers. **Assessment Boundary:** N/A.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Designing Solutions: • Compare multiple solutions to a problem.	• Wind and water can change the shape of the land. • Because there is always more than one possible solution to a problem, it is useful to compare and test designs. • Developing and using technology has impacts on the natural world.	**Stability and Change:** • Things may change slowly or rapidly.
2.ESS2.2 Develop a model to represent the shapes and kind of land and bodies of water in an area.		
Clarification Statement: Examples could include a diagram, drawing, physical replica, or three-dimensional diorama. Models can be based on photographs, virtual images, or in-person observations. **Assessment Boundary:** Assessment does not include quantitative scaling in models.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model to represent patterns in the natural world.	• Maps show where things are located. • One can map the shapes and kinds of land and water in any area.	**Patterns:** • Patterns in the natural world can be observed.
2.ESS2.3 Obtain information to identify where water is found on Earth and that it can be solid or liquid.		
Clarification Statement: Information can be obtained through text, media, or in-person observations. Patterns can be observed through identifying where solid water (ice) is found and where liquid water can be located. **Assessment Boundary:** N/A.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Obtaining, Evaluating, and Communicating Information: • Obtain information using various texts and media.	• Water is found in the ocean, rivers, lakes, and ponds. • Water exists as solid ice and in liquid form.	**Patterns:** • Patterns in the natural world can be observed.

3RD GRADE (3)		
Motion and Stability: Forces and Interactions (PS2)		
3.PS2.1 Plan and conduct investigations on the effects of balanced and unbalanced forces on the motion of an object.		
Clarification Statement: Examples could include that an unbalanced force on one side of a ball can make it start moving and balanced forces pushing on a box from opposite sides will not produce any motion at all. **Assessment Boundary:** Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.	• Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but quantitative addition of forces is not used at this level.) • Objects in contact exert forces on each other.	**Cause and Effect:** • Cause and effect relationships are routinely identified.
3.PS2.2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.		
Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing (pendulum), object rolling down a ramp from different heights, a ball rolling back and forth in a bowl, and two children on a see-saw. **Assessment Boundary:** Assessment does not include technical terms such as period and frequency.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.	• The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed).	**Patterns:** • Patterns of change can be used to make predictions.

Motion and Stability: Forces and Interactions (PS2)		
3.PS2.3 Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.		
Clarification Statement: Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force. **Assessment Boundary:** Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Asking Questions: • Ask questions that can be investigated based on patterns such as cause and effect relationships.	• Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.	**Cause and Effect:** • Cause and effect relationships are routinely identified, tested, and used to explain change.
3.PS2.4 Define a simple design problem that can be solved by applying scientific ideas about magnets.*		
Clarification Statement: Examples of problems could include a door that will not stay closed or two objects that keep colliding. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Define Problems: • Define a simple problem that can be solved through the development of a new or improved object or tool.	• Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. • Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process.	**Cause and Effect:** • Cause and effect relationships are routinely identified, tested, and used to explain change. *Other crosscutting concepts may be more appropriate depending on the problem chosen.*

From Molecules to Organisms: Structure and Function (LS1)		
3.LS1.1 Develop and use models to describe that organisms have unique and diverse life cycles but all have a common pattern of birth, growth, reproduction, and death.		
Clarification Statement: Changes different organisms go through during their life form a pattern. Organism life cycles that can be studied include mealworms, dandelions, lima beans, dogs, and butterflies. **Assessment Boundary:** Assessment includes animal and plant life cycles. Plant life cycles are limited to those of flowering plants. Assessment does not include details of human reproduction or microscopic organisms.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop models to describe phenomena.	• Reproduction is essential to the continued existence of every kind of organism. • Plants and animals have unique and diverse life cycles.	**Patterns:** • Patterns of change can be used to make predictions.

Ecosystems: Interactions, Energy, and Dynamics (LS2)		
3.LS2.1 Construct an argument that some animals form groups that help members survive.		
Clarification Statement: Arguments could include examples of group behavior such as division of labor in a bee colony, flocks of birds staying together to confuse or intimidate predators, or wolves hunting in packs to more efficiently catch and kill prey. When animals are no longer part of their group, they may not survive as well. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engage in Argument from Evidence: • Construct an argument from evidence, data, and/or a model.	• Being part of a group helps animals obtain food, defend themselves, and cope with changes. • Groups may serve different functions and vary dramatically in size.	**Cause and Effect:** • Cause and effect relationships are routinely used to explain change.

Heredity: Inheritance and Variation of Traits (LS3)

3.LS3.1 Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans. **Assessment Boundary:** Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data: • Analyze and interpret data to make sense of phenomena using logical reasoning.	• Many characteristics of organisms are inherited from their parents. • Different organisms vary in how they look and function because they have different inherited information.	**Patterns:** • Similarities and differences in patterns can be used to sort and classify natural phenomenon.

3.LS3.2 Use evidence to support the explanation that traits can be influenced by the environment.

Clarification Statement: Examples of the environment affecting a trait could include that normally tall plants grown with insufficient water are stunted; a pet dog that is given too much food and little exercise may become overweight; and animals who teach their offspring skills like hunting. **Assessment Boundary:** N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations: • Use evidence (e.g., observations, patterns) to support an explanation.	• Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. • The environment also affects the traits that an organism develops.	**Cause and Effect:** • Cause and effect relationships are routinely identified and used to explain changes.

Biological Unity and Diversity (LS4)		
3.LS4.1 Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.		
Clarification Statement: Examples of data could include type, size, and distribution of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms. **Assessment Boundary:** Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Analyzing and Interpreting Data: • Analyze and interpret data to make sense of phenomena using logical reasoning.	• Some kinds of plants and animals that once lived on Earth are no longer found anywhere. • Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.	**Scale, Proportion, and Quantity:** • Observable phenomena exist from very short to very long time periods.
3.LS4.2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving and reproducing.		
Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Use evidence (e.g., observations, patterns) to construct an explanation.	• Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.	**Cause and Effect:** • Cause and effect relationships are routinely identified, tested, or used to explain change.

Biological Unity and Diversity (LS4)

3.LS4.3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other. At no time should animals be put in danger to collect evidence.
Assessment Boundary: N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence: • Construct an argument with evidence.	• For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. • Changes in an organism's habitat are sometimes beneficial to it and sometimes harmful.	**Cause and Effect:** • Cause and effect relationships are routinely identified and used to explain change.

3.LS4.4 Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.*

Clarification Statement: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms. **Assessment Boundary:** Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence: • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.	• When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. • Populations live in a variety of habitats, and change in those habitats affects the organisms living there. • Knolwedge of relevant scientific concepts and research findings is important in engineering.	**Systems and System Models:** • A system can be described in terms of its components and their interactions.

Earth's Systems (ESS2)		
3.ESS2.1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.		
Clarification Statement: Examples of data at this grade level could include average temperature, precipitation, and wind direction. **Assessment Boundary:** Assessment of graphical displays is limited to frequency tables, line plots, pictographs, and single bar graphs. Students are not expected to calculate averages but simply to represent them in graphical form.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Analyzing and Interpreting Data: • Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships.	• Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.	**Patterns:** • Patterns of change can be used to make predictions.

Earth's Systems (ESS2)		
3.ESS2.2 Obtain and combine information to describe climates in different regions of the world.		
Clarification Statement: Information could include hours of daylight, amount of precipitation, temperature, seasons, and wind. Descriptions could include the use of frequency tables, line plots, pictographs, and single bar graphs. Climate data should include weather conditions over multiple years. **Assessment Boundary:** Assessments do not include causes of seasons.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Obtaining, Evaluating, and Communicating Information: • Obtain and combine information from books and other reliable media to explain phenomena.	• Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years to centuries.	**Patterns:** • Patterns of change can be used to make predictions.

Earth and Human Activity (ESS3)		
3.ESS3.1 Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.*		
Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind/hail resistant roofs/windows, textured walking surfaces for ice, tornado shelters, and lighting rods. While earthquakes, volcanoes, and tsunamis are natural hazards they are not caused by weather phenomenon. **Assessment Boundary:** Assessments are limited to weather-related hazards only.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.	• A variety of natural hazards result from natural processes. • Humans cannot eliminate natural hazards but can take steps to reduce their impact. • Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), decrease known risks (e.g., seatbelts in cars), and meet societal demands (e.g., cell phones).	**Cause and Effect:** • Cause and effect relationships are routinely identified, tested, and used to explain change.

4TH GRADE (4)		
Energy (PS3)		
4.PS3.1 Use evidence to construct an explanation relating the speed of an object to the energy of that object.		
Clarification Statement: Energy can be moved from place to place by moving objects (e.g. wind moving a sail then moving a boat, throwing a ball, or paddling a boat). As objects increase in speed they possess more energy (e.g. ball rolling down a ramp). **Assessment Boundary:** Assessment does not include quantitative measures of changes in the speed of an object (acceleration) or on any precise, quantitative, or complete definition of energy.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Use evidence (e.g., measurements, observations, patterns) to construct an explanation.	• The faster a given object is moving, the more energy it possesses.	**Patterns:** • Patterns can be used as evidence to support an explanation.

Energy (PS3)		
4.PS3.2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.		
Clarification Statement: Light, heat, sound, and electric currents transfer energy. Examples of this can include sound from a radio, light from a flashlight, the Sun heating a window pane, and currents to electronic devices. When energy is transferred it can stay in the same form or change forms. **Assessment Boundary:** Assessment does not include quantitative measurements of energy or the difference between transferring and transforming energy.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Make observations to produce data to serve as the basis for evidence for an explanation of a phenomena or test a design solutions.	• Energy can be moved from place to place by moving objects or through sound, light, or electric currents. • Energy is present whenever there are moving objects, sound, light, or heat. • When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. • Light also transfers energy from place to place. • Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light.	**Energy and Matter:** • Energy can be transferred in various ways and between objects.

Energy (PS3)

4.PS3.3 Ask questions and predict outcomes about the changes in energy that occur when objects collide.

Clarification Statement: Collisions include any interactions between objects when they come in contact with one another and transfer energy. Emphasis is on the change in energy due to the change in speed, not forces, as objects interact. **Assessment Boundary:** Assessment does not include quantitative measures of changes in the speed of an object (acceleration) or quantitative measurements of energy.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions: • Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.	• Energy can be moved from place to place by moving objects or through sound, light, or electric currents. • Energy is present whenever there are moving objects, sound, light, or heat. • When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. • When objects collide, the contact forces transfer energy so as to change the objects' motions.	**Energy and Matter:** • Energy can be transferred in various ways and between objects.

Energy (PS3)		
4.PS3.4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.*		
Clarification Statement: Examples of devices could include mousetrap cars; rubber band-powered vehicles; electric circuits that convert electrical energy into light, sound, or motion energy of a vehicle; and a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Designing Solutions: • Apply scientific ideas to solve design problems.	• Energy can be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. • The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. • Possible solutions to a problem are limited by available materials and resources (constraints).Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. • The success of a designed solution is determined by considering the desired features of a solution (criteria). • Engineers improve existing technologies or develop new ones.	**Energy and Matter:** • Energy can be transferred in various ways and between objects.

Waves and Their Applications in Technologies for Information Transfer (PS4)		
4.PS4.1 Develop and use a model of waves to describe patterns in terms of amplitude and wavelength, and to show that waves can cause objects to move.		
Clarification Statement: Examples of models could include diagrams, analogies, and physical models using items like stringed beads, rubber bands, or yarn to illustrate wavelength and amplitude of waves. Examples of wave patterns that cause objects to move up and down or side to side could include the vibrating patterns associated with sound, the vibrating patterns of seismic waves produced by earthquakes. **Assessment Boundary:** Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model using an analogy, example, or abstract representation to describe a scientific principle.	• Waves, which are regular patterns of motion, can be made in water by disturbing the surface. • When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. • Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks).	**Patterns:** • Similarities and differences in patterns can be used to sort and classify designed products.
4.PS4.2 Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.		
Clarification Statement: Models would identify components such as the source of the light, objects that are seen, the path of the light, and the eye. Models could be used to investigate what happens when one of the components changes (Example: Close the eyes, block the light, or change the light path). **Assessment Boundary:** Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model to describe phenomena.	• An object can be seen when light reflected from its surface enters the eyes.	**Cause and Effect:** • Cause and effect relationships are routinely identified.

Waves and Their Applications in Technologies for Information Transfer (PS4)		
4.PS4.3 Generate and compare multiple solutions that use patterns to transfer information.*		
Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, QR codes, barcodes, and using Morse code to send text. **Assessment Boundary:** Assessment does not include creating or writing digital code.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Designing Solutions: • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.	• Digitized information can be transmitted over long distances without significant degradation. • High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. • Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.	**Patterns:** • Similarities and differences in patterns can be used to sort and classify designed products.

From Molecules to Organisms: Structure and Processes (LS1)		
4.LS1.1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.		
Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin. **Assessment Boundary:** Assessment is limited to macroscopic structures within plant and animal systems.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Construct an argument with evidence, data, and/or a model.	• Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.	**Structure and Function:** • Substructures have shapes and parts that serve functions.

From Molecules to Organisms: Structure and Processes (LS1)		
4.LS1.2 Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.		
Clarification Statement: Emphasis is on systems of information transfer. Examples of response to stimuli include a dog is hot and lies in the shade, a rabbit hears a noise and runs away, and a person is cold so they put on a jacket. **Assessment Boundary:** Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Use a model to test interactions concerning the functioning of a natural system.	• Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. • Animals are able to use their perceptions and memories to guide their actions.	**Systems and System Models:** • A system can be described in terms of its components and their interactions.

Earth's Place in the Universe (ESS1)		
4.ESS1.1 Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.		
Clarification Statement: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock. **Assessment Boundary:** Assessment does not include specific knowledge or memorization of specific rock formation and layers. Assessment is limited to relative time.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Identify the evidence that supports particular points in an explanation.	• Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. • The presence and location of certain fossil types indicate the order in which rock layers were formed.	**Patterns:** • Patterns can be used as evidence to support an explanation.

Earth's Systems (ESS2)		
4.ESS2.1 Plan and conduct investigations on the effects of water, ice, wind, and vegetation on the relative rate of weathering and erosion.		
Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow. **Assessment Boundary:** Assessment is limited to a single form of weathering or erosion.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • With guidance, plan and conduct an investigation with peers.	• Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.	**Cause and Effect:** • Cause and effect relationships are routinely identified, tested, and used to explain change.
4.ESS2.2 Analyze and interpret data from maps to describe patterns of Earth's features.		
Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Analyzing and Interpreting Data: • Analyze and interpret data to make sense of phenomena using logical reasoning.	• The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. • Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. • Major mountain chains form inside continents or near their edges. • Maps can help locate the different land and water features where people live and in other areas of Earth.	**Patterns:** • Patterns can be used as evidence to support an explanation.

Earth and Human Activity (ESS3)

4.ESS3.1 Obtain and combine information to describe that energy and fuels are derived from renewable and non-renewable resources and how their uses affect the environment.

Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels. **Assessment Boundary:** N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information: • Obtain and combine information from books and other reliable media to explain phenomena.	• Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. • Some resources are renewable over time, and others are not.	**Cause and Effect:** • Cause and effect relationships are routinely identified, tested, and used to explain change.

4.ESS3.2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.*

Clarification Statement: Examples of solutions could include designing an earthquake resistant building, improving monitoring of volcanic activity, and constructing waterways for flood waters. **Assessment Boundary:** Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Designing Solutions: • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.	• A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). • Humans cannot eliminate the hazards but can take steps to reduce their impacts. • Testing a solution involves investigating how well it performs under a range of likely conditions. • Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands.	**Cause and Effect:** • Cause and effect relationships are routinely identified and used to explain change.

5TH GRADE (5)

Matter and Its Interactions (PS1)

5.PS1.1 Develop a model to describe that matter is made of particles too small to be seen.

Clarification Statement: Examples of evidence that could be utilized in building models include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water. **Assessment Boundary:** Assessment does not include atomic scale mechanism of evaporation and condensation or defining the unseen particles.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models: • Develop a model to describe phenomena.	• Matter of any type can be subdivided into particles that are too small to see, but even then, the matter still exists and can be detected by other means. • A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon; the effects of air on larger particles or objects.	**Scale, Proportion, and Quantity:** • Natural objects exist from the very small to the immensely large.

5.PS1.2 Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.

Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that forms new substances. Measurements can be organized in tables, charts, and graphs and can be used as evidence that weight is conserved. **Assessment Boundary:** Assessment does not include distinguishing between mass and weight.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Use Mathematics and Computational Thinking: • Represent data in graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships.	• The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. • No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level).	**Scale, Proportion, and Quantity:** • Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

Matter and Its Interactions (PS1)		
5.PS1.3 Make observations and measurements to identify materials based on their properties.		
Clarification Statement: Observations can be based on direct experiences with materials and comparisons of materials. Examples of materials to be identified could include powders (e.g. baking soda, cornstarch, sugar), metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property. **Assessment Boundary:** Assessment does not include density or distinguishing mass and weight. At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.	• Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.)	**Scale, Proportion, and Quantity:** • Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.
5.PS1.4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.		
Clarification Statement: Examples of interactions forming new substances can include mixing baking soda and vinegar. Examples of interactions not forming new substances can include mixing baking soda and water. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.	• When two or more different substances are mixed, a new substance with different properties may be formed.	**Cause and Effect:** • Cause and effect relationships are routinely identified, tested, and used to explain change.

Motion and Stability: Forces and Interactions (PS2)		
5.PS2.1 Support an argument, with evidence, that Earth's gravitational force pulls objects downward toward the center of the earth.		
Clarification Statement: "Downward" is a local description of the direction that points toward the center of the spherical earth. Earth causes objects to have a force on them that point toward the center of the Earth, "downward". Evidence could be drawn from diagrams, models, and data that are provided. **Assessment Boundary:** Mathematical representation of gravitational force is not assessed.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Construct and/or support an argument with evidence, data, and/or a model.	• The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.	**Cause and Effect:** • Cause and effect relationships are routinely identified, tested, and used to explain change.

Energy (PS3)		
5.PS3.1 Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the Sun.		
Clarification Statement: Examples of models could include diagrams and flow-charts. **Assessment Boundary:** Assessment does not include cellular mechanisms of digestive absorption.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Use models to describe phenomena.	• The energy released from food was once energy from the Sun that was captured by plants in the chemical process that forms plant matter (from air and water). • Food provides animals with the materials they need for body repair and growth, energy they need to maintain body warmth and for motion.	**Energy and Matter:** • Energy can be transferred in various ways and between objects.

From Molecules to Organisms: Structure and Processes (LS1)		
5.LS1.1 Support an argument that plants get the materials they need for growth chiefly from air and water.		
Clarification Statement: While energy for plant growth comes from the Sun, material for plant growth comes chiefly from air and water, not from the soil. Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil. **Assessment Boundary:** Does not include molecular explanations of photosynthesis.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Support an argument with evidence, data, or a model.	• The energy released from food was once energy from the Sun that was captured by plants in the chemical process that forms plant matter (from air and water). • Plants acquire their material for growth chiefly from air and water.	**Energy and Matter:** • Matter is transported into, out of, and within systems.

Ecosystems: Interactions, Energy, and Dynamics (LS2)		
5.LS2.1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.		
Clarification Statement: Emphasis is on the idea that matter in systems cycles among living and nonliving things (air, water, decomposed materials in soil). Examples of systems could include organisms, ecosystems, and the Earth. **Assessment Boundary:** Assessment does not include photosynthesis or molecular explanations.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model to describe phenomena.	• The food of almost any kind of animal can be traced back to plants. • Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. • Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." • Decomposition eventually restores (recycles) some materials back to the soil. • Organisms can survive only in environments in which their particular needs are met. • A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. • Newly introduced species can damage the balance of an ecosystem. • Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. • Organisms obtain gases and water from the environment, and release waste matter (gas, liquid, or solid) back into the environment.	**Systems and System Models:** • A system can be described in terms of its components and their interactions.

Ecosystems: Interactions, Energy, and Dynamics (LS2)		
5.LS2.2 Use models to explain factors that upset the stability to local ecosystems.		
Clarification Statement: Explanatory models can include representations of relationships between and among organisms, or simulations can be used to predict how factors might impact an ecosystem. Factors that upset an ecosystem's stability includes invasive species, drought, human development, and removal of predators. **Assessment Boundary:** Does not include molecular explanations.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model to describe phenomena.	• Organisms can survive only in environments in which their particular needs are met. • A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. • Newly introduced species can damage the balance of an ecosystem.	**Systems and System Models:** • A system can be described in terms of its components and their interactions.

Earth's Place in the Universe (ESS1)		
5.ESS1.1 Support an argument with evidence that differences in the apparent brightness of the Sun compared to other stars is due to their relative distances from Earth.		
Clarification Statement: Examples of scale could include relative distance of specific stars to Earth. Evidence to support arguments could come from data or models. Examples of stars include Polaris, Sirius, and Betelgeuse. **Assessment Boundary:** Assessment is limited to relative distances, not size of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Arguments from Evidence: • Support an argument with evidence, data, or a model.	• The Sun is a star that appears brighter than other stars because it is closer to Earth. • The Sun is a star that appears larger than other stars because it is closer to Earth. • Stars range greatly in their distance from Earth.	**Scale, Proportion, and Quantity:** • Natural objects exist from the very small to the immensely large.

Earth's Place in the Universe (ESS1)

5.ESS1.2 Represent data in graphical displays to reveal patterns of daily changes in the length and direction of shadows, in addition to different positions of the Sun, Moon, and stars at different times of the day, month, and year.

Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the Sun, and selected stars that are visible only in particular months or the position of the Moon with respect to the Sun and Earth. **Assessment Boundary:** Assessment does not include causes of seasons or labeling specific phases of the Moon.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data: • Represent data in graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships.	• The orbits of Earth around the Sun and of the Moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include: day and night; daily changes in the length and direction of shadows; and different positions of the Sun, Moon, and stars at different times of the day, month, and year.	**Patterns:** • Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena.

Earth's Systems (ESS2)

5.ESS2.1 Develop a model to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

Clarification Statement: The geosphere, hydrosphere, atmosphere, and biosphere are each a system. Examples of system interactions could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. **Assessment Boundary:** Assessment is limited to the interactions of two systems at a time.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models: • Develop a model using an example to describe phenomena.	• Earth's major systems are the geosphere, hydrosphere, atmosphere, and biosphere. • These systems interact in multiple ways to affect Earth's surface materials and processes. • The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. • Winds and clouds in the atmosphere interact with landforms to determine patterns of weather.	**System and System Models:** • A system can be described in terms of its components and their interactions.

Earth's Systems (ESS2)		
5.ESS2.2 Describe and graph amounts of saltwater and freshwater in various reservoirs to provide evidence about the distribution of water on Earth.		
Clarification Statement: Descriptions could include comparisons using graphs, charts, and tables. Quantities could include percentages, total volume, and amounts. Emphasis is on using amounts or percentages of water to make comparisons. No attempt to calculate percentages should be made. **Assessment Boundary:** Assessment is limited to oceans, lakes, rivers, glaciers, groundwater, and polar ice caps, and does not include the atmosphere. Only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. Assessment should not include circle charts (pie charts) or calculation of percentages.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematics and Computational Thinking: • Describe and graph quantities such as area and volume to address scientific questions.	• Nearly all of Earth's available water is in the ocean. • Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.	**Scale, Proportion, and Quantity:** • Standard units are used to measure and describe physical quantities such as weight and volume.

Earth and Human Activity (ESS3)		
5.ESS3.1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environments.		
Clarification Statement: Examples of information might include the use of natural fertilizers or biological pest control by farmers, replanting trees after cutting them by the logging industry, and the institution of recycling programs in cities. **Assessment Boundary:** Assessment is limited to one human interaction at a time.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Obtaining, Evaluating, and Communicating Information: • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.	• Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.	**System and System Models:** • A system can be described in terms of its components and their interactions.

6TH GRADE (6)		
Matter and Its Interactions (PS1)		
6.PS1.4 Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.		
Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium. **Assessment Boundary:** The use of mathematical formulas is not intended		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model to predict and/or describe phenomena.	• Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. • The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. • The term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. • The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system’s material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. • Temperature is not a direct measure of a system’s total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material.	**Cause and Effect:** • Cause and effect relationships are routinely identified, tested, and used to explain change.

Energy (PS3)		
6.PS3.3 Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.*		
Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup. Care should be taken with devices that concentrate significant amounts of energy, e.g. conduction, convection, and/or radiation. **Assessment Boundary:** Assessment does not include calculating the total amount of thermal energy.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Designing Solutions: • Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process, or system.	• Temperature is a measure of the average kinetic energy of particles of matter. • The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. • Energy is spontaneously transferred out of hotter regions or objects and into colder ones. • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. • Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. • A solution needs to be tested, and then modified on the basis of the test results in order to improve it. • There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem.	**Energy and Matter:** • The transfer of energy can be tracked as energy flows through a designed or natural system.

Energy (PS3)		
6.PS3.4 Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.		
Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added. **Assessment Boundary:** Assessment does not include calculating the total amount of thermal energy transferred.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.	• Temperature is a measure of the average kinetic energy of particles of matter. • The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. • The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment.	**Scale, Proportion, and Quantity:** • Proportional relationships (e.g., speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes.

Waves and Their Applications in Technologies for Information Transfer (PS4)		
6.PS4.2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.		
Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions of light waves through a prism, mechanical waves through gas vs. liquids vs. solids, or sound waves through different mediums. **Assessment Boundary:** Assessment is limited to qualitative applications pertaining to electromagnetic and mechanical waves.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop and use a model to describe phenomena.	• A sound wave needs a medium through which it is transmitted. • When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. • The path that light can travel can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air, and glass) where the light path bends. • A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. However, because light can travel through space, it cannot be a matter wave, like sound or water waves.	**Structure and Function:** • Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.

From Molecules to Organisms: Structure and Processes (LS1)

6.LS1.1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells. **Assessment Boundary:** Assessment does not include identification of specific cell types and should emphasize the use of evidence from investigations.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations: • Conduct an investigation to produce data to serve as the basis for evidence that meets the goals of an investigation.	• All living things are made up of cells, which is the smallest unit that can be said to be alive. • An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).	**Scale, Proportion, and Quantity:** • Phenomena that can be observed at one scale may not be observable at another scale.

6.LS1.2 Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall. Other organelles can be introduced while covering this concept.

Assessment Boundary: Assessment of organelle structure/function relationships limited to cell wall and cell membrane. Assessment of other organelles is limited to their relationship to the whole cell. Assessment does not include biochemical functions of cell or cell parts.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models: • Develop and use a model to describe phenomena.	• Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.	**Structure and Function:** • Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts.

From Molecules to Organisms: Structure and Processes(LS1)

6.LS1.3 Use an argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.

Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence: • Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon.	• In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.	**Systems and System Models:** • Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.

6.LS1.8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

Clarification Statement: Examples include receptors in the eye that respond to light intensity and color; receptors in hair cells of the inner ear that detect vibrations conducted from the eardrum; taste buds that detect chemical qualities of foods including sweetness, bitterness, sourness, saltiness, and umami (savory taste); and receptors in the skin that respond to variations in pressure. **Assessment Boundary:** The assessment should provide evidence of students' abilities to provide a basic and conceptual explanation of the process. Assessment does not include mechanisms for the transmission of this information.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information: • Read and comprehend grade appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas.	• Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.	**Cause and Effect:** • Cause and effect relationships may be used to predict phenomena in natural systems.

Earth's Place in the Universe (ESS1)		
6.ESS1.4 Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's geologic history.		
Clarification Statement: Emphasis is on analyses of rock formations and fossils they contain to establish relative ages of major events in Earth's history. Scientific explanations can include models to study the geologic time scale. **Assessment Boundary:** Assessment does not include recalling the names of specific periods or epochs and events within them.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past, and will continue to do so in the future.	• The geologic time scale interpreted from rock strata provides a way to organize Earth's history. • Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.	**Scale, Proportion, and Quantity:** • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Earth's Systems (ESS2)		
6.ESS2.1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives these processes within and among Earth's systems.		
Clarification Statement: Emphasis is on how energy from the Sun and Earth's hot interior drive processes that cause physical and chemical changes to materials within and between the geosphere, hydrosphere, atmosphere, and biosphere. Examples of processes could include melting, crystallization, weathering, deformation, and sedimentation, which act together to form and change rocks and minerals through the rock cycle. **Assessment Boundary:** Assessment does not include the identification or naming of minerals.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop and use a model to describe phenomena.	• All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the Sun and Earth's hot interior. The energy that flows and matter that cycles produces chemical and physical changes in Earth's materials.	**Stability and Change:** • Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales, including the atomic scale.

Earth's Systems (ESS2)		
6.ESS2.2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.		
Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes usually behave gradually but are punctuated by catastrophic events (such as earthquakes, volcanoes, and meteor impacts). Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate. **Assessment Boundary:** Assessment does not include identification or naming of specific events.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	• The planet's systems interact over scales that range from microscopic to global in size; these interactions have shaped Earth's history and will determine its future. • Water's movements, both on the land and underground, cause weathering and erosion, which change the land's surface features and create underground formations.	**Scale, Proportion, and Quantity:** • Time, space, and energy phenomena can be observed at various scales, using models to study systems that are too large or too small.

Earth's Systems (ESS2)		
6.ESS2.3 Analyze and interpret data on the patterns of distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.		
Clarification Statement: Examples could include identifying patterns on maps of earthquakes and volcanoes relative to plate boundaries, the shapes of the continents, the locations of ocean structures (including mountains, volcanoes, faults, and trenches), or similarities of rock and fossil types on different continents. **Assessment Boundary:** Paleomagnetic anomalies in oceanic and continental crust are not assessed.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Analyze and Interpret Data: • Analyze and interpret data to determine similarities and differences in findings.	• Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. • Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.	**Patterns:** • Patterns in rate of change and other numerical relationships can provide information about natural and human-designed systems.

Earth's Systems (ESS2)

6.ESS2.4 Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical. **Assessment Boundary:** A quantitative understanding of the latent heats of vaporization and fusion is not assessed.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models: • Develop a model to describe unobservable mechanisms.	• Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation, and crystallization, and precipitation, as well as downhill flows on land. • Global movements of water and its changes in form are propelled by sunlight and gravity.	**Energy and Matter:** • Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.

6.ESS2.5 Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.

Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses interact. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation). **Assessment Boundary:** Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations: • Collect data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.	• Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. • These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. • Because these patterns are so complex, weather can be predicted only probabilistically.	**Cause and Effect:** • Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Earth's Systems (ESS2)		
6.ESS2.6 Develop and use a model to describe how unequal heating and rotation of the Earth causes patterns of atmospheric and oceanic circulation that determine regional climates.		
Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation (e.g., Gulf Stream, North Pacific Drift, California Current) is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Interactions between the atmosphere and oceans can affect the ocean's surface temperature (El Nino/La Nina). Examples of models can be diagrams, maps and globes, or digital representations. **Assessment Boundary:** Assessment should not be focused on specific weather events, but on the patterns that drive Earth's climate systems.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop and use a model to describe phenomena.	• Variations in density due to variations in temperature and salinity drive a global pattern on interconnected ocean currents. • Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. • These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. • The ocean exerts a major influence on weather and climate by absorbing energy from the Sun, and globally redistributing it through ocean currents.	**Systems and System Models:** • Models can be used to represent systems and their interactions (such as inputs, processes, and outputs) and energy, matter, and information flows within the systems.

Earth and Human Activity (ESS3)		
6.ESS3.2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.		
Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires), or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts). **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Analyzing and Interpreting Data: • Analyze and interpret data to provide evidence for phenomena.	• Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces, can help forecast the locations and likelihoods of future events.	**Patterns:** • Graphs, charts, and images can be used to identify patterns in data.

7TH GRADE (7)		
Matter and Its Interactions (PS1)		
7.PS1.1 Develop models to describe the atomic composition of simple molecules and extended structures.		
Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and/or methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms. **Assessment Boundary:** Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Use a model to predict the relationships between systems or between components of a system.	• Substances are made from different types of atoms, which combine with one another in various ways. • Atoms form molecules that range in size from two to thousands of atoms. • Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).	**Scale, Proportion, and Quantity:** • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
7.PS1.2 Analyze and interpret patterns of data related to the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.		
Clarification Statement: Analyze characteristic chemical and physical properties of pure substances. Examples of chemical reactions could include burning sugar or steel wool, baking a cake, milk curdling, or metal rusting. **Assessment Boundary:** Assessment is limited to analysis of the following properties: color change, formation of a gas, temperature change, density, melting point, boiling point, solubility, flammability, and odor.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Analyzing and Interpreting Data: • Analyze and interpret data to determine similarities and differences in findings.	• Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. • Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.	**Patterns:** • Macroscopic patterns are related to the nature of microscopic and atomic-level structure.

Matter and Its Interactions (PS1)		
7.PS1.3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.*		
Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Obtaining, Evaluating, and Communicating Information: • Gather, read, synthesize information from multiple appropriate sources, and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.	• Each pure substance has characteristics, physical and chemical properties (for any bulk quantity under given conditions), that can be used to identify it. • Substances react chemically in characteristic ways. • In a chemical process, the atoms that make up the original substances regroup into different molecules, and these new substances have different properties from those of the reactants. • Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. • The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.	**Structure and Function:** • Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.

Matter and Its Interactions (PS1)		
7.PS1.5 Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.		
Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms. **Assessment Boundary:** Assessment does not include the use of atomic masses or intermolecular forces.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model to describe unobservable mechanics.	• Substances react chemically in characteristic ways. • In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. • The total number of each type of atom is conserved and thus, the mass does not change. Laws are regularities or mathematical descriptions of natural phenomena.	**Energy and Matter:** • Matter is conserved because atoms are conserved in physical and chemical processes.

Matter and Its Interactions (PS1)		
7.PS1.6 Construct, test, and modify a device that releases or absorbs thermal energy by chemical processes to solve a problem.*		
Clarification Statement: Examples of device modification could include changing factors such as type and concentration of a substance. Examples of problems could be keeping a chemical ice pack cold longer or chemical heat pack warm longer. Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride. **Assessment Boundary:** Assessment is limited to the criteria of amount, time, and temperature of substances in testing the device.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Designing Solutions: • Undertake a design project engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.	• Some chemical reactions release energy, others store energy. • A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. • Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process – that is, some of the characteristics may be incorporated into the new design. • The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.	**Energy and Matter:** • The transfer of energy can be tracked as energy flows through a designed or natural system.

<table>
<tr><th colspan="3">Energy (PS3)</th></tr>
<tr><td colspan="3">7.PS3.1 Construct and interpret graphical displays of data to describe the proportional relationships of kinetic energy to the mass of an object and to the speed of an object.</td></tr>
<tr><td colspan="3">Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball. Assessment Boundary: Does not include mathematical calculations of kinetic energy.</td></tr>
<tr><th>Science and Engineering Practice</th><th>Disciplinary Core Ideas</th><th>Crosscutting Concepts</th></tr>
<tr><td>Analyze and Interpret Data:
• Construct and interpret graphical displays of data to identify linear and nonlinear relationships.</td><td>• Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.</td><td>Scale, Proportion and Quantity:
• Proportional relationships (e.g., speed as a ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and process.</td></tr>
</table>

Energy (PS3)		
7.PS3.2 Develop a model to describe that when objects interacting at a distance change their arrangement, different amounts of potential energy are stored in the system.		
Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems. **Assessment Boundary:** Assessment is limited to two objects and electric, magnetic, and gravitational interactions.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model to predict and/or describe phenomena.	• A system of objects may also contain stored (potential) energy, depending on their relative positions. • When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.	**Systems and System Models:** • Models can be used to represent systems and their interactions (such as inputs, processes, and outputs) and energy and matter flows within systems.
7.PS3.5 Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.		
Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object. **Assessment Boundary:** Assessment does not include calculations of energy.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon.	• When the motion energy of an object changes, there is inevitably some other change in energy at the same time.	**Energy and Matter:** • The transfer of energy can be tracked as energy flows through a designed or natural system.

From Molecules to Organisms: Structure and Function (LS1)		
7.LS1.6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.		
Clarification Statement: Emphasis is on tracing movement of matter and flow of energy. **Assessment Boundary:** Assessment does not include the biochemical mechanisms of photosynthesis.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	• Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. • The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. • In this reaction, carbon dioxide and water combine to form carbon- based organic molecules and release oxygen.	**Energy and Matter:** • Within a natural system, the transfer of energy drives the motion and/or cycling of matter.
7.LS1.7 Develop a model to describe how food molecules in plants and animals are broken down and rearranged through chemical reactions to form new molecules that support growth and/or release energy as matter moves through an organism.		
Clarification Statement: Emphasis is on describing how energy stored within food molecules is released as they are broken apart and rearranged into new molecules. **Assessment Boundary:** Assessment does not include details of the chemical reactions for photosynthesis or respiration.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model to predict and/or describe phenomena.	• Within an individual organism, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or release energy. • Cellular respiration in plants and animals involves chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.	**Energy and Matter:** • Matter is conserved because atoms are conserved in physical and chemical processes.

Ecosystems: Interactions, Energy, and Dynamics (LS2)

7.LS2.1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources. **Assessment Boundary:** Determining the carrying capacity of ecosystems is beyond the intent.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data: • Analyze and interpret data to provide evidence for phenomena.	• Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. • In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. • Growth of organisms and population increases are limited by access to resources.	**Cause and Effect:** • Cause and effect relationships may be used to predict phenomena in natural or designed systems.

7.LS2.2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

Clarification Statement: Emphasis is on constructing explanations that predict consistent patterns of interactions in different ecosystems in terms of the relationships among and between living organisms and nonliving components of ecosystems. Examples of types of interactions could include competition, predation, parasitism, commensalism, mutualism. **Assessment Boundary:** N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations: • Construct an explanation that includes qualitative or quantitative relationships between variables that predict and/or describe phenomena.	• Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.	**Patterns:** • Patterns can be used to identify cause and effect relationships.

Ecosystems: Interactions, Energy, and Dynamics (LS2)

7.LS2.3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system. **Assessment Boundary:** Assessment does not include the use of chemical reactions to describe the processes.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models: • Develop a model to describe phenomena.	• Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. • Transfers of matter into and out of the physical environment occur at every level. • Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. • The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.	**Energy and Matter:** • The transfer of energy can be tracked as energy flows through a natural system.

7.LS2.4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems. **Assessment Boundary:** N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence: • Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or model for a phenomenon.	• Ecosystems are dynamic in nature; their characteristics can vary over time. • Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.	**Stability and Change:** • Small changes in one part of a system might cause large changes in another part.

Ecosystems: Interactions, Energy, and Dynamics (LS2)		
7.LS2.5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.*		
Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.	• Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. • The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. • Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. • The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies form region to region and over time.	**Stability and Change:** • Small changes in one part of a system might cause large changes in another part.

Earth and Human Activity (ESS3)

7.ESS3.1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geological traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).

Assessment Boundary: N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations: • Apply scientific ideas, principles, and evidence (including students' own investigations, models, theories, simulations, peer review) to provide an explanation of phenomena.	• Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. • Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. • These resources are distributed unevenly around the planet as a result of past geologic processes.	**Cause and Effect:** • Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Earth and Human Activity (ESS3)

7.ESS3.3 Apply scientific principles to design a method for monitoring and minimizing human impact on the environment.*

Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land). **Assessment Boundary:** N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations: • Apply scientific principles to design an object, tool, process, or system.	• Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. • Typically, as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. • The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region, and over time.	**Cause and Effect:** • Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Earth and Human Activity (ESS3)		
7.ESS3.4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.		
Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or model for a phenomenon.	• Typically, as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.	**Cause and Effect:** • Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Earth and Human Activity (ESS3)		
7.ESS3.5 Obtain, evaluate, and communicate evidence of the factors that have caused changes in global temperatures over the past century.		
Clarification Statement: Examples of evidence can include tables, graphs, and maps of global and regional temperatures; atmospheric levels of gases such as carbon dioxide and methane; and the impact humans have on the environment. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Obtaining, Evaluating and Communicating Evidence: • Gather, read, synthesize information from multiple appropriate sources, and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.	• Understanding atmospheric changes and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge (such as understanding of human behavior) and on applying that knowledge wisely in decisions and activities.	**Stability and Change:** • Stability might be disturbed either by sudden events or gradual changes that accumulate over time.

8TH GRADE (8)		
Motion and Stability: Forces and Interactions (PS2)		
8.PS2.1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects in a system.*		
Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle. **Assessment Boundary:** Assessment is limited to vertical or horizontal interactions in one dimension.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Apply scientific principles to design an object, tool, process, or system.	• For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). • The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.	**Systems and System Models:** • Models can be used to represent systems and their interactions (such as inputs, processes, and outputs) and energy, matter, and information flows within the systems.

Motion and Stability: Forces and Interactions (PS2)		
8.PS2.2 Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.		
Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law); frame of reference; and specification of units. An increase in force can be caused by increasing the mass, the acceleration, or both the mass and acceleration of an object. An example of evidence could include reasoning from mathematical expressions (F=ma). **Assessment Boundary:** Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and a change in one variable at a time. Assessment does not include the use of trigonometry.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Plan an investigation individually and collaboratively; identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.	• The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero its motion will change. • The greater the mass of the object, the greater the force needed to achieve the same change in motion. • For any given object, a larger force causes a larger change in motion.	**Stability and Change:** • Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales.

Motion and Stability: Forces and Interactions (PS2)		
8.PS2.3 Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.		
Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor. **Assessment Boundary:** Assessment about questions that require quantitative answers is limited to proportional reasoning. Assessment of Coulomb's Law is not intended.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Asking Questions: • Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles.	• Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.	**Cause and Effect:** • Cause and effect relationships may be used to predict phenomena in natural or designed systems.

8.PS2.4 Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system. **Assessment Boundary:** Assessment does not include Newton's Law of Gravitation or Kepler's Laws. Assessment should be focused on qualitative observations and data, or other quantitative data that does not require mathematical computations beyond basic central tendencies.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence • Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.	• Gravitational forces are always attractive. • There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass (e.g., Earth and the Sun).	**Systems and System Models:** • Models can be used to represent systems and their interactions (such as inputs, processes and outputs) and energy and matter flows within systems.

Motion and Stability: Forces and Interactions (PS2)		
8.PS2.5 Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.		
Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically charged balloons. Examples of investigations could include first-hand experiences or simulations. **Assessment Boundary:** Assessment is limited to electric and magnetic fields, and limited to qualitative evidence for the existence of fields.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation.	• Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively).	**Cause and Effect:** • Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Waves and Their Applications in Technologies for Information Transfer (PS4)		
8.PS4.1 Use mathematical representations to describe patterns in a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.		
Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking. **Assessment Boundary:** Assessment does not include electromagnetic waves and is limited to standard repeating waves.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematical and Computational Thinking: • Use mathematical representation to describe and/or support scientific conclusions and design solutions.	• A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.	**Patterns:** • Graphs and charts can be used to identify patterns in data.

Waves and Their Applications in Technologies for Information Transfer (PS4)		
8.PS4.3 Integrate qualitative scientific and technical information to support the claim that digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.*		
Clarification Statement: Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in WIFI devices, and conversion of stored binary patterns to make sound or text on a computer screen. Examples of reliability in encoding could include transmitting digital information at a higher quality than analog signals (digital vs. analog photographs or videos, or digital vs. analog thermometer). Examples of reliability in transmission could include the degradation of an analog signal compared to a digital signal. **Assessment Boundary:** Assessment does not include binary counting or the specific mechanism of any given device.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Obtaining, Evaluating, and Communicating Evidence: • Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings.	• Many modern communications devices use digitized signals (sent as wave pulses) as they are a more reliable way to encode and transmit information.	**Structure and Function:** • Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.

From Molecules to Organisms: Structure and Processes (LS1)

8.LS1.4 Use arguments based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

Clarification Statement: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury. **Assessment Boundary:** Assessment should not focus on the identification of the reproductive plant structures.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence: • Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for phenomena.	• Animals engage in characteristic behaviors that increase the odds of reproduction. • Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.	**Cause and Effect:** • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

8.LS1.5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds. **Assessment Boundary:** Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations: • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	• Genetic factors, as well as local conditions, affect the growth of the adult plant.	**Cause and Effect:** • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

Heredity: Inheritance and Variation of Traits (LS3)

8.LS3.1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins. Examples: Radiation treated plants, genetically modified organisms (e.g. roundup resistant crops, bioluminescence), mutations both harmful and beneficial. **Assessment Boundary:** Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models: • Develop and use a model to describe phenomena.	• Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. • Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. • In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. • Though rare, mutations may result in changes to the structure and function of proteins. • Some changes are beneficial, others harmful, and some neutral to the organism.	**Structure and Function:** • Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore complex natural structures/systems can be analyzed to determine how they function.

Heredity: Inheritance and Variation of Traits (LS3)

8.LS3.2 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation. **Assessment Boundary:** The assessment should measure the students' abilities to explain the general outcomes of sexual versus asexual reproduction in terms of variation seen in the offspring.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models: • Develop and use a model to describe phenomena.	• Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. • Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. • In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other.	**Cause and Effect:** • Cause and effect relationships may be used to predict phenomena in natural systems.

Biological Unity and Diversity (LS4)

8.LS4.1 Analyze and interpret data to identify patterns within the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth.

Clarification Statement: Emphasis is on finding patterns of change in the complexity of anatomical structures in organisms and the chronological order of fossils' appearance in the rock layers. The natural laws that operate today are assumed to operate as they have in the past. **Assessment Boundary:** Assessment does not include the names of individual species or geological time scales in the fossil record.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Analyze and Interpret Data: • Analyze and interpret data to determine similarities and differences in findings.	• The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.	**Patterns:** • Graphs and charts can be used to identify patterns in data.

8.LS4.2 Apply scientific ideas to construct an explanation for the patterns of anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer ancestral relationships.

Clarification Statement: Emphasis is on explanations of the ancestral relationships among organisms in terms of similarities or differences of anatomical features or structures. Examples could include how structural similarities/differences could determine relationships between two modern organisms (e.g., wings of birds vs. bats vs. insects) or modern and fossil organisms (e.g., fossilized horses compared to modern horses, trilobites compared to horseshoe crabs). **Assessment Boundary:** Assessment does not include the names of individual species or geological eras in the fossil record.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations: • Construct a scientific explanation based on valid and reliable evidence.	• The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. • Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record serve as evidence of ancestral relationships among organisms and changes in populations over time.	**Patterns:** • Graphs and charts can be used to identify patterns in data.

Biological Unity and Diversity (LS4)		
8.LS4.3 Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.		
Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance in diagrams or pictures. **Assessment Boundary:** Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Analyze and Interpret Data: • Analyze and interpret data to determine similarities and differences in findings.	• Comparison of embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy.	**Patterns:** • Graphs and charts can be used to identify patterns in data.
8.LS4.4 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.		
Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations for why in a specific environment impacted by different factors (e.g., limited food availability, predators, nesting site availability, light availability), some traits confer advantages that make it more probable that an organism will be able to survive and reproduce there. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Construct an explanation that includes qualitative or quantitative relationships between variables that predict and/or describe phenomena.	• Natural selection leads to the predominance of certain traits in a population, and the suppression of others.	**Cause and Effect:** • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

Biological Unity and Diversity (LS4)

8.LS4.5 Gather and synthesize information about the practices that have changed the way humans influence the inheritance of desired traits in organisms.*

Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and on the impacts these practices have on society, as well as the technologies leading to these scientific discoveries. **Assessment Boundary:** The assessment should provide evidence of students' abilities to understand and communicate how technology affects both individuals and society.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information: • Gather, read, synthesize information from multiple appropriate sources; assess the credibility, accuracy, and possible bias of each publication and methods used; and describe how they are supported or not supported by evidence.	• In artificial selections, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits by genes, which are then passed on to offspring. • Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.	**Cause and Effect:** • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

8.LS4.6 Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time. **Assessment Boundary:** The assessment should provide evidence of students' abilities to explain trends in data for the number of individuals with specific traits changing over time. Assessment does not include Hardy Weinberg calculations.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Using Mathematics and Computational Thinking: • Use mathematical representation to describe and/or support scientific conclusions and design solutions.	• Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. • Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population change.	**Cause and Effect:** • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

Earth's Place in the Universe (ESS1)

8.ESS1.1 Develop and use a model of the Earth-Sun-Moon system to describe the cyclic patterns of lunar phases, eclipses of the Sun and Moon, and seasons.

Clarification Statement: Earth's rotation relative to the positions of the Moon and Sun describes the occurrence of tides; the revolution of Earth around the Sun explains the annual cycle of the apparent movement of the constellations in the night sky; the Moon's revolution around Earth explains the cycle of spring/neap tides and the occurrence of eclipses; and the Moon's elliptical orbit mostly explains the occurrence of total and annular eclipses. The position and tilt of Earth, as it revolves around the Sun, explain why seasons occur. Examples of models can be physical, graphical, or conceptual. **Assessment Boundary:** Definitions of spring or neap tides should not be included.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models: • Develop and use a model to describe a phenomenon.	• Patterns of the apparent motion of the Sun, the Moon, and stars in the sky can be observed, described, predicted, and explained with models. • The model of the solar system can explain eclipses of the Sun and the Moon. • Earth's spin axis is fixed in direction over the short term but tilted relative to its orbit around the Sun. The seasons are a result of its tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.	**Patterns:** • Patterns can be used to identify cause-and- effect relationships.

Earth's Place in the Universe (ESS1)

8.ESS1.2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

Clarification Statement: Emphasis for the model is on effects of gravity and inertia as the forces that hold together the solar system and Milky Way Galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as a school or state). **Assessment Boundary:** Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models: • Develop and use a model to describe a phenomenon.	• Earth and its solar system are part of the Milky Way Galaxy, which is one of the many galaxies in the universe. • The solar system consists of the Sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the Sun by its gravitational pull on them. • The solar system appears to have formed from a disk of dust and gas, drawn together by gravity.	**Systems and System Models:** • Models can be used to represent systems and their interactions.

8.ESS1.3 Analyze and interpret data to determine scale properties of objects in the solar system.*

Clarification Statement: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models. **Assessment Boundary:** Assessment emphasis is on data analysis of properties of the planets and should not include recalling facts about the planets and other solar system bodies.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data: • Analyze and interpret data to determine similarities and differences in findings.	• The solar system consists of the Sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the Sun by its gravitational pull on them. • Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.	**Scale, Proportion, and Quantity:** • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

PHYSICAL SCIENCE (PS)		
Matter and Its Interactions (PS1)		
PS.PS1.1 Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.		
Clarification Statement: Examples of properties that could be predicted from trends and patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen. **Assessment Boundary:** Assessment is limited to main group elements. Assessment does not include understanding of ionization energy and electronegativity.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Use a model to predict the relationships between systems or between components of a system.	• Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. • The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.	**Patterns:** • Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Matter and Its Interactions (PS1)		
PS.PS1.2 Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, knowledge of the patterns of chemical properties, and formation of compounds.		
Clarification Statement: Identifying patterns in reactions allows the emphasis to be on student explanation of observed reaction outcomes. Reactions that students could be exposed to are synthesis (limited to elements forming a compound), decomposition (limited to a compound producing two or more elements), combustion, single displacement, or double displacement. **Assessment Boundary:** Assessment is limited to chemical reactions involving main group elements.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	• The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. • The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.	**Patterns:** • Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Matter and Its Interactions (PS1)		
PS.PS1.5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.		
Clarification Statement: Emphasis is on student reasoning that focuses on the qualitative evidence for number and energy of collisions (Collison Theory) and relationships between rate and temperature. **Assessment Boundary:** Assessment is limited to explaining the result of changing one condition at a time in a simple reaction in which there are only two reactants.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.	• Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangement of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.	**Cause and Effect:** • Cause and effect relationships can be suggested and predicted for complex natural and human-designed systems by examining what is known about smaller scale mechanisms within the system.
PS.PS1.7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.		
Clarification Statement: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale. Mathematical representation can include balancing chemical equations to represent the laws of conservation of mass, constant composition (definite proportions) and understanding the ratio of the coefficients between reactants and products. **Assessment Boundary:** Assessment does not include complex chemical reactions or stoichiometry. Emphasis is on assessing students' use of mathematical reasoning and not on memorization and rote application of problem-solving techniques.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematics and Computational Thinking: • Use mathematical representations of phenomena to support claims.	• The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.	**Energy and Matter:** • The total amount of energy and matter in closed systems is conserved.

Motion and Stability: Forces and Interactions (PS2)

PS.PS2.1 Analyze and interpret data to support the claim of a causal relationship between the net force on an object and its change in motion, as described in Newton's second law of motion.

Clarification Statement: Examples of data could include tables or graphs of position or velocity of an object as a function of time. Examples of objects subjected to a net force can include objects in free-fall, objects sliding down a ramp, or moving objects pulled by a constant force.

Assessment Boundary: Assessment is limited to macroscopic objects moving in one-dimensional motion, at non-relativistic speeds. Air-resistance is ignored.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data: • Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims.	• Newton's second law accurately predicts changes in the motion of macroscopic objects.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

PS.PS2.2 Use mathematical representations to support the explanation that the total momentum of a system of objects is conserved when there is no net force on the system.

Clarification Statement: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle. **Assessment Boundary:** Assessment is limited to systems of two macroscopic bodies moving in one dimension and does not include naming the types of collisions. Assessment should provide evidence of students' abilities to explain the mathematical relationships between momentum, mass, and velocity.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Using Mathematics and Computational Thinking: • Use mathematical, computational, and/or algorithmic representations of phenomena or design solutions to describe and/or support claims and/or explanations.	• Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. • If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by change in the momentum of objects outside the system.	**Systems and System Models:** • When investigating or describing a system, the boundaries and initial conditions of the system need to be defined.

Motion and Stability: Forces and Interactions (PS2)		
PS.PS2.3 Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.*		
Clarification Statement: An example of evaluation could include determining the success of the device at protecting an object from damage. Examples of devices could include football helmets, parachutes, and car restraint systems, such as seatbelts and airbags. Refinement of the device may include modifying one or more parts or all of the device to improve performance of the device. **Assessment Boundary:** Assessment is limited to qualitative evaluations and/or algebraic manipulations.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Designing Solutions: • Apply scientific ideas to solve a design problem, taking into account possible unanticipated effects.	• If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by change in the momentum of objects outside the system. • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account; and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.	**Cause and Effect:** • Systems can be designed to cause a desired effect.

Motion and Stability: Forces and Interactions (PS2)		
PS.PS2.5 Plan and conduct an investigation to provide evidence that an electric current can cause a magnetic field and that a changing magnetic field can cause an electric current.		
Clarification Statement: Students' investigations should describe the data that will be collected and the evidence to be derived from that data. Examples could include electromagnets/solenoids, motors, current carrying wires, and compasses. **Assessment Boundary:** Assessment is limited to planning and conducting investigations with provided materials and tools.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements; consider limitations on the precision of the data (e.g., number of trials, cost, risk, time); and refine the design accordingly.	• Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. • Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. • "Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Energy (PS3)		
PS.PS3.1 Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.		
Clarification Statement: Emphasis is on utilizing calculations to understand that energy is transferred in and out of systems and conserved, as well as explaining the meaning of mathematical expressions used in the model. **Assessment Boundary:** Assessment is limited to two or three components and the transfer of thermal energy, kinetic energy, potential energy, and/or the energies in gravitational, magnetic, or electric fields.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematics and Computational Thinking: • Create a computational model of a phenomenon, process, or system based on basic assumptions.	• Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. • Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. • Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. • Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g., relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. • The availability of energy limits what can occur in any system.	**System and System Models:** • Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models.

Energy (PS3)

PS.PS3.2 Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as either motions of particles or energy stored in fields.

Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to the position of an object above the earth (considered as stored in fields), and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations. **Assessment Boundary:** Assessment does not include quantitative calculations, chemical energy, or effects of air resistance/friction.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models: • Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.	• Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. • At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. • These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a com- bination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space.	**Energy and Matter:** • Energy cannot be created or destroyed—only moves between one place and another place, between objects and/or fields, or between systems.

Energy (PS3)

PS.PS3.3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*

Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints placed on a device could include the cost of materials, types of materials available, having to use renewable energy, an efficiency threshold, and time to build and/or operate the device.

Assessment Boundary: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Designing Solutions: • Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and trade-off considerations.	• At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.	**Energy and Matter:** • Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

<table>
<tr><th colspan="3">Energy (PS3)</th></tr>
<tr><td colspan="3">PS.PS3.4 Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).</td></tr>
<tr><td colspan="3">Clarification Statement: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the thermal energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water. Assessment Boundary: Assessment is limited to devices constructed with materials provided to students. Assessment includes both quantitative and conceptual descriptions of energy change.</td></tr>
<tr><th>Science and Engineering Practice</th><th>Disciplinary Core Ideas</th><th>Crosscutting Concepts</th></tr>
<tr><td>Planning and Carrying Out Investigations:
• Plan an investigation or test a design individually and collaboratively to produce data to serve as the basis for evidence as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems. Consider possible confounding variables or effects and evaluate the investigation’s design to ensure variables are controlled.</td><td>• Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.
• Uncontrolled systems always evolve toward more stable states - that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than surrounding environments cool down).</td><td>Systems and System Models:
• When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.</td></tr>
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Waves and Their Applications in Technologies for Information Transfer (PS4)

PS.PS4.1 Use mathematical representations to explain both qualitative and quantitative relationships among frequency, wavelength, and speed of waves traveling in various media.

Clarification Statement: Emphasis is on using mathematical representations to understand how various media change the speed of waves. Examples of waves moving through various media could include electromagnetic radiation traveling in a vacuum or glass, sound waves traveling through air or water, or seismic waves traveling through Earth. **Assessment Boundary:** Assessment is limited to algebraic relationships and describing those relationships qualitatively.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Mathematical and Computational Thinking: • Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.	• The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

PS.PS4.2 Evaluate questions about the advantages and disadvantages of using a digital transmission and storage of information.*

Clarification Statement: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.
Assessment Boundary: N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions: • Evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set, or the suitability of a design.	• Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. • Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.	**Stability and Change:** • Systems can be designed for greater or lesser stability.

Waves and Their Applications in Technologies for Information Transfer (PS4)		
PS.PS4.4 Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.		
Clarification Statement: Emphasis is on the idea that different frequencies of electromagnetic radiation have different energies, and the damage to living tissue depends on the energy of the radiation. Examples of published materials could include peer-reviewed scientific articles, or trade books, magazines, web resources, videos, and other passages that may reflect bias. **Assessment Boundary:** Assessment is limited to qualitative descriptions.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Obtaining, Evaluating, and Communicating Information: • Evaluate the validity and reliability of multiple claims that appear in scientific and technical texts or media reports, verifying the data when possible.	• When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). • Shorter wavelength electromagnetic radiation (ultraviolet, X-rays, gamma rays) can ionize atoms and cause damage to living cells. • Photoelectric materials emit electrons when they absorb light of high enough frequency.	**Cause and Effect:** • Cause and effect relationships can be suggested and predicted for complex natural and human-designed systems by examining what is known about smaller scale mechanisms within the system.

CHEMISTRY (CH)

Matter and Its Interactions (PS1)

CH.PS1.1 Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

Clarification Statement: Examples could include trends in ionization energy, atomic radius, or electronegativity. Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and ion formation.

Assessment Boundary: Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends or exception explanations (e.g. Be to B or N to O).

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models: • Use a model to predict the relationships between systems or between components of a system.	• Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. • The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.	**Patterns:** • Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Matter and Its Interactions (PS1)		
CH.PS1.2 Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, knowledge of the patterns of chemical properties, and formation of compounds.		
Clarification Statement: Periodic trends (ionization energy, electronegativity, reactivity), patterns of valence electrons, and classifying reaction types should be utilized when constructing and revising explanations for the prediction of products (e.g. synthesis/combination, decomposition, combustion, single displacement, double displacement, oxidation/reduction, and/or acid/base). **Assessment Boundary:** Assessment is limited to chemical reactions involving main group elements and polyatomic ions (e.g. Nitrate, Nitrite, Sulfate, Hydroxide, Carbonate, and Phosphate).		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, and peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	• The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. • The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.	**Patterns:** • Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Matter and Its Interactions (PS1)		
CH.PS1.3 Plan and conduct an investigation to compare the structure of substances at the bulk scale level to infer the strength of electrical forces between particles.		
Clarification Statement: Emphasis is on understanding the relative strengths of forces between particles, not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension. The intent of the performance expectation is limited to evaluation of bulk-scale properties and not microscale properties. **Assessment Boundary:** Assessment does not include calculations related to any bulk-scale property.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements; consider limitations on the precision of the data (e.g., number of trials, cost, risk, time); and refine the design accordingly.	• The structure and interactions of matter at the bulk-scale are determined by electrical forces within and between atoms.	**Structure and Function:** • The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.

Matter and Its Interactions (PS1)		
CH.PS1.4 Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.		
Clarification Statement: Emphasis is on the idea that a chemical reaction is a system that involves an overall change in energy that is due to the absorption of energy when bonds are broken and the release of energy when new bonds are formed. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved. **Assessment Boundary:** Assessment does not include calculating the total bond energy changes during a chemical reaction from the bond energies of reactants and products.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model based on evidence to illustrate the relationships between systems or between components of a system.	• A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart. • Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.	**Energy and Matter:** • Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

Matter and Its Interactions (PS1)		
CH.PS1.5 Apply scientific principles and evidence to provide an explanation about the effects of changing the conditions of the reacting particles on the rate at which a reaction occurs.		
Clarification Statement: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules (Collision Theory). Examples of reaction conditions that affect rate could include temperature, concentration, surface area/particle size, pressure, or the addition of a catalyst. **Assessment Boundary:** Assessment is limited to explaining the result of changing one condition at a time in a simple reaction in which there are only two reactants.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.	• Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangement of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.	**Cause and Effect:** • Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system.

Matter and Its Interactions (PS1)		
CH.PS1.6 Refine the design of a chemical system by specifying a change in conditions that would produce a change in the amounts of products at equilibrium.*		
Clarification Statement: Emphasis is on the qualitative application of Le Châtelier's Principle and on refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Designs may include ways to achieve the desired effect on a system at equilibrium by changing temperature, pressure, and/or adding or removing reactants or products. **Assessment Boundary:** Assessment is limited to specifying the change in only one variable at a time. Assessment does not include calculating equilibrium constants and concentrations.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Designing Solutions: • Refine a solution to a complex real- world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and trade off considerations.	• In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. • Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed.	**Stability and Change:** • Much of science deals with constructing explanations of how things change and how they remain stable.

Matter and Its Interactions (PS1)		
CH.PS1.7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.		
Clarification Statement: Mathematical representations could include balanced chemical equations that represent the laws of conservation of mass and constant composition (definite proportions) and mass-to-mass stoichiometry. The mole concept and stoichiometry are used to show proportional relationships between masses of reactants and products. **Assessment Boundary:** Assessment does not include complex chemical reactions. Emphasis is on assessing students' use of mathematical reasoning and does not include recall of mathematical equations and rote application of problem-solving techniques.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematics and Computational Thinking: • Use mathematical representations of phenomena to support claims.	• The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.	**Energy and Matter:** • The total amount of energy and matter in closed systems is conserved.
CH.PS1.8 Develop models to illustrate the changes in composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.		
Clarification Statement: Emphasis is on qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations. Examples of nuclear processes could include the formation of elements through fusion in stars, generation of electricity in a nuclear power plant, or the use of radioisotopes in nuclear medicine. **Assessment Boundary:** Assessment does not include quantitative calculation of energy released (i.e., binding energy). Assessment is limited to alpha, beta, and gamma radioactive decay.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.	• Nuclear processes, including fusion, fission, and radioactive decay of unstable nuclei, involve release or absorption of energy. • The total number of neutrons plus protons does not change in any nuclear process.	**Energy and Matter:** • In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons are conserved.

Motion Stability: Forces and Interactions (PS2)		
CH.PS2.6 Communicate scientific and technical information about why the molecular level structure of designed materials determines how the material functions.*		
Clarification Statement: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors. Scientific and technical information should include molecular structures of specific designed materials and limit comparison to two substances of the same type. **Assessment Boundary:** Assessment is limited to provided molecular structures or specific designed materials.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Obtaining, Evaluating, and Communicating Information: • Communicate scientific and technical information (e.g., about the process of development and the design and performance of a proposed process or system) in multiple formats (including oral, graphical, textual, and mathematical).	• Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.	**Structure and Function:** • Investigating or designing net systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and the connections of components to reveal its function and/or solve a problem.

Energy (PS3)		
CH.PS3.3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*		
Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Sources of energy could include those from chemical or nuclear reactions. Examples of devices could include lemon or potato clock, a voltaic cell (batteries), hand warmers, solar panels/solar ovens, and nuclear power generation through simulations. Examples of constraints placed on a device could include the cost of materials, types of materials available, having to use renewable energy, an efficiency threshold, and time to build and/or operate the device. **Assessment Boundary:** Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Designing Solutions: • Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student- generated sources of evidence, prioritized criteria, and trade-off considerations.	• At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.	**Energy and Matter:** • Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

Energy (PS3)		
CH.PS3.4 Plan and conduct an investigation to provide evidence that the transfer of thermal energy between components in a closed system involves changes in energy dispersal and heat content and results in a more uniform energy distribution among the components in the system (second law of thermodynamics).		
Clarification Statement: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the thermal energy changes both quantitatively and conceptually. Examples of investigations could include calorimetry (i.e., dissolving a substance in water, mixing two solutions, and combining two components) where students measure temperatures and calculate heat. **Assessment Boundary:** Assessment is limited to conceptual understanding of energy and investigations based on materials and tools provided to students. Assessment includes both quantitative and conceptual descriptions of energy change.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Plan and conduct investigations individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements; consider limitations on the precision of the data (e.g., number of trials, cost, risk, time); and refine the design accordingly.	• Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. • Uncontrolled systems always evolve toward more stable states - that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than surrounding environments cool down).	**Systems and System Models:** • When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.

Waves and Their Applications in Technologies for Information Transfer (PS4)		
CH.PS4.1 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.		
Clarification Statement: Emphasis is on using mathematical relationships to understand how various media change the speed of waves. Examples of different media that could be explored include electromagnetic radiation traveling in a vacuum or glass, sound waves traveling through air or water, or seismic waves traveling through Earth. **Assessment Boundary:** Assessment is limited to algebraic relationships and describing those relationships qualitatively.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematics and Computational Thinking: • Use mathematical, computational, and/or algorithmic representations of phenomena or design solutions to describe and/or support claims and/or explanations.	• The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Waves and Their Applications in Technologies for Information Transfer (PS4)		
CH.PS4.3 Develop an argument for how scientific evidence supports the explanation that electromagnetic radiation can be described either by the wave model or the particle model, and in some situations one model is more useful than the other.		
Clarification Statement: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and the photoelectric effect. **Assessment Boundary:** Assessment does not include using quantum theory.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments.	• Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. • Boundary: The discussion at this grade level is qualitative only; it can be based on the fact that two sounds can pass a location in different directions without getting mixed up. • Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features.	**Systems and System Models:** • Models (e.g., physical, mathematical, computer) can be used to simulate systems and interactions, including energy, matter, and information flow within and between systems at different scales.

PHYSICS (PH)

Matter and Its Interactions (PS1)

PH.PS1.8 Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

Clarification Statement: Emphasis is on qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations. Examples of nuclear processes could include, the formation of elements through fusion in stars, generation of electricity in a nuclear power plant, or the use of radioisotopes in nuclear medicine. **Assessment Boundary:** Assessment does not include quantitative calculation of energy released (i.e., binding energy). Assessment is limited to alpha, beta, and gamma radioactive decay.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models: • Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.	• Nuclear processes, including fusion, fission, and radioactive decay of unstable nuclei, involve release or absorption of energy. • The total number of neutrons plus protons does not change in any nuclear process.	**Energy and Matter:** • In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons are conserved.

Motion and Stability: Forces and Interactions (PS2)

PH.PS2.1 Analyze and interpret data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

Clarification Statement: Examples of data could include tables or graphs of position or velocity of an object as a function of time. Examples of objects subjected to a net force can include objects in free-fall, objects sliding down a ramp, or moving objects pulled by a constant force. The relationship $F_{net} = ma$ should be explored qualitatively and quantitatively. **Assessment Boundary:** Assessment is limited to macroscopic objects moving in one-dimensional motion, at non-relativistic speeds.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data: • Analyze data using tools, technologies, and/or models (e.g., computations, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.	• Newton's Second Law accurately predicts changes in the motion of macroscopic objects.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Motion and Stability: Forces and Interactions (PS2)

PH.PS2.2 Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

Clarification Statement: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle. Examples could include one-dimensional elastic or inelastic collisions between objects within the system. **Assessment Boundary:** Assessment is limited to systems of two macroscopic bodies moving in one dimension and does not include naming the types of collisions.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Using Mathematics and Computational Thinking: • Use mathematical, computational, and/or algorithmic representations of phenomena or design solutions to describe and/or support claims and/or explanations.	• Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. • If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by change in the momentum of objects outside the system.	**Systems and System Models:** • When investigating or describing a system, the boundaries and initial conditions of the system need to be defined.

PH.PS2.3 Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.*

Clarification Statement: An example of evaluation could include determining the success of the device at protecting an object from damage. Examples of devices could include football helmets, parachutes, and car restraint systems, such as seatbelts and airbags. Refinement of the device may include modifying one or more parts or all of the device to improve performance of the device. **Assessment Boundary:** Assessment is limited to qualitative evaluations and/or algebraic manipulations.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Designing Solutions: • Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student- generated sources of evidence, prioritized criteria, and tradeoff considerations.	• If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by change in the momentum of objects outside the system. • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.	**Cause and Effect:** • Systems can be designed to cause a desired effect.

Motion and Stability: Forces and Interactions (PS2)		
PH.PS2.4 Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between object.		
Clarification Statement: Emphasis is on both quantitative and conceptual descriptions of interactions between masses in gravitational fields and electrical charges in electric fields. **Assessment Boundary:** Assessment is limited to systems with two objects.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematics and Computational Thinking: • Use mathematical, computational, and/or algorithmic representations of phenomena or design solutions to describe and/or support claims and/or explanations.	• Newton's Law of Universal Gravitation and Coulomb's Law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. • Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. • Magnets or electric fields cause magnetic fields; electric charges or changing magnetic fields causes electric fields.	**Patterns:** • Different patterns may be observed at each of the scales at which a system is studied and can provide for causality in explanations of phenomena.

Motion and Stability: Forces and Interactions (PS2)		
PH.PS2.5 Plan and conduct an investigation to provide evidence that an electric current can cause a magnetic field and that a changing magnetic field can cause an electric current.		
Clarification Statement: Students' investigations should describe the data that will be collected and the evidence to be derived from that data. Examples could include electromagnets/solenoids, motors, current carrying wires, and compasses. **Assessment Boundary:** Assessment is limited to planning and conducting investigations with provided materials and tools.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements; consider limitations on the precision of the data (e.g., number of trials, cost, risk, time); and refine the design accordingly.	• Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. • Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. • "Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Energy (PS3)		
PH.PS3.1 Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.		
Clarification Statement: Emphasis is on utilizing calculations to understand that energy is transferred in and out of systems and conserved, as well as explaining the meaning of mathematical expressions used in the model. **Assessment Boundary:** Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, potential energy, and/or the energies in gravitational, magnetic, or electric fields.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematics and Computational Thinking: • Create a computational model of a phenomenon, process, or system based on basic assumptions.	• Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. • Conservation of energy means energy cannot be created or destroyed and the total change of energy in a system is always equal to the energy transferred into or out of the system. • Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. • Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. • The availability of energy limits what can occur in any system.	**Systems and System Models:** • Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models.

Energy (PS3)		
PH.PS3.2 Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as either motions of particles or energy stored in fields.		
Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to the position of an object above the earth (considered as stored in fields), and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations. **Assessment Boundary:** Assessment does not include quantitative calculations.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.	• Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. • That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. • At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. • These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases, the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space.	**Energy and Matter:** • Energy cannot be created or destroyed—only moves between one place and another place, between objects and/or fields, or between system.

Energy (PS3)		
PH.PS3.3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*		
Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints placed on a device could include the cost of materials, types of materials available, having to use renewable energy, an efficiency threshold, and time to build and/or operate the device. **Assessment Boundary:** Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Designing Solutions: • Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and trade-off considerations.	• At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.	**Energy and Matter:** • Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

Energy (PS3)		
PH.PS3.4 Plan and conduct an investigation to provide evidence that the transfer of thermal energy between components in a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).		
Clarification Statement: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the thermal energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water. **Assessment Boundary:** Assessment is limited to investigations based on materials and tools provided to students. Assessment includes both quantitative and conceptual descriptions of energy change.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements; consider limitations on the precision of the data (e.g., number of trials, cost, risk, time) and refine the design accordingly.	• Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. • Uncontrolled systems always evolve toward more stable states-that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down).	**Systems and System Models:** • When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.

Energy (PS3)		
PH.PS3.5 Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.		
Clarification Statement: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other, including an explanation of how the change in energy of the objects is related to the change in energy of the field. Examples of electric field phenomena may include volcanic lightning or laser printing and examples of magnetic field phenomena may include a mag-lev or magnetic braking. **Assessment Boundary:** Assessment is limited to systems containing two objects.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.	• When two objects interact, each one exerts a force on the other. These forces can transfer energy between the objects. Forces between two objects at a distance are explained by force fields (gravitational, electric, or magnetic) between them.	**Energy and Matter:** • Energy cannot be created or destroyed. It only moves between one place to another, between objects and/or fields, or between systems.

Waves and Their Applications in Technologies for Information Transfer (PS4)		
PH.PS4.1 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.		
Clarification Statement: Emphasis is on using mathematical relationships to understand how various media change the speed of waves. Examples of different media that could be explored include electromagnetic radiation traveling in a vacuum or glass, sound waves traveling through air or water, or seismic waves traveling through Earth. **Assessment Boundary:** Assessment is limited to algebraic relationships and describing those relationships qualitatively.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematics and Computational Thinking: • Use mathematical, computational, and/or algorithmic representations of phenomena or design solutions to describe and/or support claims and/or explanations.	• The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Waves and Their Applications in Technologies for Information Transfer (PS4)		
PH.PS4.2 Evaluate questions about the advantages and disadvantages of using digital transmission and storage of information.*		
Clarification Statement: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security and theft. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Asking Questions: • Evaluate questions that challenge the premises(s) of an argument, the interpretation of a data set, or the suitability of a design.	• Information can be digitized (e.g., picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. • Modern civilization depends on major technological systems. • Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.	**Stability and Change:** • Systems can be designed for greater or lesser stability.

Waves and Their Applications in Technologies for Information Transfer (PS4)		
PH.PS4.3 Develop an argument for how scientific evidence supports the explanation that electromagnetic radiation can be described either by the wave model or the particle model, and in some situations one model is more useful than the other.		
Clarification Statement: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and the photoelectric effect. **Assessment Boundary:** Assessment does not include using quantum theory.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Construct, use, and/or present an oral and written argument or counter-arguments based on data and evidence.	• Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. • Boundary: The discussion at this grade level is qualitative only; it can be based on the fact that two sounds can pass a location in different directions without getting mixed up. • Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. • The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features.	**Systems and System Models:** • Models (e.g., physical, mathematical, computer) can be used to simulate systems and interactions (including energy, matter and information flows) within and between systems at different scales.

Waves and Their Applications in Technologies for Information Transfer (PS4)		
PH.PS4.4 Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.		
Clarification Statement: Emphasis is on the idea that different frequencies of electromagnetic radiation have different energies, and the damage to living tissue depends on the energy of the radiation. Examples of published materials could include peer-reviewed scientific articles, or trade books, magazines, web resources, videos, and other passages that may reflect bias. **Assessment Boundary:** Assessment is limited to qualitative descriptions.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Obtaining, Evaluating, and Communicating Information: • Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible.	• When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). • Shorter wavelength electromagnetic radiation (ultraviolet, X- rays, gamma rays) can ionize atoms and cause damage to living cells. • Photoelectric materials emit electrons when they absorb light of high enough frequency.	**Cause and Effect:** • Cause and effect relationships can be suggested and predicted for complex natural and human-designed systems by examining what is known about smaller scale mechanisms within the system.

Waves and Their Applications in Technologies for Information Transfer (PS4)		
PH.PS4.5 Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.*		
Clarification Statement: Examples could include solar cells capturing light and converting it to electricity and transmitting an audio file through a modulated laser signal. Other examples can be found in medical imaging and communication technology. **Assessment Boundary:** Assessments are limited to qualitative information. Assessments do not include band theory.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Obtaining, Evaluating, and Communicating Information: • Communicate scientific and/or technical information (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).	• Solar cells are human-made devices that capture the Sun's energy and produce electrical energy. • Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. • Photoelectric materials emit electrons when they absorb light of a high enough frequency. • Multiple technologies based on the understanding of waves and their interactions with matter are part of every day experiences in the modern world (e.g., medical imaging, communications, scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them. • Modern civilization depends on major technological systems.	**Cause and Effect:** • Cause and effect relationships can be suggested and predicted for complex natural and human-designed systems by examining what is known about smaller scale mechanisms within the system.

BIOLOGY (B)		
From Molecules to Organisms: Structures and Processes (LS1)		
B.LS1.1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.		
Clarification Statement: Emphasis is on the conceptual understanding that the sequence of nucleotides in DNA determines the amino acid sequence of proteins through the processes of transcription and translation. **Assessment Boundary:** Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	• Systems of specialized cells within organisms help them perform the essential functions of life. • All cells contain genetic information in the form of DNA molecules. • Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of the cells.	**Structure and Function:** • The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of their various materials.

From Molecules to Organisms: Structures and Processes (LS1)		
B.LS1.2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.		
Clarification Statement: Emphasis is on developing a model in which relevant parts (e.g., an organ system, organs, and their component tissues) and processes (e.g., transport of fluids, motion) of body systems in multicellular organisms are identified and described. Models should then be used to illustrate how relevant parts within a system interact and how systems interact with one another to provide specific functions in multicellular organisms. **Assessment Boundary:** Assessment does not include interactions and functions at the molecular or chemical reaction level and is limited to two systems interacting at a time.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.	• Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.	**Systems and System Models:** • Models (e.g., physical, mathematical, computer) can be used to simulate systems and interactions, including energy, matter, and information flow within and between systems at different scales.

From Molecules to Organisms: Structures and Processes (LS1)

B.LS1.3 Plan and conduct an investigation to provide evidence of the importance of maintaining homeostasis in living organisms.

Clarification Statement: A state of homeostasis (stability) must be maintained for organisms to remain alive and functional even as external conditions change within some range. Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, root development in response to water levels, and cell response to hypertonic and hypotonic environments. **Assessment Boundary:** Assessment does not include the cellular processes involved in the feedback mechanism.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Conducting Investigations: • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence.	• Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Outside that range (e.g., at too high or low external temperature, with too little food or water available) the organism cannot survive.	**Stability and Change:** • Feedback (negative or positive) can stabilize or destabilize a system.

B.LS1.4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

Clarification Statement: Emphasis is not on the details of each phase of mitosis but on the conceptual understanding that mitosis produces genetically identical cells via DNA replication and cell division and that immature cells may become specialized through differentiation.
Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models: • Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.	• In multicellular organisms, individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. • The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. • Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism.	**Systems and System Models:** • Models (e.g., physical, mathematical, computer) can be used to simulate systems and interactions, including energy, matter, and information flow within and between systems at different scales.

From Molecules to Organisms: Structures and Processes (LS1)

B.LS1.5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

Clarification Statement: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, or conceptual models developed from investigations.
Assessment Boundary: The assessment should provide evidence of students' abilities to
describe the inputs and outputs of photosynthesis, not the specific biochemical steps (e.g., photosystems, electron transport, and Calvin Cycle).

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models: • Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.	• The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen.	**Energy and Matter:** • Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

B.LS1.6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

Clarification Statement: Emphasis is on using evidence from models and/or simulations to support explanations for how organisms take in matter and rearrange the atoms in chemical reactions to form amino acids and/or other large carbon-based molecules.
Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations: • Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation.	• The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into large molecules (such as proteins or DNA), used, for example, to form new cells. • As matter and energy flow through different organization levels of living systems, chemical elements are recombined in different ways to form different products.	**Energy and Matter:** • Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

From Molecules to Organisms: Structures and Processes (LS1)		
B.LS1.7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed, resulting in a net transfer of energy.		
Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration. Examples of models could include diagrams, chemical equations, or conceptual models developed from investigations. **Assessment Boundary:** Assessment should not include identification of the steps or specific processes involved in cellular respiration (e.g. glycolysis, Kreb's Cycle, and electron transport).		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.	• As matter and energy flow through different organization levels of living systems, chemical elements are recombined in different ways to form different products. • As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. • Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. • Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.	**Energy and Matter:** • Energy cannot be created or destroyed. It only moves between one place to another, between objects and/or fields, or between systems.

Ecosystems: Interactions, Energy, and Dynamics (LS2)		
B.LS2.1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacities of ecosystems at different scales.		
Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, or population changes gathered from simulations or historical data sets. **Assessment Boundary:** Assessment does not include deriving mathematical equations to make comparisons.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematics and Computational Thinking: • Use mathematical, computational, and/or algorithmic representations of phenomena to describe and/or support claims and/or explanations.	• Ecosystems have carrying capacities, which are limits to the number of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges as predation, competition, and disease. • Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.	**Scale, Proportion, and Quantity:** • The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.

Ecosystems: Interactions, Energy, and Dynamics (LS2)		
B.LS2.2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.		
Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data. **Assessment Boundary:** Assessment is limited to provided data.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematics and Computational Thinking: • Use mathematical representation to describe and/or support scientific conclusions.	• Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. • Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. • A complex set of interactions within an ecosystem can keep its number and types of organisms relatively constant over long periods of time under stable conditions. • If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient) as opposed to becoming a very different ecosystem. • Extreme fluctuations in conditions or the size of any populations, however, can challenge the functions of ecosystems in terms of resources and habitat availability.	**Scale, Proportion, and Quantity:** • Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth).

Ecosystems: Interactions, Energy, and Dynamics (LS2)		
B.LS2.3 Construct and revise an explanation based on evidence for the cycling of matter and the flow of energy in aerobic and anaerobic conditions.		
Clarification Statement: Emphasis is on describing the role of aerobic and anaerobic respiration in the conservation of matter and flow of energy into, out of, and within various ecosystems (e.g., chemosynthetic bacteria near deep ocean vents, yeast in various environments, muscle cells during exertion, water-logged plants). **Assessment Boundary:** Assessment focuses on the conceptual understanding and does not include the specific chemical processes of either aerobic or anaerobic respiration.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	• Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes.	**Energy and Matter:** • Energy drives the cycling of matter within and between systems.

Ecosystems: Interactions, Energy, and Dynamics (LS2)		
B.LS2.4 Use a mathematical representation to support claims for the cycling of matter and the flow of energy among organisms in an ecosystem.		
Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen, and nitrogen being conserved as they move through an ecosystem. **Assessment Boundary:** The assessment should provide evidence of students' abilities to develop and use energy pyramids, food chains, food webs, and other models from data sets.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematics and Computational Thinking: • Use mathematical representation to describe and/or support scientific conclusions.	• Plants or algae form the lowest level of the food chain. • At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward to produce growth and release energy in cellular respiration at the higher level. • Given this inefficiency, there are generally fewer organisms at higher levels of a food web. • Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. • The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. • At each link in an ecosystem, matter and energy are conserved.	**Energy and Matter:** • Energy cannot be created or destroyed. It only moves between one place to another, between objects and/or fields, or between systems.

Ecosystems: Interactions, Energy, and Dynamics (LS2)		
B.LS2.5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.		
Clarification Statement: Examples of models could include simulations and mathematical models. The emphasis is on the movement of carbon. **Assessment Boundary:** Assessment does not include the specific chemical steps of photosynthesis and respiration.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model based on evidence to illustrate the relationships between systems or components of a system.	• Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. • The main way that solar energy is captured and stored on Earth is through the complex chemical process known as photosynthesis.	**Systems and System Models:** • Models (e.g., physical, mathematical, computer) can be used to simulate systems and interactions; including energy, matter, and information flow within and between systems at different scales.

Ecosystems: Interactions, Energy, and Dynamics (LS2)		
B.LS2.6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.		
Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise. **Assessment Boundary:** The assessment should provide evidence of students' abilities to derive trends from graphical representations of population trends. Assessments should focus on describing drivers of ecosystem stability and change, not on the organismal mechanisms of responses and interactions.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Evaluate the claims, evidence, and/or reasoning behind currently accepted explanations or solutions to determine the merit of arguments.	• A complex set of interactions within an ecosystem can keep its number and types of organisms relatively constant over long periods of time under stable conditions. • If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient) as opposed to becoming a very different ecosystem. • Extreme fluctuations in conditions or the size of any populations, however, can challenge the functions of ecosystems in terms of resources and habitat availability.	**Stability and Change:** • Much of science deals with constructing explanations of how things change and how they remain stable.

Ecosystems: Interactions, Energy, and Dynamics (LS2)		
B.LS2.8 Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.		
Clarification Statement: Emphasis is on advantages of grouping behaviors (e.g., flocking, schooling, herding) and cooperative behaviors (e.g., hunting, migrating, swarming) on survival and reproduction. **Assessment Boundary:** The assessment should provide evidence of students' abilities to: (1) distinguish between group versus individual behavior, (2) identify evidence supporting the outcomes of group behavior, and (3) develop logical and reasonable arguments based on evidence.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Evaluate the claims, evidence, and/or reasoning behind currently accepted explanations or solutions to determine the merit of arguments.	• Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Heredity: Inheritance and Variation of Traits (LS3)		
B.LS3.1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.		
Clarification Statement: Emphasis is on the use of models of DNA to formulate questions, the answers to which would clarify the cause and effect relationships (including distinguishing between causal and correlational relationships) between DNA, the proteins it codes for, and the resulting traits observed in an organism. **Assessment Boundary:** Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Asking Questions: • Ask questions that arise from examining models or a theory, to clarify and/or seek additional information and relationships.	• All cells contain genetic information in the form of DNA molecules. • Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of the cells. • Each chromosome consists of a single, very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. • The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. • Not all DNA codes for protein; some segments of DNA are involved in regulatory or structural functions, and some have no, as of yet, known functions.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Heredity: Inheritance and Variation of Traits (LS3)

B.LS3.2 Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs. **Assessment Boundary:** Assessment does not include the phases of meiosis or the biochemical mechanisms of specific steps in the process.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence: • Make and defend a claim based on evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge and student-generated evidence.	• In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. • Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which also cause mutations in genes, and variables in mutations are also inherited. • Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in the population; thus, the variation and distribution of traits observed depends on both genetic and environmental factors.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Heredity: Inheritance and Variation of Traits (LS3)		
B.LS3.3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.		
Clarification Statement: Emphasis is on distribution and variation of traits in a population and the use of mathematics (e.g., calculations of frequencies based on data from Punnett squares, graphical representations) to describe the distribution of traits in a population, not individuals. **Assessment Boundary:** Emphasis is on students' use of genetic models to explain the variation and patterns observed in a population as a combination of genetic and environmental factors. Assessment does not include Hardy-Weinberg calculations.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Analyzing and Interpreting Data: • Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific questions and problems, using digital tools when feasible.	• Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in the population; thus, the variation and distribution of traits observed depends on both genetic and environmental factors.	**Scale, Proportion, and Quantity:** • Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth).

Biological Unity and Diversity (LS4)

B.LS4.1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence should include similarities in DNA and amino acid sequences, but could also include fossil record, anatomical structures, and the order of appearance of structures in embryological development. **Assessment Boundary:** Emphasis is on students' abilities to use evidence such as DNA and amino acid sequences, cladograms, analogous/homologous structures, and fossil records to communicate their understanding of common ancestry and biological evolution.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information: • Communicate scientific information (e.g., about phenomena) in multiple formats (including orally, graphically, textually, and mathematically).	• Genetic information provides evidence of common ancestry and diversity. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. • Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment.	**Patterns:** • Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Biological Unity and Diversity (LS4)		
B.LS4.2 Construct an explanation based on evidence that biological diversity is influenced by (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.		
Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to survive and reproduce. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning. **Assessment Boundary:** Assessment does not include genetic drift, gene flow through migration, and co-evolution.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	• Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation— that leads to differences in performance among individuals.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Biological Unity and Diversity (LS4)

B.LS4.3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

Clarification Statement: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations for adaptations. **Assessment Boundary:** Emphasis is on students' abilities to analyze shifts in numerical distribution of traits as evidence to support explanations. Analysis is limited to basic statistical and graphical analysis, not allele or gene frequency calculations.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data: • Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible.	• Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. • The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. • Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. • Adaptation also means that the distribution of traits in a population can change when conditions change.	**Patterns:** • Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations and phenomena.

Biological Unity and Diversity (LS4)		
B.LS4.4 Construct an explanation based on evidence for how natural selection leads to adaptation of populations.		
Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or adaptation of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	• Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. • That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. • Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Biological Unity and Diversity (LS4)		
B.LS4.5 Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.		
Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments.	• Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. • Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' adaptation over time is lost.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

EARTH AND SPACE SCIENCE (ES)

Earth's Place in the Universe (ESS1)

ES.ESS1.1 Develop a model based on evidence to illustrate the life span of the Sun and the role of nuclear fusion in the Sun's core to convert matter to energy that eventually reaches Earth in the form of radiation.

Clarification Statement: Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the Sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the Sun's radiation varies due to sudden solar flares ("space weather"), the 11-year sunspot cycle, and non-cyclic variations over centuries.

Assessment Boundary: Assessment does not include details of the atomic and sub-atomic processes involved with the Sun's nuclear fusion.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Develop and Use Models: • Develop and/or use a model (including mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems.	• The star called the Sun is changing and will burn out over a lifespan of approximately 10 billion years. • Nuclear Fusion processes in the center of the Sun release the energy that ultimately reaches Earth as radiation.	**Energy and Matter:** • Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

Earth's Place in the Universe (ESS1)

ES.ESS1.2 Construct an explanation of how the universe formed as a single point and continues to expand based on astronomical evidence of light spectra, motion of distant galaxies, and the composition of matter in the universe.

Clarification Statement: Emphasis is on the astronomical evidence of the red shift of light from galaxies as an indication that the universe is currently expanding, the remnant cosmic microwave background radiation, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases. **Assessment Boundary:** Details about the mapped distribution of galaxies and clusters are not assessed.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations: • Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.	• The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. • Observations of distant galaxies receding from our own, the measured composition of stars and non-stellar gases, and maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe are used as evidence to support the explanation of formation. • Other than the hydrogen and helium formed at the time of formation, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. • Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities.	**Energy and Matter:** • Energy cannot be created or destroyed. It only moves between one place to another, between objects and/or fields, or between systems.

Earth's Place in the Universe (ESS1)

ES.ESS1.3 Construct an explanation about the process that causes stars to produce elements throughout their life cycle.

Clarification Statement: Emphasis is on the way nucleosynthesis, and therefore the different elements created, depend on the mass of a star and the stage of its lifetime. **Assessment Boundary:** Details of the many different nucleosynthesis pathways for stars of different masses are not assessed.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations: • Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation.	• The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. • Other than the hydrogen and helium formed at the time of formation, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. • Heavier elements are produced when certain massive stars achieve a supernova stage and explode.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

ES.ESS1.4 Use mathematical or computational representations to determine patterns that can be used to predict the motion of orbiting objects in the solar system.

Clarification Statement: Emphasis is on Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as planets and moons (e.g. graphical representations of orbits). **Assessment Boundary:** Mathematical representations for the gravitational attraction of bodies and Kepler's Laws of orbital motions should not deal with more than two bodies, nor involve calculus.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Using Mathematics and Computational Thinking • Use mathematical representations of phenomena or design solutions to support and revise explanations.	• The solar system consists of the Sun and a collection of objects of varying sizes and conditions-including planets and their moons-that are held in orbit around the Sun by its gravitational pull on them. • Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the Sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system.	**Patterns:** • Mathematical representations are needed to identify some patterns.

Earth's Place in the Universe (ESS1)		
ES.ESS1.5 Evaluate evidence in the patterns of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.		
Clarification Statement: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages of oceanic crust increases with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust decreasing with distance away from a central ancient core (a result of past plate interactions). **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Evaluate the claims, evidence, and/or reasoning behind currently accepted explanations or solutions to determine the merit of arguments.	• Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history.	**Stability and Change:** • Much of science deals with constructing explanations of how things change and how they remain stable.
ES.ESS1.6 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of changes in Earth's formation and early history.		
Clarification Statement: Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth, which formed along with the rest of the solar system. Examples of evidence include the absolute ages of ancient materials (obtained by radiometric dating of meteorites, Moon rocks, and Earth's oldest minerals), the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.	• Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history. • Spontaneous radioactive decays follow a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials.	**Stability and Change:** • Much of science deals with constructing explanations of how things change and how they remain stable.

Earth Systems (ESS2)		
ES.ESS2.1 Develop a model to illustrate how Earth's internal and surface processes operate at different scales of space and time to form continental and ocean-floor features.		
Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and mountain building) and destructive mechanisms (such as weathering, erosion, and landslides or mudslides). **Assessment Boundary:** Assessment does not include memorization of formation details of specific geographic features of Earth's surface.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model based on evidence to illustrate the relationships between systems or components of a system.	• Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. • Plate tectonics is the unifying theory that explains the past and current movements of rocks at Earth's surface and provides a framework for understanding its geologic history. • Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within the Earth's crust.	**Scale, Proportion, and Quantity:** • Some systems can only be studied indirectly as they are too small, too large, too fast, or too slow to observe directly.

Earth Systems (ESS2)

ES.ESS2.2 Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks and interactions that cause changes to other Earth's systems.

Clarification Statement: Examples could be taken from system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion, which limits additional vegetation patterns; how dammed rivers increase groundwater recharge, decrease sediment transport, and increased coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent. Examples could also include climate feedbacks that increase surface temperatures through geologic time. **Assessment Boundary:** N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data: • Analyze data using tools, technologies, and/or models in order to make valid and reliable scientific claims.	• Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. • The foundation for Earth's global climate system is the electromagnetic radiation from the Sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.	**Stability and Change:** • Feedback (negative or positive) can stabilize or destabilize a system.

Earth Systems (ESS2)		
ES.ESS2.3 Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.		
Clarification Statement: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three- dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of the Earth's surface features as well as three-dimensional structure in the subsurface, obtained from seismic waves; records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core); and prediction of the composition of Earth's layers from high pressure laboratory experiments. **Assessment Boundary:** Emphasis is on the processes occurring in the layers of the Earth.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model based on evidence to illustrate the relationships between systems or components of a system.	• Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface features, its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. • Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. • The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. • Plate tectonics can be viewed as the surface expression of mantle convection. • Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet.	**Energy and Matter:** • Energy drives the cycling of matter within and between systems.

Earth Systems (ESS2)		
ES.ESS2.4 Analyze and interpret data to explore how variations in the flow of energy into and out of Earth's systems causes changes to the atmosphere and climate.		
Clarification Statement: Changes differ by timescale, from sudden (large volcanic eruption, ocean circulation), to intermediate (ocean circulation, solar output, human activity), and long-term (Earth's orbit and the orientation of its axis and changes in atmospheric composition). Examples of human activities could include fossil fuel combustion, cement production, or agricultural activity and natural processes such as changes in incoming solar radiation or volcanic activity. Examples of data can include tables, graphs, maps of global and regional temperatures, and atmospheric levels of gases. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Analyzing and Interpreting Data: • Analyze data using computational models in order to make valid and reliable scientific claims.	• The geological record shows that changes to global and regional climate can be caused by interactions among changes in the Sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term (tectonic cycles). • The foundation for Earth's global climate system is the electromagnetic radiation from the Sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. • Cyclical changes in the shape of Earth's orbit around the Sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the Earth. These phenomena cause a cycle of ice ages and other changes in climate.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Earth Systems (ESS2)		
ES.ESS2.5 Plan and conduct investigations of how the structure and resulting properties of water interact with the Earth's materials and surface processes.		
Clarification Statement: Emphasis is on how the structure of water affects its physical and chemical properties. These properties can lead to mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids). **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations: • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence.	• The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy; transmit sunlight; expand upon freezing; dissolve and transport materials; and lower the viscosities and melting points of rocks.	**Structure and Function:** • The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of their various materials.

Earth Systems (ESS2)		
ES.ESS2.6 Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.		
Clarification Statement: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms. Examples could include more carbon absorbed in the oceans leading to ocean acidification or more carbon present in the atmosphere. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model based on evidence to illustrate the relationships between systems or components of a system.	• Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. • Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.	**Energy and Matter:** • Energy drives the cycling of matter within and between systems.
ES.ESS2.7 Engage in argument from evidence for how the simultaneous co-evolution of Earth's systems and life on Earth led to periods of stability and change over geologic time.		
Clarification Statement: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors influence conditions for life, which in turn continuously alters Earth's surface. Examples include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and affected animal life; how microbial life on land increased the formation of soil, which in turn allowed for the development of land plant species; or how the changes in coral species created reefs that altered patterns of erosion and deposition along coastlines and provided habitats to support biodiversity. Geologic timescale should be considered with the emphasis above. **Assessment Boundary:** Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth's other systems.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Construct an oral and written argument or counter- argument based on data and evidence.	• Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. • The many dynamic and delicate feedback mechanisms between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it.	**Stability and Change:** • Much of science deals with constructing explanations of how things change and how they remain stable.

Earth and Human Activities (ESS3)		
ES.ESS3.1 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate affect human activity.		
Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils (such as river deltas), and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, landslides, mudslides, and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Natural hazards and other geologic events exhibit some non-random patterns of occurrence. Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	• Resource availability has guided the development of human society. • Natural hazards and other geologic events have shaped the course of human history; they have significantly altered the sizes of human populations and have driven human migrations.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Earth and Human Activities (ESS3)

ES.ESS3.2 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios on large and small scales.*

Clarification Statement: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples of large-scale solutions include developing best practices for agriculture; soil use; forestry; mining; and production of conventional, unconventional, or renewable energy resources. Examples of small-scale solutions could include mulching lawn clippings or adding biomass to gardens. **Assessment Boundary:** N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence: • Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations).	• All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. • When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.	**Scale, Proportion, and Quantity:** • Using concepts of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale.

ES.ESS3.5 Construct a scientific explanation from evidence for how geological processes cause uneven distribution of natural resources.

Clarification Statement: Emphasis is on how geological processes have led to geological sedimentary basins that provide significant accumulations of crude oil and natural gas in some areas and not others, how geological processes lead to diverse soil profiles that support a diversity and range of agricultural crops, and how plate tectonics lead to concentrations of mineral deposits. **Assessment Boundary:** N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations: • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	• Most elements exist in Earth's crust at concentrations too low to be extracted, but in some locations-where geological processes have concentrated them-extraction is economically viable.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

ENVIRONMENTAL SCIENCE (EN)

Ecosystems: Interactions, Energy, and Dynamics (LS2)

EN.LS2.1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacities of ecosystems at different scales.

Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, or population changes gathered from simulations or historical data sets. **Assessment Boundary:** Assessment does not include deriving mathematical equations to make comparisons.

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Using Mathematics and Computational Thinking: • Use mathematical, computational, and/or algorithmic representations of phenomena to describe and/or support claims and/or explanations.	• Ecosystems have carrying capacities, which are limits to the number of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges as predation, competition, and disease. • Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.	**Scale, Proportion, and Quantity:** • The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.

Ecosystems: Interactions, Energy, and Dynamics (LS2)		
EN.LS2.2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.		
Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data. **Assessment Boundary:** The assessments should provide evidence of students' abilities to analyze and interpret the effect new information has on explanations (e.g., DDT effects on raptor populations, effects of water temperature below reservoirs on fish spawning, invasive species effects when spread to larger scale).		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematics and Computational Thinking: • Use mathematical representation to describe and/or support scientific conclusions.	• Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. • Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. • A complex set of interactions within an ecosystem can keep its number and types of organisms relatively constant over long periods of time under stable conditions. • If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient) as opposed to becoming a very different ecosystem. • Extreme fluctuations in conditions or the size of any populations, however, can challenge the functions of ecosystems in terms of resources and habitat availability.	**Scale, Proportion, and Quantity:** • Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale.

Ecosystems: Interactions, Energy, and Dynamics (LS2)		
EN.LS2.4 Use a mathematical representation to support claims for the cycling of matter and the flow of energy among organisms in an ecosystem.		
Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen, and nitrogen being conserved as they move through an ecosystem. **Assessment Boundary:** The assessment should provide evidence of students' abilities to develop and use energy pyramids, food chains, food webs, and other models from data sets.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematics and Computational Thinking: • Use mathematical representation to describe and/or support scientific conclusions.	• Plants or algae form the lowest level of the food chain. • At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward to produce growth and release energy in cellular respiration at the higher level. • Given this inefficiency, there are generally fewer organisms at higher levels of a food web. • Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. • The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. • At each link in an ecosystem, matter and energy are conserved.	**Energy and Matter:** • Energy cannot be created or destroyed. It only moves between one place to another, between objects and/or fields, or between systems.

Ecosystems: Interactions, Energy, and Dynamics (LS2)		
EN.LS2.6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.		
Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise. **Assessment Boundary:** The assessment should provide evidence of students' abilities to derive trends from graphical representations of population trends. Assessments should focus on describing drivers of ecosystem stability and change, not on the organismal mechanisms of responses and interactions.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence: • Evaluate the claims, evidence, and/or reasoning behind currently accepted explanations or solutions to determine the merit of arguments.	• A complex set of interactions within an ecosystem can keep its number and types of organisms relatively constant over long periods of time under stable conditions. • If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient) as opposed to becoming a very different ecosystem. • Extreme fluctuations in conditions or the size of any populations, however, can challenge the functions of ecosystems in terms of resources and habitat availability.	**Stability and Change:** • Much of science deals with constructing explanations of how things change and how they remain stable.

Ecosystems: Interactions, Energy, and Dynamics (LS2)

EN.LS2.7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*

Clarification Statement: Examples of human activities can include habitat destruction, pollution, introduction of invasive species, overexploitation, climate change, overpopulation, urbanization, and building dams. **Assessment Boundary:** N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Designing Solutions: • Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.	• Anthropogenic changes (induced by human activity) in the environment can disrupt an ecosystem and threaten the survival of some species. • Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). • Humans depend on the living world for the resources and other benefits provided by biodiversity, but human activity is also having adverse impacts on biodiversity. Thus, sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. • Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. • When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics, and to consider social, cultural, and environmental impacts.	**Stability and Change:** • Much of science deals with constructing explanations of how things change and how they remain stable.

Earth Systems (ESS2)		
EN.ESS2.1 Develop a model to illustrate how Earth's internal and surface processes operate at different scales of space and time to form continental and ocean-floor features.		
Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and mountain building) and destructive mechanisms (such as weathering, erosion, and landslides or mudslides). **Assessment Boundary:** Assessment does not include memorization of formation details of specific geographic features of Earth's surface.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model based on evidence to illustrate the relationships between systems or components of a system.	• Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. • Plate tectonics is the unifying theory that explains the past and current movements of rocks at Earth's surface and provides a framework for understanding its geologic history. • Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within the Earth's crust.	**Scale, Proportion, and Quantity:** • Some systems can only be studied indirectly as they are too small, too large, too fast, or too slow to observe directly.

Earth Systems (ESS2)		
EN.ESS2.2 Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks and interactions that cause changes to other Earth systems.		
Clarification Statement: Examples could be taken from system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion, which limits additional vegetation patterns; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent. Examples could also include climate feedbacks that increase surface temperatures through geologic time. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Analyzing and Interpreting Data: • Analyze data using tools, technologies, and/or models in order to make valid and reliable scientific claims.	• Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. • The foundation for Earth's global climate system is the electromagnetic radiation from the Sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.	**Stability and Change:** • Feedback (negative or positive) can stabilize or destabilize a system.

Earth Systems (ESS2)		
EN.ESS2.3 Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.		
Clarification Statement: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three- dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of the Earth's surface features as well as three-dimensional structure in the subsurface, obtained from seismic waves; records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core); and prediction of the composition of Earth's layers from high pressure laboratory experiments. **Assessment Boundary:** Emphasis is on the processes occurring in the layers of the Earth.		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models: • Develop a model based on evidence to illustrate the relationships between systems or components of a system.	• Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface features, its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, and a solid mantle and crust. • Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. • The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. • Plate tectonics can be viewed as the surface expression of mantle convection. • Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet.	**Energy and Matter:** • Energy drives the cycling of matter within and between systems.

Earth Systems (ESS2)		
EN.ESS2.4 Analyze and interpret data to explore how variations in the flow of energy into and out of Earth's systems causes changes to the atmosphere and climate.		
Clarification Statement: Changes differ by timescale, from sudden (large volcanic eruption, ocean circulation), to intermediate (ocean circulation, solar output, human activity), and long-term (Earth's orbit and the orientation of its axis and changes in atmospheric composition). Examples of human activities could include fossil fuel combustion, cement production, or agricultural activity and natural processes such as changes in incoming solar radiation or volcanic activity. Examples of data can include tables, graphs, maps of global and regional temperatures, and atmospheric levels of gases. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Analyzing and Interpreting Data: • Analyze data using computational models in order to make valid and reliable scientific claims.	• The geological record shows that changes to global and regional climate can be caused by interactions among changes in the Sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term (tectonic cycles). • The foundation for Earth's global climate system is the electromagnetic radiation from the Sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. • Cyclical changes in the shape of Earth's orbit around the Sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the Earth. These phenomena cause a cycle of ice ages and other changes in climate.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Earth Systems (ESS2)		
EN.ESS2.5 Plan and conduct investigations of how the structure and resulting properties of water interact with the Earth's materials and surface processes.		
Clarification Statement: Emphasis is on how the structure of water affects its physical and chemical properties. These properties can lead to mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids). **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Conducting Investigations: • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence.	• The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy; transmit sunlight; expand upon freezing; dissolve and transport materials; and lower the viscosities and melting points of rocks.	**Structure and Function:** • The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.

<table>
<tr><th colspan="3">Earth Systems (ESS2)</th></tr>
<tr><td colspan="3">EN.ESS2.6 Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.</td></tr>
<tr><td colspan="3">Clarification Statement: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms. Examples could include more carbon absorbed in the oceans leading to ocean acidification or more carbon present in the atmosphere. Assessment Boundary: N/A</td></tr>
<tr><th>Science and Engineering Practice</th><th>Disciplinary Core Ideas</th><th>Crosscutting Concepts</th></tr>
<tr><td>Developing and Using Models:
• Develop a model based on evidence to illustrate the relationships between systems or components of a system.</td><td>• Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.
• Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.</td><td>Energy and Matter:
• Energy drives the cycling of matter within and between systems.</td></tr>
<tr><td colspan="3">EN.ESS2.7 Engage in argument from evidence for how the simultaneous co-evolution of Earth’s systems and life on Earth led to periods of stability and change over geologic time.</td></tr>
<tr><td colspan="3">Clarification Statement: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth’s other systems, whereby geoscience factors influence conditions for life, which in turn continuously alters Earth’s surface. Examples include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and affected animal life; how microbial life on land increased the formation of soil, which in turn allowed for the development of land plant species; or how the changes in coral species created reefs that altered patterns of erosion and deposition along coastlines and provided habitats to support biodiversity. Geologic timescale should be considered with the emphasis above. Assessment Boundary: Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth’s other systems.</td></tr>
<tr><th>Science and Engineering Practice</th><th>Disciplinary Core Ideas</th><th>Crosscutting Concepts</th></tr>
<tr><td>Engaging in Argument from Evidence:
• Construct an oral and written argument or counter-argument based on data and evidence.</td><td>• Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.
• The many dynamic and delicate feedback mechanisms between the biosphere and other Earth systems cause a continual co-evolution of Earth’s surface and the life that exists on it.</td><td>Stability and Change:
• Much of science deals with constructing explanations of how things change and how they remain stable.</td></tr>
</table>

Earth and Human Activities (ESS3)		
EN.ESS3.1 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate affect human activity.		
Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, landslides, mudslides, and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Natural hazards and other geologic events exhibit some non-random patterns of occurrence. Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	• Resource availability has guided the development of human society. • Natural hazards and other geologic events have shaped the course of human history; they have significantly altered the sizes of human populations and have driven human migrations.	**Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Earth Human Activities (ESS3)

EN.ESS3.2 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios on large and small scales.*

Clarification Statement: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples of large-scale solutions include developing best practices for agriculture, soil use, forestry, mining, and production of conventional, unconventional, or renewable energy resources. Examples of small-scale solutions could include mulching lawn clippings or adding biomass to gardens. **Assessment Boundary:** N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence: • Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations).	• All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. • When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.	**Scale, Proportion, and Quantity:** • Using concepts of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale.

EN.ESS3.3 Use computational simulations to illustrate changes between the relationships of natural resources, human populations, and biodiversity and their sustainability within Earth systems.

Clarification Statement: Emphasis is on the importance of responsible stewardship of Earth's resources. Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of consumption, and urban planning. **Assessment Boundary:** N/A

Science and Engineering Practice	Disciplinary Core Ideas	Crosscutting Concepts
Using Mathematical and Computational Thinking: • Create a computational model or simulation of a phenomenon, design device, process, or system.	• The sustainability of human societies and biodiversity that supports them requires responsible management of natural resources.	**Stability and Change:** • Change and rates of change can be quantified and modeled over very short or very long periods of time. Some systems' changes are irreversible.

Earth and Human Activities (ESS3)		
EN.ESS3.4 Evaluate design solutions for a major global or local environmental problem that reduces or stabilizes the impacts of human activities on natural systems.*		
Clarification Statement: Examples of major global or local problems could include water pollution or availability, air pollution, deforestation, or energy production. Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use. Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions. **Assessment Boundary:** N/A		
Science and Engineering Practice	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations: • Design or refine a solution to a complex problem, based on scientific knowledge, student generated sources of evidence, prioritized criteria, and tradeoff considerations.	• Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. • When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. • Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.	**Stability and Change:** • Feedback (negative or positive) can stabilize or destabilize a system.

OKLAHOMA ACADEMIC STANDARDS

SOCIAL STUDIES

OKLAHOMA STATE DEPARTMENT OF
EDUCATION
CHAMPION EXCELLENCE

Table of Contents

Introduction

The Oklahoma Academic Standards for Social Studies is the result of the contributions of hundreds of social studies educators, representatives of higher education, tribal representatives, and community members. This document reflects a balanced synthesis of the work of all members of the Oklahoma Academic Standards for Social Studies Writing and Draft Committees.

The standards specify what students should know and be able to do as learners of social studies at the end of each grade level or social studies course. The order of the standards at any grade level is not meant to imply a sequence of topics and should be considered flexible for the organization of any course.

The Oklahoma Academic Standards for Social Studies were informed by the National Council of the Social Studies (NCSS) Skills Framework , the Center for Civic Education Civics Standards, the National Council for Geographic Education (NCGE) Geography for Life Standards, the Council for Economic Education Voluntary National Content Standards in Economics, the National Council for History Education (NCHE) Habits of Mind, the National Center for History in the Schools Standards for Historical Thinking, the Oklahoma Academic Standards for English Language Arts and Social Studies, and other states' standards documents.

Standards Overview

Having a literate citizenry rests on a commitment to democratic values and the practice of them. It requires the ability to use knowledge about one's community, nation and world, apply inquiry processes, and employ skills of data collection and analysis, collaboration, decision-making; and problem-solving. Young people who are knowledgeable, skillful, and committed to democracy are necessary to sustaining and improving the democratic way of life. This will also enable our students to become participating members of a global community. A well-rounded, vigorous social studies education encourages and enables each student to acquire a core of basic knowledge, an arsenal of useful skills, and a way of thinking drawn from many academic disciplines. Thus equipped, students are prepared to become informed, contributing, and participating citizens in this democratic republic – the United States of America.

The standards are comprised of two primary components, content standards and social studies practices. The content standards designate specific learning targets at each grade level or course. These content standards are derived from the major disciplines of the social sciences: history, geography, civics and economics. The social studies practices define basic skills and disciplinary tools to prepare students for college, career, and civic life. These practices are meant to be integrated with the instruction of content standards.

Social Studies Content Strands Overview

Social Studies is a systematic and coordinated discipline designed to promote civic competence by drawing upon four content strands: history, geography, civics, and economics. These strands draw from all fields of study related to the social sciences to provide a framework used in the development of the content standards for social studies. They are to be threaded through an integrated program, from grades pre-K through 12, as appropriate at each level. While at some grades and for some courses, specific strands will be more dominant than others, all strands are represented and interrelated in the standards for each grade and course.

Strand 1: History
History focuses on the written record of human experience revealing how individuals and societies developed institutions, philosophies, ideals, and cultural values, and resolved their problems. A balanced study of history helps students understand the how and why of the challenges and successes of past societies. By studying the choices and decisions of the past, students can confront today's problems with a deeper awareness of their alternatives and likely consequences.

Strand 2: Geography
Geography has more to do with asking questions and solving problems than with rote memorization of isolated facts. It is the study of the earth's surface and the processes that shape it, the relationships between people and environments, and the connections between people and places. As a discipline, geography provides the skills to help students answer questions about where things are, how they got there, and how they interact with other things - in the past, now, and in the future.

Strand 3: Civics
Civics is defined to mean the study of the rights and duties of Oklahoma and United States citizens and of how their governments work. This strand helps students understand the essential principles and workings of their political system and that of others, as well as the relationship of American politics and government to world affairs. The goal of civics is to develop literate, informed, competent, and responsible citizens who are politically aware, active, and committed to the fundamental values and principles of American constitutional democracy.

Strand 4: Economics
Economics provides students with an understanding of how individuals, communities, states, and nations allocate both scarce and abundant resources. A clear understanding of economics enables students to comprehend the various competing economic philosophies, ideas, and forces that affect them every day, measure the effectiveness of each, and identify and evaluate the consequences of personal decisions and public policies. Students then will understand how a market economy effectively functions preparing them to be producers, consumers, and citizens.

Social Studies Practices Overview

The Social Studies Practices reflect the key skills and disciplinary tools to prepare students for college, career, and civic life. The practices are meant to be integrated with the instruction of content standards. The five practices are defined broadly below and are further delineated on pg. 6. The social studies practices are designed to support student mastery of the content through a progression of skills PK-12.

Engage in Democratic Processes

Understanding civic virtues and the role of civic institutions. Students will gain knowledge of the history, principles, and foundations of American democracy to participate in civic and democratic processes. Students will identify the institutions of American government to analyze their role as responsible citizens.

Analyze and Address Authentic Civic Issues

Understanding the importance of critical questioning to solve real world problems. Students will develop essential questions to frame independent inquiry related to the past and present. Students will identify and address public problems individually and collaboratively to improve communities and society.

Acquire, Apply, and Evaluate Evidence

Understanding and using strategies to analyze evidence in the social studies. Students will evaluate historical, geographic, and economic information. Students will draw conclusions from primary and secondary sources to formulate informed decisions.

Read Critically and Interpret Information Sources

Understanding the purpose of engaging with text. Students will evaluate factual information and points of view as presented in text. Students will read historical and contemporary texts to engage in collaborative discussion.

Engage in Evidence-Based Writing

Understanding the multiple purposes of the writing process. Students will develop written products designed for a variety of social studies related investigations. Students will use and integrate evidence to present knowledge and support opinion.

Social Studies Practices PK-12

The Social Studies Practices describe the experience all students should have as they explore and reason about social studies content PK-12. Additional guidance for what the Social Studies Practices look like across grade levels is provided in **Appendix A: Social Studies Practices PK-12 Progression**.

1. **Engage in Democratic Processes** - Students will understand the principles of government, the benefits of democratic systems, and their responsibilities as citizens.
   - 1.A. Students will demonstrate an understanding of the virtues that citizens should use when interacting with each other and the virtues that guide official government institutions.
   - 1.B. Students will demonstrate an understanding of the important institutions of their society and the principles that these institutions are intended to reflect.
   - 1.C. Students will demonstrate understanding of the processes and rules by which groups of people make decisions, govern themselves, and address public problems.
2. **Analyze and Address Authentic Civic Issues** - Students will determine the kinds of sources that will be helpful in answering essential, compelling, and supporting questions addressing authentic civic issues.
   - 2.A. Students will demonstrate the capability for developing essential, compelling, and supporting questions that address authentic civic issues.
   - 2.B. Students will demonstrate the ability to investigate problems taking into consideration multiple points of view represented in arguments, structure of an explanation, and other sources.
3. **Acquire, Apply, and Evaluate Evidence** - Students will utilize interdisciplinary tools and master the basic concepts of the social studies in order to acquire and apply content understanding in all related fields of study.
   - 3.A. Students will develop skills and practices which demonstrate an understanding that historical inquiry is based on the analysis and evaluation of evidence and its credibility.
   - 3.B. Students will demonstrate an understanding of geographic concepts and develop mastery of geographic tools and ways of thinking in order to become geographically informed.
   - 3.C. Students will analyze the principles of economic systems and develop an understanding of the benefits of a market system in local, national, and global settings.
4. **Read Critically and Interpret Informational Sources** - Students will engage in critical, active reading of grade-level appropriate primary and secondary sources related to key social studies concepts, including frequent analysis and interpretation of informational sources.
   - 4.A. Students will comprehend, evaluate, and synthesize textual sources to acquire and refine knowledge in the social studies.
   - 4.B. Students will apply critical reading and thinking skills to interpret, evaluate, and respond to a variety of complex texts from historical, ethnic, and global perspectives.
5. **Engage in Evidence-Based Writing** - Students will apply effective communication skills by developing a variety of evidence-based written products designed for multiple purposes and tasks, in order to demonstrate their understandings of social studies concepts, ideas, and content.
   - 5.A. Students will summarize and paraphrase, integrate evidence, and cite sources to create written products, research projects, and presentations for multiple purposes related to social studies content.
   - 5.B. Students will engage in authentic inquiry to acquire, refine, and share knowledge through written presentations related to social studies.

Reading the Oklahoma Academic Standards for Social Studies

Practices

Oklahoma Academic Standards for Social Studies 2nd Grade (2)

Grade or Course

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence-Based Writing

2nd Grade Content Standards

2.1 The student will explain the importance of the basic principles that provide the foundation of the American system of government.	**2.1.1** Describe the Constitution of the United States as the structure for our national government.
	2.1.2 Summarize the five key individual rights and liberties protected by the First Amendment to the Constitution of the United States.
	2.1.3 Explain how active citizens participate in the government by voting to elect officials that represent them.
	2.1.4 Identify the basic roles of national leaders including the President of the United States , the members of the United States Congress, and the justices of the Supreme Court.
	2.1.5 Explain how all people can play an important role in their community.
2.2 The student will describe the physical and human characteristics of their environment.	**2.2.1** Construct basic maps using cardinal directions and map symbols.
	2.2.2 Describe absolute and relative location using latitude, longitude, and hemispheres on basic maps and globes.
	2.2.3 Use political maps to locate the state of Oklahoma and the six bordering states.
	2.2.4 Identify and locate basic landforms, bodies of water, continents, and oceans on a map.
	2.2.5 Describe how communities modify the environment to meet their needs.
	2.2.6 Describe customs, traditions, clothing, food, housing, and music as basic elements of various cultures represented within the local community.

Standards

Objectives

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

Pre Kindergarten Content Standards

PK.1 The student will exhibit traits of good citizenship.	**PK.1.1** Describe the importance of rules and personal responsibilities including working together to make decisions as a member of a family and classroom community.
	PK.1.2 Explain the need to respect the uniqueness of individuals in our class and community.
	PK.1.3 Describe the concept of being a citizen.
	PK.1.4 Identify the United States Flag as a symbol of the country.
PK.2 The student will demonstrate knowledge of basic physical and human geographic concepts.	**PK.2.1** Explain that a map is a drawing of a place.
	PK.2.2 Use basic directional terms in relation to the student's relative location.
	PK.2.3 Describe a classroom as a community.
	PK.2.4 Identify family customs and traditions as basic elements of culture.
PK.3 The student will understand that history relates to events and people of other times and places.	**PK.3.1** Explain history as things that happened in the past.
	PK.3.2 Describe how we honor people and events of the past.
	PK.3.3 Use words and phrases, such as before and after, as they relate to chronology and time in order to explain how things change.
	PK.3.4 Explain that lessons can be learned from the past.
PK.4 The student will identify basic economic concepts.	**PK.4.1** Identify basic needs all people share.
	PK.4.2 Explain that people work to earn money to buy things they need and want.
	PK.4.3 Explain how resources are used by people to meet their needs.
	PK.4.4 Describe how various school personnel provide needed services.

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

Kindergarten Content Standards

K.1 The student will exhibit traits of good citizenship.	**K.1.1** Describe the importance of rules, personal responsibilities, and natural consequences as a member of a family, class, and school.
	K.1.2 Identify ways to be an active member of the community.
	K.1.3 Identify the United States Flag as a symbol of the country, explaining the stripes as symbols for the first states and the stars as symbols for the current states in our country.
	K.1.4 Identify the purpose of the Pledge of Allegiance and explain appropriate flag etiquette.
	K.1.5 Identify other important United States symbols including the Statue of Liberty located in New York Harbor.
K.2 The student will demonstrate knowledge of basic physical and human geographic concepts.	**K.2.1** Explain that a globe is a model of the Earth and that a map is a drawing of a place; construct basic maps.
	K.2.2 Identify basic cardinal directions and relative location terms.
	K.2.3 Identify the shape of the state of Oklahoma on a map.
	K.2.4 Explain that the school is part of a larger community and one's community is within the state of Oklahoma.
	K.2.5 Describe what makes one's community alike or different than other communities.
	K.2.6 Describe family and community customs and traditions as basic elements of culture.

K.3 The student will understand that history relates to events and people of other times and places.	**K.3.1** Explain how events of the past may have affected our community and the way we live today.
	K.3.2 Explain how we honor people and events of the past.
	K.3.3 Use words and phrases related to chronology and time to explain how things change including before/after and yesterday/today/tomorrow.
	K.3.4 Explain that different types of sources can be used to learn about the past.
K.4 The student will identify basic economic concepts.	**K.4.1** Describe the basic needs of all people: food, clothing, and shelter; differentiate between these needs and a want.
	K.4.2 Explain the relationship between work and earning money.
	K.4.3 Identify ways that people use their money, including spending and saving.
	K.4.4 Explain how various community members including police officers, firefighters, soldiers, school personnel, business professionals, and medical personnel impact the student's life.

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

1st Grade Content Standards

1.1 The student will analyze their role as a citizen in a community.	**1.1.1** Describe the need for written laws and the main purpose of government, including the concept of consequences for one's actions when a law or rule is violated.
	1.1.2 Describe how citizens within communities work together to accomplish common tasks and fulfill roles of authority.
	1.1.3 Explain patriotic traditions including *The Pledge of Allegiance*, describe appropriate flag etiquette and proper behavior during the playing of *The Star-Spangled Banner*.
	1.1.4 Identify important symbols of the United States including the Bald Eagle and the Liberty Bell, and explain their meanings.
1.2 The student will demonstrate knowledge of basic geographic concepts.	**1.2.1** Describe the difference between physical and political maps; construct basic maps of specific places.
	1.2.2 Identify cardinal directions and use them to identify specific locations on a map.
	1.2.3 Identify the difference between continents and oceans.
	1.2.4 Compare the features of urban and rural communities.
	1.2.5 Describe community customs and traditions as basic elements of culture.
1.3 The student will examine important events and historical figures in the nation's past.	**1.3.1** Explain why people may see events from different points of view.
	1.3.2 Describe the contributions of people and groups who have shaped our history and ways we commemorate important places and events of the past.
	1.3.3 Read and construct basic timelines to understand the chronology of events in history.
	1.3.4 Identify primary sources and how they help us to learn about the past.

1.4 The student will describe the characteristics of the American economic system.	**1.4.1** Explain the costs and benefits of spending and saving in order to meet needs and wants.
	1.4.2 Describe ways people are paid for their labor and how goods and services are purchased using money and credit.
	1.4.3 Identify and explain the roles of consumers and producers in the American economy.
	1.4.4 Describe the role of banks in the community.

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

2nd Grade Content Standards

2.1 The student will explain the importance of the basic principles that provide the foundation of the American system of government.	**2.1.1** Describe the Constitution of the United States as the structure for our national government.
	2.1.2 Summarize the five key individual rights and liberties protected by the First Amendment to the Constitution of the United States.
	2.1.3 Explain how active citizens participate in the government by voting to elect officials that represent them.
	2.1.4 Identify the basic roles of national leaders including the President of the United States , the members of the United States Congress, and the justices of the Supreme Court.
	2.1.5 Explain how all people can play an important role in their community.
2.2 The student will describe the physical and human characteristics of their environment.	**2.2.1** Construct basic maps using cardinal directions and map symbols.
	2.2.2 Describe absolute and relative location using latitude, longitude, and hemispheres on basic maps and globes.
	2.2.3 Use political maps to locate the state of Oklahoma and the six bordering states.
	2.2.4 Identify and locate basic landforms, bodies of water, continents, and oceans on a map.
	2.2.5 Describe how communities modify the environment to meet their needs.
	2.2.6 Describe customs, traditions, clothing, food, housing, and music as basic elements of various cultures represented within the local community.

2.3 The student will examine the lives of notable Americans who expanded peoples' rights and freedoms through our history.	**2.3.1** Analyze the contributions of people and groups who have shaped our history and who are honored by holidays and commemorative months.
	2.3.2 Compare perspectives of people in the past to people in the present.
	2.3.3 Compare different accounts of the same historical event using primary and secondary sources.
	2.3.4 Explain possible reasons for events in the past.
2.4 The student will understand basic economic concepts in the American economy.	**2.4.1** Explain the importance of supply and demand in the consumer and producer relationship.
	2.4.2 Explain how barter and trade can lead to interdependence among communities.
	2.4.3 Describe the connection between taxes and community services, including schools, sanitation and water, fire and police protection, parks and recreation, libraries, and roads.
	2.4.4 Describe how setting goals and creating a budget helps people pay for things they need and want.

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

3rd Grade Content Standards

3.1 The student will analyze the traits of good citizens.	**3.1.1** Examine and determine the main purposes of Oklahoma's state government and identify elected leaders of the state of Oklahoma and the three branches of government.
	3.1.2 Explain that tribal governments in Oklahoma have a right to self-government known as sovereignty.
	3.1.3 Describe the historical significance of the symbols of Oklahoma including the Oklahoma State Seal and the Oklahoma Flag; explain how the name of Oklahoma is derived from the Choctaw language.
	3.1.4 Describe relationships between people and events of the past, including those commemorated on national, state, and community holidays.
	3.1.5 Define the concept of civic virtue and responsibilities of the citizen at the local, state, and tribal levels, including respect for diversity.
3.2 The student will examine Oklahoma's geography and how people of Oklahoma interact with their environment.	**3.2.1** Examine Oklahoma's political and physical features. **A.** Identify the state of Oklahoma using relative location, absolute location (latitude and longitude), direction, scale, size, and shape using physical and political maps. **B.** Interpret thematic maps of Oklahoma with the essential map elements of title, legend, scale, and directional indicators. **C.** Identify Oklahoma's major landforms and bodies of water on a physical map. **D.** Identify Oklahoma's major metropolitan centers and cities on a political map. **E.** Describe the climate and various natural vegetation zones found in Oklahoma. **F.** Identify the six states bordering Oklahoma on a map.

	3.2.2 Examine the interaction of the environment and the peoples of Oklahoma. **A.** Describe how early American Indians used Oklahoma's natural resources, such as bison hunting, fur trading, and farming. **B.** Describe how pioneers to Oklahoma adapted to and modified their environment, such as sod houses, windmills, and crops. **C.** Summarize how the weather and the environment have impacted the economy of Oklahoma in events such as the Dust Bowl, floods, and tornadoes. **D.** Summarize how Oklahomans affect and change their environments such as the construction of the McClellan-Kerr Arkansas River Navigation System, creation of recreational lakes by the building of dams, irrigation of croplands, and the establishment of wildlife refuges.
	3.2.3 Identify the characteristics of renewable and non-renewable resources and evaluate the role of citizens in conserving natural resources.
3.3 The student will analyze the significant events and historic personalities contributing to the development of the state of Oklahoma.	**3.3.1** Understand and describe the relationship between historic events and chronology through the creation of basic timelines.
	3.3.2 Read and interpret primary sources related to key events in Oklahoma's past.
	3.3.3 Describe American Indian pre-contact cultures that have inhabited what is now Oklahoma, such as the Spiro Mound Builders.
	3.3.4 Identify cultural similarities and differences of the existing sovereign tribal nations in Oklahoma, especially those near the local community.
	3.3.5 Describe early expeditions into Oklahoma such as those of Coronado, Washington Irving, and George Catlin.
	3.3.6 Describe the migrations, settlements, relocations and forced removals of American Indians.
	3.3.7 Describe cowboy life and cattle drives as typified by experiences along such routes as the Chisholm Trail and the impact of Mexican ranching traditions on the cattle industry and cowboy culture.
	3.3.8 Distinguish between the points of view of both American Indians and settlers regarding the opening of territories in Oklahoma for settlement.
	3.3.9 Commemorate Statehood Day, November 16, as the joining of Indian and Oklahoma Territories.

	3.3.10 Describe the contributions of Oklahoma's military personnel, including the Buffalo Soldiers, the code talkers, and the 45th Infantry.
	3.3.11 Explain how Oklahomans come together to help one another during difficult times, such as recovering from the bombing of the Oklahoma City Murrah Building, exhibiting what has become the "Oklahoma Standard".
	3.3.12 Examine notable historic and present-day Oklahomans utilizing biographies and information texts such as Jim Thorpe, Sequoyah, Will Rogers, Wiley Post, Mickey Mantle, Shannon Lucid, Bill Pickett, Clara Luper, and Maria Tallchief.
3.4 The student will identify and describe basic economic activities creating prosperity in the state of Oklahoma.	**3.4.1** Compare differences among human, natural, and capital resources used to produce goods and services.
	3.4.2 Summarize how the factors of scarcity and surplus and the laws of supply and demand of natural and human resources require people to make choices about producing and consuming goods and services.
	3.4.3 Examine how the development of Oklahoma's major economic activities have contributed to the growth of the state, including, mining and energy industry, agriculture, aviation, tourism, tribal enterprises, and military installations.

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

4th Grade Content Standards

4.1 The student will describe the features of self-government and the role of citizens of the United States.	**4.1.1** Describe the concepts of democracy and representative government, including the rule of law, equality, the common good, and individual rights. **A.** Explain the concept of civic responsibilities, including respect for the law, the necessity for compromise, civic participation, and public service. **B.** Understand the necessity of respect for diversity of the individual and diversity of groups comprising American society.
	4.1.2 Compare powers exercised by the local, state, and national levels of governments, recognizing tribal sovereignty as a tribal nation's inherent right to self-govern.
	4.1.3 Summarize the role of citizens as responsible stewards of natural resources and the environment. **A.** Describe the benefits of participation in recycling and anti-littering activities. **B.** Identify present-day examples to conserve natural resources and the development of alternative, sustainable energy sources.
4.2 The student will examine the physical geography and environments of the United States.	**4.2.1** Use maps and other geographic representations (such as globes and graphs), tools, and technologies to acquire, process, and report information from a spatial perspective. **A.** Use and describe various elements of maps, including keys/legends, scale, cardinal, and intermediate directions. **B.** Interpret aerial photographs, satellite images and thematic maps to locate and identify physical and human features of the United States and North America. **C.** Use latitude and longitude to identify the location of physical and human features of the United States.
	4.2.2 Identify major physical features in the United States and analyze how physical processes shape places. **A.** Identify and describe the physical characteristics of places, including the major landforms, bodies of water, vegetation and climates in the United States. **B.** Describe the location and characteristics of the major ecosystems in the United States.

	4.2.3 Explain how people create regions using common geographic characteristics. **A.** Identify and describe the major physical, cultural, and economic regions of the United States, comparing one's own region to the other regions. **B.** Explain how and why regions change over time by comparing regions in the past with life in the same regions in the present.
	4.2.4 Describe how physical processes of the Earth's surface impact humans and their environment. **A.** Identify and describe the different climates in the United States using maps, globes, and graphs. **B.** Explain how climate and natural processes including floods, wind, and storms impact how we live.
	4.2.5 Identify and locate on a political map the fifty states and the United States capital.
4.3 The student will analyze the human characteristics of the United States and how geography impacts historic events.	**4.3.1** Identify and describe early settlement patterns of regions in the United States. **A.** Draw conclusions from maps to show how climate, vegetation, natural resources, and historic events affect the location and growth of settlements. **B.** Identify major American Indian groups and their ways of life in each region, including economic activities, customs, and viewpoints on land usage and ownership. **C.** Summarize the reasons for key expeditions of North America by Spain, France, and England and their impact on the development of each region. **D.** Identify push and pull factors of human migration. **E.** Evaluate the impact of the Columbian Exchange on American Indian groups, African slaves and European settlers, including agriculture, trade, culture, military alliances, control of territory, and the sudden and significant decline of indigenous peoples.
	4.3.2 Examine the characteristics of culture, including the distribution and complexity of the regions of the United States. **A.** Identify the characteristics of culture (language, customs, beliefs, food, clothing, shelter) and compare the cultural characteristics of different regions of the United States. **B.** Explain how the characteristics of culture affect the ways in which people live.
4.4 The student will identify basic economic activities of the United States.	**4.4.1** Analyze how humans adapt to and modify their environments in order to survive and grow. **A.** Explain how humans depend upon the physical environment for food, shelter, and economic activities. **B.** Distinguish between renewable and nonrenewable resources. **C.** Explain how physical environments can provide both opportunities and limitations for human activity.

	4.4.2 Describe the patterns and networks of economic interdependence among regions of the United States. **A.** Identify and locate on a map the major cities of the United States, including their relative location to natural resources and transportation routes. **B.** Identify the major economic activities of each region of the United States by comparing how people satisfy their basic needs through the production of goods and services. **C.** Describe the relative location of natural resources, such as fossil fuels, minerals and soils, and their relationship to each region's major economic activities, including agriculture, manufacturing, transportation, energy, and services.
	4.4.3 Explain how economic activities can threaten the physical environment. **A.** Identify ways in which humans can change ecosystems, such as clearing forests, draining wetlands, and diverting waterways, by examining present-day issues related to the use of resources. **B.** Identify examples of changes in land use in local communities and how the physical environment can be stressed by human activities.

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

5th Grade Content Standards

5.1 The student will examine and compare the Jamestown and Plymouth settlements as the foundations of American culture and society.	**5.1.1** Summarize reasons for European colonization of North America and the impact on the development of the American colonies.
	5.1.2 Examine the economic and political motivations for English settlements at Roanoke and Jamestown .
	5.1.3 Explain the economic and political motivations of immigrants and indentured servants who came to Virginia.
	5.1.4 Explain the early successes and challenges of the Jamestown settlement including the leadership of John Smith, interrelationships with American Indians, challenges of the Starving Times, and the export of natural resources for profit.
	5.1.5 Explain the English commitment to the permanent settlement at Jamestown as evidenced through the events of 1619 including: **A.** representative government established through the House of Burgesses **B.** private ownership of land **C.** introduction of Africans as slave labor **D.** arrival of women and families
	5.1.6 Analyze the religious, economic, and political motivations of immigrants and indentured servants who migrated to Plymouth.
	5.1.7 Explain the early successes and challenges of the Plymouth settlement including: **A.** practice of self-government established by the Mayflower Compact **B.** contributions of American Indians including Chief Massasoit and Squanto **C.** leadership of William Bradford
	5.1.8 Explain how American Indian agricultural practices, such as the Three Sisters, contributed to the early survival of the colonists.
5.2 The student will compare the developments of the New	**5.2.1** Explain the contributions of important citizens and groups to the foundation of the colonies including the Puritans and Quakers, Roger Williams, Anne Hutchinson, William Penn, Lord Baltimore, and James Oglethorpe.

England Colonies, the Middle Colonies, and the Southern Colonies.	**5.2.2** Compare the economic development of the three colonial regions including: **A.** agriculture and exports as affected by climate and natural resources **B.** a labor system utilizing indentured servants **C.** slave labor central to the growth of the economy
	5.2.3 Explain the international economic and cultural interactions resulting from the triangular trade routes, including the forced migration of Africans through the Transatlantic slave trade and experiences of the Middle Passage.
	5.2.4 Analyze the forms of self-government in the three colonial regions including the role of religion in the establishment of some colonial governments, the Virginia House of Burgesses, and New England town hall meetings.
	5.2.5 Explain the evolving relationships between American Indians and the British colonists involving territorial claims.
	5.2.6 Explain that tribal sovereignty is a tribal nation's inherent right to self-govern.
	5.2.7 Compare daily life in the colonies as experienced by different social classes, plantation owners, farmers, merchants, craftsmen, artisans, and women and children.
	5.2.8 Compare the experiences of both free and enslaved Africans in the British colonies, including resistance efforts by enslaved peoples and attempts to maintain aspects of African culture.
5.3 The student will examine the foundations of the American nation established during the Revolutionary Era.	**5.3.1** Examine the causes and effects of significant events leading to armed conflict between the thirteen American colonies and Great Britain including: **A** French and Indian War **B.** Proclamation of 1763 **C.** Sugar and Stamp Acts **D.** Townshend Act **E.** colonial arguments regarding taxation and rightful representation in Parliament **F.** boycotts of British goods and the efforts of the Committees of Correspondence **G.** Quartering Act **H.** Boston Massacre **I.** Tea Act and The Boston Tea Party **J.** Coercive Acts (Intolerable Acts) **K.** British raids on Lexington and Concord **L.** publication of *Common Sense*, by Thomas Paine

	5.3.2 Analyze the ideals stated in the Declaration of Independence, drafted by Thomas Jefferson and adopted July 4, 1776, used to: **A.** identify natural, unalienable rights, such as life, liberty, and the pursuit of happiness **B.** declare the equality of all individuals **C.** define the purpose of government **D.** establish the principle of self-government and consent of the governed **E.** explain specific colonial grievances
	5.3.3 Explain the importance of the Articles of Confederation as the first American national system of government under which the colonies waged a war in order to gain independence.
	5.3.4 Compare the Iroquois Confederacy's representative government to the early attempts of the colonies to unite as one nation.
	5.3.5 Compare the advantages and disadvantages of the British and the American colonies at the eve and during the Revolutionary War, including political and military leadership, military strength, population, resources, foreign alliances, and motivations for fighting.
	5.3.6 Analyze the relationships of significant military and diplomatic events of the Revolutionary War including the leadership of General George Washington, experiences of Valley Forge, impact of the battles of Bunker Hill, Trenton, Saratoga, Yorktown, and the Treaty of Paris in 1783.
	5.3.7 Identify the points of view of major groups that remained loyal to Britain, joined the patriot cause, or remained neutral.
	5.3.8 Identify the contributions of key individuals involved in the American Revolution including Patrick Henry, Samuel Adams, John Adams, Abigail Adams, Paul Revere, Nathan Hale, John Paul Jones, Thayendanegea (Joseph Brant), Nancy Ward the Beloved Woman of the Cherokee, Marquis de Lafayette, Benjamin Franklin, Mercy Otis Warren, and Phillis Wheatley.
5.4 The student will examine the formation of the American	**5.4.1** Evaluate issues and events that led to the Constitutional Convention, including a weak national government and Shays' Rebellion.

system of government following the American Revolution.	**5.4.2** Identify key leaders and explain the debates and compromises of the Constitutional Convention, including: **A.** Virginia and New Jersey Plans **B.** Great Compromise **C.** Three-fifths Compromise and its maintenance of the institution of slavery **D.** Father of the Constitution, James Madison **E.** President of the Convention, George Washington
	5.4.3 Examine the purposes and basic responsibilities of government as described in the Preamble of the Constitution of the United States, which established the supreme law of the land.
	5.4.4 Describe the relationship between the federal government and sovereign American Indian nations, as established under the Constitution of the United States.
	5.4.5 Compare the viewpoints of the Federalists, led by James Madison, and Anti-Federalists, such as George Mason, over the addition of a bill of rights.
	5.4.6 Explain how the Constitution of the United States was amended to include the Bill of Rights and summarize the liberties protected in each of the ten amendments.
5.5 The student will describe the structure and responsibilities of the American system of government and the role of the individual citizen.	**5.5.1** Examine the key principles of government established in the Constitution of the United States including: **A.** separation of powers among three branches of government **B.** the system of checks and balances **C.** shared powers between the federal and state governments.
	5.5.2 Describe the roles of Congress, the President, and the Supreme Court in the legislative process.
	5.5.3 Describe the responsibilities of United States citizens including: **A.** registration and voting in public elections **B.** becoming informed voters **C.** engagement in civil discourse **D.** service on trial juries **E.** payment of taxes **F.** obedience to laws **G.** registration for military service

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

6th Grade Content Standards

6.1 The student will analyze data from a geographic perspective using the skills and tools of geography.	**6.1.1** Apply geographic information to support analysis from primary and secondary sources located in a variety of texts.
	6.1.2 Describe how various map projections distort the surface of the earth; apply the concepts of scale, distance, direction, relative location, absolute location, and latitude and longitude.
	6.1.3 Integrate visual information, draw conclusions, and make predictions from geographic data and analyze spatial distribution and patterns by interpreting that data as displayed on geographic tools.
	6.1.4 Integrate visual information and develop the skill of mental mapping of the political and physical features of Earth's surface in order to organize information about people, places, and environments.
	6.1.5 Describe and analyze the role of geographic factors on current events and issues.
6.2 The student will analyze the physical systems of the major regions of the Western Hemisphere.	**6.2.1** Use visual information to identify and describe on a physical map the landforms, bodies of water, climate, and vegetation zones that are important to each region.
	6.2.2 Explain how the processes and factors of latitude, elevation, Earth-Sun relationships, prevailing winds, and proximity to bodies of water influence climate.
	6.2.3 Describe the predominant natural resources found in each region.
	6.2.4 Describe the relationship and summarize the impact of the distribution of major renewable and nonrenewable resources on each region.

6.3 The student will identify the characteristics, distribution, and demographic patterns of human populations and systems of the Western Hemisphere.	**6.3.1** Identify on a political map the major countries and population centers of each region.
	6.3.2 Identify and describe cultural traits of language, ethnic heritage, religion, and traditions practiced among peoples.
	6.3.3 Analyze the impact of geography on population distribution, growth, and change, applying geographic concepts of population density, the availability of resources.
	6.3.4 Describe how the push and pull factors of migration have affected settlement patterns and the human characteristics of places over time.
	6.3.5 Compare the systems of government, including representative governments (democracy, republic, constitutional monarchy) and authoritarian systems (dictatorship, absolute monarchy).
	6.3.6 Identify the role of the citizen in the selection of government officials and lawmaking; compare individual liberties under different forms of government.
	6.3.7 Identify and explain topics related to indigenous sovereignty.
	6.3.8 Evaluate how the three levels of economic activities (primary, secondary, tertiary) contribute to the development of a nation and region.
	6.3.9 Describe benefits and limitations of the traditional, market, and command economic systems, including how government policies affect economic activities and trade relationships.
	6.3.10 Identify the common characteristics of developed and developing countries, including the impact of education and technology; analyze data used by geographers such as literacy rate, life expectancy, per capita income, and infant mortality.

6.4 The student will analyze the interactions of humans and their environment in the Western Hemisphere.	**6.4.1** Describe the commercial agriculture and industrial regions that support human development.
	6.4.2 Evaluate the effects of human modification on the natural environment through transformation caused by subsistence and commercial agriculture, industry, demand for energy, and urbanization.
	6.4.3 Analyze the impact of climate and natural disasters on human populations, including forced migration, scarcity of consumer goods, economic activities, and loss of life.
	6.4.4 Analyze environmental challenges of each region.
	6.4.5 Evaluate the role of ecotourism in creating environmental awareness of resources, climate, cultures, and wildlife.
	6.4.6 Describe the role of citizens as responsible stewards of natural resources and the environment.
6.5 The student will compare common physical and human characteristics of regions which create identity or uniqueness and influence people's perceptions of the Western Hemisphere.	**6.5.1** Define the concept of region and identify the major political, physical, cultural, and economic regions.
	6.5.2 Explain how cultural diffusion, both voluntary and forced, impacts societies of a region.
	6.5.3 Describe patterns of global economic interdependence and trade, including the concepts of balance of trade and supply and demand; compare measures of economic growth including Gross Domestic Product (GDP) and Gross National Product (GNP).
	6.5.4 Analyze global interdependence which explains the outsourcing of technological and manufacturing jobs to developing regions.
	6.5.5 Analyze reasons for conflict and cooperation among and between groups, societies, nations, and regions.

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

7th Grade Content Standards

7.1 The student will analyze data from a geographic perspective using the skills and tools of geography.	**7.1.1** Integrate specific geographic information to support analysis from primary and secondary sources located in texts, documents, newspapers, magazines, journals, political cartoons, and online news sources.
	7.1.2 Apply the concepts of scale, distance, direction, relative location, absolute location, and latitude and longitude.
	7.1.3 Explain the relationship between the continents, world oceans, and major cultural regions.
	7.1.4 Integrate visual information and apply the skill of mental mapping of the political and physical features of the Earth's surface in order to organize information about people, places, and environments.
	7.1.5 Integrate visual information, draw conclusions, and make predictions from geographic data; analyze spatial distribution and patterns by interpreting that data as displayed on geographic tools.
	7.1.6 Describe and analyze the role of geographic factors on current events and issues.
7.2 The student will analyze the physical systems of the major regions of the Eastern Hemisphere.	**7.2.1** Identify on a physical map the major landforms and bodies of water of each region.
	7.2.2 Describe the distribution of major renewable and nonrenewable resources of each region.
	7.2.3 Explain how the competition for scarce resources can cause economic and political conflict and cooperation.
7.3 The student will identify the characteristics, distribution and demographic patterns of human populations and systems of the Eastern Hemisphere.	**7.3.1** Identify on a political map the major countries and population centers of each region.
	7.3.2 Compare common cultural traits, including language, ethnic heritage, social systems, and traditions.
	7.3.3 Evaluate the impact of a region's major religions, including geographic hearths, major beliefs, customs, and the significance of religion in contemporary societies; explain how religion can both unify or divide people.
	7.3.4 Evaluate and summarize the impact of geography on population distribution, density, growth, change, settlement patterns, the availability of resources, and migration, including push and pull factors.
	7.3.5 Describe reasons for and analyze from multiple perspectives the challenges and benefits of migration on inigenous and immigrant populations.

	7.3.6 Describe the distribution of resources and evaluate how the three levels of economic activities (primary, secondary, tertiary) contribute to the development of a country or region.
	7.3.7 Compare the structures of representative governments and authoritarian systems.
	7.3.8 Identify the role of the citizen in the selection of government officials and lawmaking; compare individual liberties under different forms of government.
	7.3.9 Identify and explain the advantages and disadvantages of traditional, market, and command economic systems.
	7.3.10 Explain the role of government policies in utilizing wealth from natural resources to finance development.
	7.3.11 Assess the influence of economic development and distribution of wealth on society.
	7.3.12 Distinguish between developed and developing regions using the Human Development Index; analyze data used by geographers, including literacy rate, life expectancy, infant mortality, and per capita income.
7.4 The student will analyze the interactions of humans and their environment in the Eastern Hemisphere.	**7.4.1** Analyze the impact of climate events, weather patterns and natural disasters on human populations and the environment, resulting in forced migrations, scarcity of consumer goods, economic activities, and loss of life.
	7.4.2 Explain how climate change is affecting environments and human populations.
	7.4.3 Explain the differences among subsistence, cash crop and commercial agriculture, including the impact on economic development.
	7.4.4 Evaluate the effects of human modification of and adaptation to the natural environment through transformation caused by agriculture, the use of modern irrigation methods, industry, demand for energy, and urbanization.
	7.4.5 Summarize the role of ecotourism in creating environmental awareness of resources, climate, cultures and wildlife.
	7.4.6 Describe the role of citizens as responsible stewards of natural resources and the environment.
7.5 The student will compare common physical and human characteristics of regions which create identity or uniqueness and influence people's	**7.5.1** Define the concept of region and explain how and why regions change over time through physical and human processes which operate to modify the Earth's surface.
	7.5.2 Describe how cultural diffusion, both voluntary and forced, impacts society.
	7.5.3 Explain patterns of global interdependence and world trade, including the impact of changing technology on trade routes.

perceptions of the Eastern Hemisphere.	**7.5.4** Explain patterns of global economic interdependence and world trade, focusing on the concepts of balance of trade, supply and demand; compare the economic measurements of productivity, Gross Domestic Product (GDP) and Gross National Product (GNP).
	7.5.5 Analyze global interdependence which explains the outsourcing of technological and manufacturing jobs to developing regions.
	7.5.6 Analyze reasons for conflict and cooperation among groups, societies, and countries, including the creation and involvement of supranational organizations.
	7.5.7 Describe how political, economic, and cultural forces challenge contemporary political arrangements leading to the devolution of states (civil wars, terrorism, genocide, and ethnic separatism).

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

8th Grade Content Standards

8.1 The student will analyze the foundations of the United States by examining the causes, events, and ideologies which led to the American Revolution	**8.1.1** Describe the political climate in the British colonies prior to the French and Indian War including the policy of salutary neglect, mercantilism through the Navigation Acts and colonial reaction through the Albany Plan of Union; compare the Iroquois Confederacy to early attempts to unite the colonies.
	8.1.2 Summarize the political and economic consequences of the French and Indian War including imperial policies of taxation, the Proclamation of 1763, and the migration of colonists into American Indian sovereign territories.
	8.1.3 Summarize British attempts to regulate the colonies and colonial responses including: **A.** Sugar Act **B.** Stamp Act Congress Resolves **C.** Committees of Correspondence **D.** legal principle of taxation and political representation **E.** Townshend Act and boycotts of British goods **F.** Quartering Act **G.** Boston Massacre **H.** Tea Act and Boston Tea Party **I.** Coercive Acts (Intolerable Acts) **J.** First Continental Congress **K.** British raids on Lexington and Concord
	8.1.4 Analyze the significance of the Second Continental Congress including: **A.** formation of the Continental Army **B.** establishment of currency **C.** Olive Branch Petition **D.** French alliance negotiated by Benjamin Franklin **E.** committee to draft a declaration of independence

	8.1.5 Analyze the ideological and propaganda war between Great Britain and the colonies including: **A.** points of views of the Patriots and the Loyalists **B.** writings of Mercy Otis Warren and Phillis Wheatley **C.** use of Paul Revere's engraving of the Boston Massacre **D.** rejection of the Olive Branch Petition **E.** *Give Me Liberty or Give Me Death*, speech attributed to Patrick Henry **F.** *Common Sense* pamphlet by Thomas Paine
	8.1.6 Examine the central ideas expressed in the Declaration of Independence, drafted by Thomas Jefferson and adopted July 4, 1776, and their intellectual origins including: **A.** John Locke's theory on natural and unalienable rights, including life, liberty and the pursuit of happiness **B.** the ideals of equality for all individuals, including the impact of the First Great Awakening. **C.** the purpose of government as a social contract requiring the consent of the governed **D.** economic and political grievances against British policies.
8.2 The student will examine key military and diplomatic events of the Revolutionary War that resulted in an independent nation.	**8.2.1** Explain the purpose of the Articles of Confederation which established the first American national system of government to support and conduct a war against Britain.
	8.2.2 Evaluate the motivations and points of view of various populations to remain loyal to Britain, join the patriot cause, or choose neutrality, including: **A.** Patriots and Loyalists and their political, economic, and family interests **B.** American Indians and the preservation of their homelands, cultures, and trade **C.** women and their political status **D.** free and enslaved blacks and their petitions to colonial governments for a ban on slavery.
	8.2.3 Identify and evaluate the contributions of individuals and significant groups toward winning independence from British rule.
	8.2.4 Compare the advantages and disadvantages of the British and the American colonists including political and military leadership, military strength, population and resources, motivation, foreign alliances, financial and military support, and the British recruitment of enslaved black men in exchange for freedom.

	8.2.5 Summarize the impact of key military and diplomatic events of the Revolutionary War including: **A.** military leadership of General George Washington **B.** victories at Boston, Trenton, and Saratoga **B.** publication of Thomas Paine's *The Crisis* **D.** Valley Forge encampment **E.** French alliance, negotiated by Benjamin Franklin **F.** victory at Yorktown **G.** Treaty of Paris, 1783
8.3 The student will examine the formation of the American system of government following the Revolutionary War and the creation of the Constitution of the United States as the supreme law of the land.	**8.3.1** Examine the strengths and weaknesses of the Articles of Confederation that led to the Constitutional Convention in Philadelphia in 1787, including: **A.** resolution of disputes over the western territories as resolved by the Northwest Ordinance **B.** organization and leadership necessary to win the war **C.** lack of a common national currency **D.** lack of a common defense **E.** lack of a national judiciary **F.** mismanagement of war debts due to an inability to tax **G.** unanimous vote required to amend the Articles of Confederation **H.** civil unrest as typified in Shays' Rebellion.
	8.3.2 Analyze the significance of the Constitutional Convention, contributions of the Framers, major debates and compromises including the Virginia and New Jersey Plans, Great Compromise, the leadership of James Madison, Father of the Constitution, and George Washington, President of the Convention.
	8.3.3 Describe how the framers of the Constitution addressed the issue of slavery including the Three-Fifth Compromise which maintained the institution of slavery in both northern and southern states, the Fugitive Slave Clause, and the delayed ban on the slave trade.
	8.3.4 Explain the significance of the Commerce Clause in establishing a constitutional relationship between Indian tribes and the United States government.
	8.3.5 Examine the concept of self-government, the purpose, and the responsibilities of government as expressed in the Preamble to the Constitution of the United States.

	8.3.6 Analyze the key principles of government established by the Constitution of the United States including: **A.** federalism (reserved and concurrent powers) **B.** separation of powers among three branches of government (legislative, executive, judicial) **C.** a system of checks and balances among the three branches **D.** popular sovereignty and consent of the governed **E.** judicial review **F.** rule of law
	8.3.7 Examine the Federalist and Anti-Federalist arguments for and against the ratification of the Constitution as expressed in the *Federalist Papers* authored by James Madison, Alexander Hamilton, and John Jay and the writings of Anti-Federalists, such as George Mason, including concerns over a strong central government and the omission of a bill of rights.
	8.3.8 Explain how the Constitution of the United States was amended to include the Bill of Rights; identify and analyze the guarantees of individual rights and liberties as expressed in each of the ten amendments.
	8.3.9 Identify the structure and responsibilities of the elected and appointed officials of the three branches of government in relationship to the legislative process, including the role of Congress and the President, as well as the Supreme Court's power of judicial review.
	8.3.10 Describe the responsibilities of United States citizens such as: **A.** registering and voting in public elections **B.** engaging in informed civil discourse **C.** serving on a jury **D.** paying taxes **E.** obeying laws **F.** registering for military service

8.4 The student will examine the political and economic changes that occurred during the Early Federal Period.	**8.4.1** Analyze the impact of the Whiskey Rebellion and enforcement of the government's right to tax.
	8.4.2 Describe President Washington's attempt to develop a cohesive Indian policy, which included respectful interactions with American Indian leaders, treaties to delineate tribal lands, and precedent-setting practices of assimilation.
	8.4.3 Describe the advice in *President Washington's Farewell Address* and its impact.
	8.4.4 Evaluate the impact of the Alien and Sedition Acts on individual rights during the Adams Administration, including the responses of the Democratic-Republicans in the *Virginia and Kentucky Resolutions*.
8.5 The student will analyze the political and geographic changes that occurred during the Jeffersonian Era.	**8.5.1** Explain the impact of the peaceful transfer of power from one political party to another, as exhibited by the presidential election of 1800.
	8.5.2 Analyze the impact of the Supreme Court under the leadership of Chief John Marshall and the *Marbury v. Madison* decision which confirmed the principle of judicial review.
	8.5.3 Analyze the acquisition of the Louisiana territory, the contributions of the Lewis and Clark Corps of Discovery Expedition, and the eventual establishment of the Indian Territory.
8.6 The student will examine the political, economic and social transformations during the "Era of Good Feelings".	**8.6.1** Explain how the War of 1812 confirmed American independence and fueled a spirit of nationalism, reflected in the lyrics of our national anthem, the *Star-Spangled Banner*, by Francis Scott Key.
	8.6.2 Examine the Monroe Doctrine as a policy of isolationism which was designed to protect American interests in the Western Hemisphere.
	8.6.3 Analyze the impact of *McCulloch v. Maryland* which established federal supremacy concerning taxation.
	8.6.4 Examine the increased tension between Southern sectionalist and Northern nationalist perspectives.
	8.6.5 Summarize the impact of the Missouri Compromise on the expansion of slavery into new western territories.
8.7 The student will examine the political, economic and social transformations of the Jacksonian Era.	**8.7.1** Describe the factors that led to the election of Andrew Jackson including the "Corrupt Bargain" election of 1824, the expansion of voting rights, and Jackson's political success by identifying with the "common man".
	8.7.2 Analyze the impact of the Nullification Crisis on the development of the states' rights debate.

	8.7.3 Analyze the impact of Jackson's policies and decisions concerning American Indian nations and their tribal sovereignty as a nation's inherent right to self-govern, including: **A.** non-adherence to federal treaties **B.** disregard for the *Worcester v. Georgia* decision **C.** forced removals of American Indians
8.8 The student will examine the political, economic, social, and geographic changes that occurred during the period of westward expansion.	**8.8.1** Examine the concept and opposing perspectives toward Manifest Destiny as a motivation and justification for westward expansion.
	8.8.2 Explain the territorial growth of the United States including the annexation of Texas, Mexican Cession, and the Gadsden Purchase; describe the need to maintain a balance of "free" and "slave" states.
	8.8.3 Identify push and pull factors of mass migration and the settlement of western territories including the California Gold Rush, settlement of Oregon, and the Mormon migration.
	8.8.4 Analyze the consequences of westward expansion, including the impact on the culture of American Indians and their homelands, and the growing sectional tensions regarding the expansion of slavery.
8.9 The student will analyze the social and economic transformations of the early nineteenth century.	**8.9.1** Explain the impact of the Industrial Revolution in the North including the concentration of population, manufacturing, and transportation.
	8.9.2 Describe the plantation system and its reliance on a slave labor system in the South, including how Eli Whitney's invention of the cotton gin increased the profitability of the crop and led to the expansion of slavery.
	8.9.3 Compare perspectives and experiences of both free and enslaved blacks including the **A.** everyday life of free African Americans **B.** everyday acts of resistance to slavery **C.** efforts of Harriet Tubman and the Underground Railroad **D.** Nat Turner's Rebellion **E.** legal restrictions and Slave Codes
	8.9.4 Summarize the impact of the Abolitionist Movement including the writings and work of Frederick Douglass and William Lloyd Garrison.
	8.9.5 Identify the ideals, significance, and key leaders of the Second Great Awakening and the Women's Suffrage Movement, including the *Declaration of Sentiments* and the leadership of Susan B. Anthony, Elizabeth Cady Stanton, and Sojourner Truth.

8.10 The student will analyze major political, economic, and social events that resulted in the Civil War.	**8.10.1** Summarize the importance of slavery as the principal cause of increased sectional polarization leading to the Civil War.
	8.10.2 Evaluate the goals of the Compromise of 1850 regarding the issue of slavery.
	8.10.3 Evaluate the impact of the publication *Uncle Tom's Cabin*, by Harriet Beecher Stowe, on anti-slavery sentiments.
	8.10.4 Analyze the impact of the Kansas-Nebraska Act on the issue of popular sovereignty in new territories regarding the institution of slavery, repeal of the Missouri Compromise, and factional feuds in Bleeding Kansas.
	8.10.5 Summarize the *Dred Scott v. Sandford* case which declared slaves as property and motivated John Brown's Raid on the federal arsenal at Harpers Ferry.
8.11 The student will analyze the course and consequences of the Civil War.	**8.11.1** Analyze the immediate impact of the presidential election of 1860 including **A.** secession of southern states who declared slavery as the central factor for seceding **B.** Lincoln's goal to preserve the Union **C.** formation of the Confederate States of America **D.** Confederate attack on Fort Sumter **E.** tensions over strategic border states.
	8.11.2 Compare the advantages and disadvantages of the Union and the Confederacy including natural resources, population, industrialization, and the military leadership of Ulysses S Grant and Robert E. Lee.
	8.11.3 Evaluate the impact and contributions of specific groups in the Civil War including free and enslaved African Americans, American Indians, women, and immigrants.
	8.11.4 Discuss the key strategies utilized during the war, such as the Anaconda Plan, Total War, and the southern defense strategy.
	8.11.5 Summarize the significance of the key battles of the war, including Antietam, Gettysburg, Vicksburg, and Lee's surrender at Appomattox.
	8.11.6 Analyze the *Emancipation Proclamation*, including its role in expanding the goals of the war and its impact on slavery; identify the significance of Juneteenth in relationship to emancipation.
	8.11.7 Explain how the *Gettysburg Address* clarified the Union's motivation for winning the war.

	8.11.8 Evaluate the impact of Lincoln's assassination, loss of his leadership, and plans for reconciliation as expressed in his *Second Inaugural* Address.
8.12 The student will analyze the political, social, and economic transformations during the Reconstruction Era to 1877.	**8.12.1** Compare the major plans and policies proposed for Reconstruction.
	8.12.2 Analyze the impact of state and federal legislation following the Civil War including **A.** 13th, 14th, and 15th Amendments **B.** Black Codes and Jim Crow laws **C.** establishment of the Freedmen's Bureau
	8.12.3 Compare the emerging social structure of the South including the **A.** influx of carpetbaggers and scalawags **B.** rise of the Ku Klux Klan and its acts of intimidation and violence **C.** election of blacks to government positions **D.** expansion of the tenant and sharecropper systems **E.** migration of former slaves.
	8.12.4 Assess the impact of the presidential election of 1876 as an end to reconstruction in the South, including decline of black leadership, loss of enforcement of the 14th and 15th amendments, and the development of segregated societies.
	8.12.5 Evaluate the impact of federal policies including: **A.** Homestead Act of 1862 and the resulting movement westward to free land **B.** impact of continued displacement of American Indians **C.** President Grant's Peace Policy on Indian affairs **D.** the development of the Transcontinental Railroad.

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

Economics Content Standards

E.1 The student will develop and apply economic reasoning and decision-making skills.	**E.1.1** Define and apply basic economic concepts of money supply, scarcity, surplus, choice, opportunity cost, cost/benefit analysis, risk/reward relationship, incentive, disincentive, and trade-off to a variety of economic situations.
	E.1.2 Determine appropriate courses of economic actions using a variety of economic reasoning and decision-making models.
	E.1.3 Examine how the decision-making process is impacted by the scope of the decision and the size of the decision-making entity.
	E.1.4 Explain that people tend to respond to fair treatment with fair treatment and to unfair treatment with retaliation, even when such reactions may not maximize their material wealth.
E.2 The student will evaluate how societies answer the three basic economic questions: what goods and services to produce, how to produce them and for whom are they produced.	**E.2.1** Compare the world's basic economic systems of market (free enterprise), command, and mixed market economies identifying countries that have adopted each and comparing the results such economic systems have produced in those countries as measured by GDP, national prosperity, individual income, and wealth.
	E.2.2 Describe the role of the factors of production, land, labor, capital, entrepreneurship, and technology as well as the place of imports and exports in economic systems.
	E.2.3 Answer how the three basic economic questions affect personal income and in turn impact the economic system.
	E.2.4 Explain the costs and benefits of government fiduciary policy and regulations including the impact both have on competition.
	E.2.5 Describe the impact of comparative and absolute advantage upon the three basic economic questions.
E.3 The student will explain how prices are set in a market economy and will determine how price provides incentives to buyers and sellers.	**E.3.1** Analyze how price and non-price factors affect the demand and supply of goods and services available in the marketplace.
	E.3.2 Explain what causes shortages and surpluses including government-imposed price floors, price ceilings, and other government regulations and the impact they have on prices and people's decisions to buy or sell.

	E.3.3 Evaluate the role of the government within the economy as to defining, establishing, and enforcing property rights.
E.4 The student will evaluate how changes in the level of competition in different markets affect prices.	**E.4.1** Explain how competition impacts the free market production and the allocation of goods and services to consumers.
	E.4.2 Explain how people's own self-interest, incentives, and disincentives influence market decisions.
E.5 The student will describe the role of economic institutions including banks, credit unions, corporations, governments, and not-for-profits in a market economy.	**E.5.1** Evaluate the impact of government ensuring the protection of private property rights and the rule of law in a market economy.
	E.5.2 Describe how banks allow people to pool their incomes and provide future income through investment in stocks.
	E.5.3 Identify how credit unions, corporations, and not-for-profits influence a market economy.
	E.5.4 Explain how successive deposits and loans made by commercial banks can cause the money supply to expand.
E.6 The student will analyze how money makes it easier to trade, borrow, save, invest, and compare the value of goods and services.	**E.6.1** Explain how individuals, businesses, and the overall economy benefit from the various uses of money, such as trading, borrowing, investing, and diversifying, versus saving money.
	E.6.2 Identify the components of the money supply and the different functions of money; give examples of each.
	E.6.3 Explain how the value of money is determined by the goods and services it can buy.

E.7 The student will evaluate how interest rates impact decisions in the market economy.	**E.7.1** Define interest rates and inflation; analyze the relationship between interest rates and inflation rates to both the borrower and the lender.
	E.7.2 Determine how changes in real interest rates impact people's decisions to borrow money and purchase goods in a market economy.
E.8 The student will analyze the role of entrepreneurs and laborers within a market economy.	**E.8.1** Identify both an entrepreneur and a laborer and describe how their decisions affect job opportunities for others, such as profit-maximizing level of output, hiring the optimal number of workers, comparing marginal costs and benefits of producing more or less of a resource.
	E.8.2 Analyze the potential risks and potential gains of entrepreneurs opening new businesses or inventing a new product; determine the financial and nonfinancial incentives that motivate entrepreneurs.
	E.8.3 Evaluate the costs and benefits of incorporation including the expansion of resources and reduction of risks.
E.9 The student will evaluate the economic role of government in a free market and a mixed market economy.	**E.9.1** Explain the aspects of and differences between a free market and a mixed market economy.
	E.9.2 Explain the purpose, costs, and benefits of government assistance programs and government funded services and projects.
	E.9.3 Evaluate the impact of voters' decisions as they relate to governmental economic policy.
E.10 The student will examine current economic conditions in the United States.	**E.10.1** Determine how interest rates, unemployment, Consumer Price Index (CPI), individual savings and debt, government debt, government-enforced price ceilings, labor supply, and inflation impact current economic conditions in the United States.
	E.10.2 Explain how these conditions have an impact on consumers, producers, and government policymakers.
	E.10.3 Explain how changes in supply and demand cause prices to change and in turn, cause buyers and sellers to change, including changes in price of productive resources and technologies used to make the product, profit opportunities available to producers for selling other products, number of sellers in a market, consumer incomes, consumer options, and the number of consumers in a market.
E.11 The student will identify the basic measures of a nation's economic output and income.	**E.11.1** Explain GDP and GNP and how they are used to describe economic output over time; compare the GDP of various countries representing market, command, and mixed economic systems.
	E.11.2 Describe the impact on the economy when GDP and GNP are growing or declining.

	E.11.3 Evaluate the impact of self-interest, competition, collusion, technological advancement, standard of living, the business cycle and fluctuation to the GDP.
	E.11.4 Examine the differences between the nominal and the real GDP.
E.12 The student will explain the role of inflation and unemployment in an economic system.	**E.12.1** Define inflation and determine how it is measured, including the impact inflation has on different sectors of the United States economy.
	E.12.2 Define the causes of unemployment, as well as the different types of unemployment; determine how unemployment is measured and the impact it has on different sectors of the United States economy.
E.13 The student will identify the potential econcomic impact of policy changes by the Federal Reserve and the federal government.	**E.13.1** Compare fiscal and monetary policy and the impact each has on the economy.
	E.13.2 Explain the role of the Federal Reserve System within government economic policy.
	E.13.3 Evaluate the conditions under which the federal government and the Federal Reserve implement expansionary or contractionary policies.

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

Oklahoma History Content Standards

OKH.1 The student will describe the state's geography and the historic foundations laid by American Indian, European, and American cultures.	**OKH.1.1** Integrate visual information to identify and describe the significant physical and human features including major trails, railway lines, waterways, cities, ecological regions, natural resources, highways, and landforms.
	OKH.1.2 Summarize the accomplishments of pre-contact cultures including the Spiro Mound Builders.
	OKH.1.3 Compare the goals and significance of early Spanish, French, and American interactions with American Indians, including trade, the impact of disease, the arrival of the horse, and new technologies.
	OKH.1.4 Compare cultural perspectives of American Indians and European Americans regarding land ownership, structure of self-government, religion, and trading practices.
OKH.2 The student will evaluate the major political and economic events that transformed the land and its people from early contact through Indian Removal and its aftermath.	**OKH.2.1** Summarize and analyze the role of river transportation to early trade and mercantile settlements including Chouteau's Trading Post at Three Forks.
	OKH.2.2 Describe the major trading and peacekeeping goals of early military posts including Fort Gibson.
	OKH.2.3 Analyze the motivations for removal of American Indians and the passage of the Indian Removal Act of 1830; trace the forced removal of American Indian nations, including the impact on the tribal nations removed to present-day Oklahoma and tribal resistance to the forced relocations.
	OKH.2.4 Describe the consequences of Indian Removal on intertribal relationships with western nations, such as the Osage, Comanche, Kiowa, Cheyenne and Arapaho.
OKH.3 The student will evaluate the major political and economic events that transformed the land and its people from the outbreak of the Civil War through allotment and land openings.	**OKH.3.1** Summarize the impact of the Civil War and Reconstruction Treaties on American Indian peoples, territories, and tribal sovereignty including: **A.** required enrollment of the Freedmen **B.** Second Indian Removal **C.** significance of the Massacre at the Washita **D.** reasons for the reservation system and the controversy regarding the reservation system as opposed to tribal lands. **E.** establishment of the western military posts including the role of the Buffalo Soldiers **F.** construction of railroads through Indian Territory

	OKH.3.2 Assess the impact of the cattle and coal mining industries on the location of railroad lines, transportation routes, and the development of communities.
	OKH.3.3 Analyze the influence of the idea of Manifest Destiny on the Boomer Movement.
	OKH.3.4 Compare multiple points of view to evaluate the impact of the Dawes Act (General Allotment Act) which resulted in the loss of tribal communal lands through a transfer to individual property and the redistribution of lands, including the Unassigned Lands and the Cherokee Outlet, by various means.
	OKH.3.5 Explain how American Indian nations lost control over tribal identity and citizenship through congressional action, including the Indian Reorganization Act.
OKH.4 The student will analyze the formation of constitutional government in Oklahoma.	**OKH.4.1** Compare the governments among the American Indian nations and the movement for the state of Sequoyah.
	OKH.4.2 Describe the proposal for an all-black state advocated by Edward McCabe.
	OKH.4.3 Explain the impact of the Enabling Act on single statehood.
	OKH.4.4 Describe and summarize attempts to create a state constitution joining Indian and Oklahoma Territories including the impact of the Progressive and Labor Movements resulting in statehood on November 16,1907.
	OKH.4.5 Compare Oklahoma's state government to the United States' national system of government including the branches of government, their functions, and powers.
	OKH.4.6 Describe the division, function, and sharing of powers among levels of government including city, county, state and tribal.
	OKH.4.7 Identify major sources of local and state revenues and the services provided including education, health and human services, transportation, courts, corrections, and public safety.
	OKH.4.8 Describe state constitutional provisions including the direct primary, initiative petition, referendum, and recall.

OKH.5 The student will examine the Oklahoma's political, social, cultural, and economic transformation during the early decades following statehood.	**OKH.5.1** Examine the policies of the United States and their effects on American Indian identity, culture, economy, tribal government and sovereignty including: **A.** passage of the Indian Citizenship Act of 1924 **B.** effects of the federal policy of assimilation including Indian boarding schools (1880s-1940s) **C.** authority to select tribal leaders as opposed to appointment by the federal government **D.** exploitation of American Indian resources, lands, trust accounts, head rights, and guardianship as required by the Bureau of Indian Affairs.
	OKH.5.2 Examine multiple points of view regarding the evolution of race relations in Oklahoma, including: **A.** growth of all-black towns (1865-1920) **B.** passage of Senate Bill 1 establishing Jim Crow Laws **C.** rise of the Ku Klux Klan **D.** emergence of "Black Wall Street" in the Greenwood District **E.** causes of the Tulsa Race Riot and its continued social and economic impact. **F.** the role labels play in understanding historic events, for example "riot" versus "massacre".
	OKH.5.3 Analyze how various segments of Oklahoma society including agriculture, mining, and state politics were influenced by the organized labor and socialist movements.
	OKH.5.4 Examine how the economic cycles of boom and bust of the oil industry affected major sectors of employment, mining, and the subsequent development of communities, as well as the role of entrepreneurs, including J.J. McAlester, Frank Phillips, E.W. Marland and Robert S. Kerr, and the designation of Tulsa as the "Oil Capital of the World".
	OKH.5.5 Evaluate the impact of the boom and bust cycle of Oklahoma's agricultural production due to mechanization and the needs of World War I, including its effect as a precursor of the Great Depression.
	OKH.5.6 Analyze William H. "Alfalfa Bill" Murray's response to the conditions created by the Great Depression.
	OKH.5.7 Describe the impact of environmental conditions and human mismanagement of resources resulting in the Dust Bowl and the migration of the "Okies", the national perceptions of Oklahomans, and the New Deal policies regarding conservation of natural resources.
	OKH.5.8 Describe the contributions of Oklahomans including African-American jazz musicians, the political and social commentaries of Will Rogers and Woody Guthrie's, Wiley Post's aviation milestones, and the artwork of the Kiowa Six.
	OKH.5.9 Summarize and analyze the impact of mobilization for World War II including the establishment of military bases, prisoner of war installations, and the contributions of Oklahomans to the war effort including the American Indian code talkers and the 45th Infantry Division.

OKH.6 The student will investigate how post-war social, political, and economic events continued to transform the state of Oklahoma from the 1950s through the present.	**OKH.6.1** Evaluate the progress of race relations and actions of civil disobedience in the state including: **A.** judicial interpretation of the equal protection clause of the 14th Amendment which ultimately resulted in the desegregation of public facilities and public schools and universities **B.** landmark Supreme Court cases of *Sipuel v. Board of Regents of the University of Oklahoma (1948)* and *McLaurin v. Oklahoma Board of Regents for Higher Education (1950)* **C.** lunch counter sit-ins organized by Clara Luper and the NAACP **D.** leadership of Governor Gary in the peaceful integration of the public common and higher education systems.
	OKH.6.2 Analyze the impact of economic growth in various sectors including: **A.** impact of rural to urban migration **B.** development of wind, water, and timber resources **C.** continuing role of agriculture **D.** emergence of tourism as an industry **E.** development of the aerospace and aviation industry including the FAA and the influence of weather research on national disaster preparedness **F.** oil and gas boom and bust, including the discovery of new fossil fuel resources **G.** improvement of the state's transportation infrastructures, such as the interstate highway system and the McClellan-Kerr Arkansas River Navigation System.
	OKH.6.3 Describe the artistic contributions of Oklahomans in the fields of music, art, literature, theater, and dance such as Ralph Ellison and the Five Indian Ballerinas.
	OKH.6.4 Summarize the impact of individual Oklahomans' leadership on state and national politics including political realignment.
	OKH.6.5 Analyze the evolving relationship between state and tribal governments impacting tribal self-determination and control over American Indian lands and resources including issues of jurisdiction, taxation, and gaming.
	OKH.6.6 Examine the contributions of major cultural and ethnic groups, including Asians, African Americans, American Indians, and Latinos to the state of Oklahoma and their impact on the social and economic transformation of the modern state of Oklahoma.
	OKH.6.7 Analyze the causes and effects of the domestic terrorist attack on the Murrah Federal Building in Oklahoma City including the responses of Oklahomans to the act, concept of the "Oklahoma Standard" and the creation of the Oklahoma City National Memorial and Museum.

	OKH.6.8 Describe the changing perceptions, both internal and external, of the state and its citizens, as reflected in the *Grapes of Wrath*, the musical *Oklahoma!*, Route 66, and the professional basketball team the Oklahoma City Thunder.
	OKH.6.9 Examine ongoing issues including immigration, criminal justice reform, employment, environmental issues, race relations, civic engagement, and education.

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

Psychology Content Standards	
PS.1 The student will examine the foundations of psychology and its origins as a separate social science discipline.	**PS.1.1** Analyze the definition of psychology in the context of psychology as an empirical science and the major approaches to psychology including cognitive-behavioral, psychoanalytic, cognitive, and humanistic.
	PS.1.2 Evaluate the origins of psychology based on significant historic figures including Wilhelm Wundt, William James, John B. Watson, and Karen Horney.
	PS.1.3 Classify the various subfields in psychology including vocational applications such as counseling, industrial, clinical, experimental, and educational psychology.
PS.2 The student will examine the development of psychology as an empirical science by describing the scientific method, explaining research strategies, and identifying ethical issues.	**PS.2.1** Describe the scientific method as the framework for research and apply the principles of research design to an appropriate experiment.
	PS.2.2 Compare quantitative and qualitative research strategies including experiments, surveys, focus groups, and narratives as the foundation of research in psychology.
	PS.2.3 Identify ethical standards psychologists must address regarding research with human and non-human participants.
	PS.2.4 Explore the various modes of psychological testing including personality, intelligence, and projective while assessing the reliability of each.
PS.3 The student will investigate the structure, biochemistry and circuitry of the brain and the nervous system to understand their roles in affecting behavior.	**PS.3.1** Identify and describe the structure and function of the brain including the hypothalamus, prefrontal lobe, corpus callosum, hemispheres, and amygdala.
	PS.3.2 Examine the structure and function of the nervous and endocrine system and how they affect behavior.
	PS.3.3 Identify the parts of a neuron and explain neurotransmission including the role and impact of various neurotransmitters.
	PS.3.4 Explain the processes of sensation and perception, as well as the capabilities and limitations of sensory processes including the visual, auditory, kinesthetic, olfactory, and gustatory sensory systems.

	PS.3.5 Describe the interaction of a person and the environment in determining perception including Gestalt principles and how one's experiences and expectations influence perception.
	PS.3.6 Identify various states of consciousness including sleep and dreams, hypnosis, meditation, and psychoactive drugs.
moral and cognitive development from conception through the latter stages of adulthood.	**PS.4.1** Explain the interaction of environmental and biological factors in human development including the role of the brain in all aspects of development.
	PS.4.2 Compare the theories of Jean Piaget, Sigmund Freud, Lawrence Kohlberg, Carl Jung, and Erik Erikson regarding human development.
PS.5 The student will understand how organisms adapt to their environment through learning and cognition.	**PS.5.1** Identify and explain the major theories of learning including Ivan Pavlov's classical conditioning, B.F. Skinner's and Albert Bandura's Operant conditioning, and Bandura's observational learning.
	PS.5.2 Describe the process, organization, and factors that influence memory and recall.
	PS.5.3 Analyze strategies and impediments involved in problem solving and decision making and how this knowledge could be applied to daily life.
PS.6 The student will understand the principles of motivation and emotion.	**PS.6.1** Compare the predominant theories of motivation and emotion including the biological, social-cognitive, humanistic, and cultural theories.
	PS.6.2 Analyze the biological and environmental influences on positive and negative emotion.
PS.7 The student will understand how society and culture influence a person's behavior and mental processes.	**PS.7.1** Evaluate the factors that lead to conformity, obedience and nonconformity as demonstrated in experiments including the Stanford Prison Experiment, Milgram Experiment, or Solomon Asch's studies.
	PS.7.2 Explain how bias, discrimination and use of stereotypes influence behavior with regard to gender, race, sexual orientation and ethnicity as demonstrated in the studies of the Brown Eyed/Blue Eyed Experiment and the Clark Doll Experiment.
	PS.7.3 Examine influences on aggression and conflict including the factors associated with the bystander effect as demonstrated in such cases as the Kitty Genovese murder.
	PS.8.1 Analyze the methods of determining abnormal behavior and the tools used to diagnose and classify disorders.

PS.8 The student will examine how psychological disorders are diagnosed, classified, and treated.	**PS.8.2** Describe symptoms and causes of major categories of psychological disorders including schizophrenia mood, anxiety, personality, somatoform, and dissociative disorders.
	PS.8.3 Compare available treatment options and how they evolved through history and among different cultures.
PS.9 The student will evaluate the many factors that promote mental health.	**PS.9.1** Identify and explain potential sources of stress, effects of stress, and various coping strategies for dealing with stress.
	PS.9.2 Describe the characteristics of and factors that promote resilience and optimism.
	PS.9.3 Analyze the relationship between psychological health and physiological health.
	PS.9.4 Identify mental health disorders such as eating disorders and obsessive compulsive disorders.

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

United States Government Content Standards

USG.1 The student will compare the formation of contemporary governments in terms of access, use and justification of power.	**USG.1.1** Compare the essential characteristics of limited versus unlimited governments.
	USG.1.2 Compare historic and contemporary examples of unlimited governments to examples of limited systems.
	USG.1.3 Compare the advantages and disadvantages of the ways governmental power is distributed, shared and structured in unitary, federal and confederal systems in terms of effectiveness, prevention of abuse of power and responsiveness to the popular will.
	USG.1.4 Compare the role of government in market and command economic systems.
USG.2 The student will describe the historical and philosophical foundations of the republican system of government in the United States.	**USG.2.1** Summarize the major documents contributing to the formation of constitutional government in the United States, including the Magna Carta, the Mayflower Compact and the English Bill of Rights.
	USG.2.2 Identify the central ideas and importance of the concept of inalienable rights, including life, liberty and the pursuit of happiness, the social contract, and the grievances stated in the Declaration of Independence and reflected in the Constitution of the United States.
	USG.2.3 Evaluate the necessity of a written constitution to set forth enumerated powers, to organize government, and to distribute powers among the three branches of government, the states, and the people.
	USG.2.4 Compare the points of view toward the structure and powers of government as expressed in the *Federalist Papers*, authored by Madison, Hamilton and Jay, as well as the writings of the Anti-Federalists.
	USG.2.5 Analyze the constitutional amendment process including the 27 amendments to the Constitution of the United States.
USG.3 The student will analyze the fundamental principles of	**USG.3.1** Examine the American system of federalism and evaluate the changes that have occurred in the relationship between the states and the national government over time.

the American system of government resulting in a republic, as established in the Constitution of the United States, the supreme law of the land.	**USG.3.2** Analyze the system of federalism including the **A.** enumerated (express) powers **B.** implied powers **C.** powers denied to the national government **D.** reserved powers to the states **E.** concurrent powers.
	USG.3.3 Summarize and explain the relationships and the responsibilities among national, state, tribal, and local governments.
	USG.3.4 Explain that tribal sovereignty is a tribal nation's inherent power to self-govern, such as challenges made regarding the Major Crimes Act.
	USG.3.5 Analyze how the Commerce Clause established the initial constitutional relationship between the Indian tribes and the United States government.
	USG.3.6 Explain how power is separated as well as shared under the American system including the **A.** system of separation of powers **B.** system of checks and balances **C.** principle of judicial review.
	USG.3.7 Evaluate the importance of the rule of law on the purposes and functions of government; explain how the rule of law provides for the protection of individual liberties, including due process and equality under the law.
	USG.3.8 Analyze the concept of popular sovereignty, including the government's responsibility to legitimize majority rule while protecting minority rights.
	USG.3.9 Analyze the rights and liberties guaranteed to all citizens in the Bill of Rights and how they are protected at the state level through the doctrine of incorporation using the 14th Amendment.
	USG.3.10 Analyze historic and contemporary examples of landmark Supreme Court decisions which have addressed and clarified individual rights under the First Amendment, including **A.** *Gitlow v. New York* (1925) **B.** *West Virginia v. Barnette* (1943) **C.** *Engel v. Vitale* (1962) **D.** *Tinker v. Des Moines* (1969) **E.** *Texas v. Johnson* (1989)

	USG.3.11 Analyze historic and contemporary examples of landmark Supreme Court cases which have specified individual rights of due process under the Constitution, including: **A.** *Mapp v. Ohio* (1961) **B.** *Gideon v. Wainwright* (1963) **C.** *Miranda v. Arizona* (1966) **D.** *Roe v. Wade* (1973) ***E***. *Furman v. Georgia* (1972).
USG.4 The student will examine the Constitution of the United States by comparing the legislative, executive, and judicial branches of government as they address the needs of the public.	**USG.4.1** Explain the purposes of government expressed in the Preamble and how the Constitution of the United States preserves the core principles of American society.
	USG.4.2 Examine the structure, functions, and authority exercised by the executive, legislative, and judicial branches of government. **A.** Identify the constitutional qualifications for holding public office and the terms of office, including the composition of Congress, the Supreme Court, and the executive branch. **B.** Explain the steps of the legislative process, including the role of Congress and the president. **C.** Explain the role of the executive branch, including the function of the bureaucracy in implementing public policy. **D.** Identify the issues and describe the significance of landmark Supreme Court decisions including *Marbury v. Madison* (1803), *McCulloch v. Maryland* (1819), *United States v. Nixon* (1974), *Bush v. Gore* (2000), and *Citizens United v. F.E.C.* (2010) **E.** Examine how government exercises its authority in real world situations including current issues and events.
USG.5 The student will be able to evaluate the significance of civic participation in order to ensure the preservation of our constitutional government.	**USG.5.1** Define civic virtue and explain the individual's duty and responsibility to participate in civic life by voting, serving on juries, volunteering within the community, running for office, serving on a political campaign, paying state and federal taxes prior to the April 15th annual deadline, and respecting legitimate authority.
	USG.5.2 Explain the naturalization process under the laws of the United States.
	USG.5.3 Analyze how our system of government provides citizens opportunities to monitor and influence the actions of the government and hold elected officials accountable.
	USG.5.4 Analyze factors affecting the political process and their role in government, including the role of political parties, interest groups, mass media, public opinion, and campaign funding.
	USG.5.5 Explain the steps of the electoral process including the components of local and national campaigns, the nominative process, and the Electoral College.

USG.6 The student will examine the United States public policy formation process.	**USG.6.1** Examine the budget process including significant policy issues and examples of economic trade-offs that occur when addressing competing public needs.
	USG.6.2 Examine how the government influences the economy using fiscal and monetary policy.
	USG.6.3 Explain the role of the national government in formulating and carrying out domestic policy.
	USG.6.4 Evaluate the role of the national government in formulating and carrying out foreign policy, national defense, and participation in international alliances and organizations.

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

United States History Content Standards

USH.1 The student will analyze the transformation of the United States through its civil rights struggles, immigrant experiences, and settlement of the American West in the Post-Reconstruction Era, 1865 to the 1920s.	**USH.1.1** Explain the constitutional issues that arise in the post-Civil War era including federalism, separation of powers, and the system of checks and balances.
	USH.1.2 Analyze the post-Reconstruction civil rights struggles. **A.** Identify the significance of Juneteenth in relation to emancipation and modern-day celebrations. **B.** Examine the purposes and effects of the 13th, 14th, and 15th Amendments. **C.** Assess the impact of the Black Codes, Jim Crow laws, and the actions of the Ku Klux Klan.
	USH.1.3 Analyze the impact of westward expansion and immigration on migration, settlement patterns in American society, economic growth, and American Indians. **A.** Summarize the reasons for immigration, shifts in settlement patterns, the immigrant experience at immigrant processing centers such as Ellis Island and Angel Island, and the impact of Nativism and Americanization. **B.** Analyze the creation of federal immigration policies including the Chinese Exclusion Act, the Gentlemen's Agreement, federal court decisions, the Supreme Court's application of the 14^{th} Amendment and the Immigration Act of 1924. **C.** Examine the rationale behind federal policies toward American Indians including the establishment of reservations, attempts at assimilation, the end of the Indian Wars at Wounded Knee, and the impact of the Dawes Act on tribal sovereignty and land ownership. **D.** Compare viewpoints of American Indian resistance to United States Indian policies as evidenced by Red Cloud in his *Cooper Union* speech, Quanah Parker, and Chief Joseph as expressed in his *I Will Fight No More Forever* speech.

USH.2 The student will analyze the social, economic and political changes that occurred during the American Industrial Revolution, the Gilded Age, and significant reform movements from the 1870s to the 1920s.	**USH.2.1** Evaluate the transformation of American society, economy and politics during the American Industrial Revolution. **A.** Analyze the impact of capitalism, laissez-faire policy and the role of leading industrialists as robber barons, captains of industry and philanthropists including John D. Rockefeller and Andrew Carnegie and his *Gospel of Wealth* essay on American society. **B.** Identify the impact of new inventions and industrial production methods including new technologies by Thomas Edison, Alexander G. Bell, Henry Ford, and the Bessemer process. **C.** Evaluate the contributions of muckrakers, including Ida Tarbell, Jacob Riis and Upton Sinclair, in changing government policies regarding child labor, working conditions and regulation of big business. **D.** Analyze major social reform movements including the Women's Suffrage and Temperance Movement and the leadership of Susan B. Anthony, Alice Paul, and Jane Addams. **E.** Evaluate the significance of the Labor Movement on the organization of workers including the impact of the Pullman strikes, the Haymarket Riot, and the leadership of Eugene V. Debs. **F.** Assess and summarize changing race relations as exemplified in the *Plessy v. Ferguson* case. **G.** Compare early civil rights leadership including the viewpoints of Booker T. Washington, and W.E.B. DuBois in response to rising racial tensions, the anti-lynching work of Ida B. Wells, and the use of poll taxes and literacy tests to disenfranchise blacks.
	USH.2.2 Evaluate the rise and reforms of Populism and the Progressive Movement including: **A.** direct primary, initiative petition, referendum, and recall intended to limit the corrupting influence of political machines **B.** impact of William Jennings Bryan and his *Cross of Gold* speech on the political landscape **C.** series of events leading to and the effects of the 16th, 17th, 18th, 19th, and 21st Amendments to the Constitution of the United States.
	USH.2.3 Analyze and summarize the key personalities, actions and policies of Presidents Theodore Roosevelt, William Howard Taft, and Woodrow Wilson by: **A.** comparing the policies of Roosevelt and Taft on environmental conservation and trust busting, **B.** evaluating the 1912 presidential election including the role of Roosevelt's *Bull Moose Party* and Eugene V. Debs Socialist Party. **C.** describing the policies of Wilson on the issue of women's right to vote.

USH.3 The student will analyze the expanding role of the United States in international affairs as America was transformed into a world power in the late 19th and early 20th centuries, 1890 to 1920.	**USH.3.1** Evaluate the impact of American imperialism on international relations and explain its impact on developing nations. **A.** Compare the economic, religious, social, and political rationales for American imperialism including the concept of "white man's burden," the annexation of Hawaii, the impact of Admiral Alfred T. Mahan, and the actions of the Anti-Imperialist League. **B.** Assess the role of yellow journalism and jingoism in inciting the desire of Americans to go to war with Spain. **C.** Examine how the Spanish-American War resulted in the rise of the United States as a world power and led to new territorial acquisitions and national insurrections in Cuba and the Philippines. **D.** Compare the foreign policies of Presidents Roosevelt, Taft, and Wilson including Big Stick Diplomacy, Dollar Diplomacy, Missionary Diplomacy, the Roosevelt Corollary, military interventionism, and the territorial acquisition and construction of the Panama Canal.
	USH.3.2 Evaluate the long-term impact of America's entry into World War I on national politics, the economy, and society. **A.** Summarize the transformation of the United States from a position of neutrality to engagement in World War I including the Zimmermann Telegram and the threats to international trade caused by unrestricted submarine warfare. **B.** Analyze the impact of the war on the home front including the use of propaganda, women's increased role in industry, the marshaling of industrial production, and the Great Migration. **C.** Analyze the institution of a draft and the suppression of individual liberties resulting in the First Red Scare, including the Palmer Raids and the Sacco-Vanzetti trials. **D.** Evaluate Wilson's foreign policy as proposed in his Fourteen Points and the reasons for the nation's return to isolationism highlighted by the Senate's rejection of the League of Nations.
USH.4 The student will analyze the cycles of boom and bust of the 1920s and 1930s on the transformation of American government, the economy and society.	**USH.4.1** Examine the economic, political, and social transformations between the World Wars. **A.** Describe modern forms of cultural expression including the significant impact of people of African descent on American culture as exhibited by the Harlem Renaissance and the Jazz Age. **B.** Describe the rising racial tensions in American society including the resurgence of the Ku Klux Klan, increased lynchings, race riots as typified by the Tulsa Race Riot, the rise of Marcus Garvey and black nationalism, and the use of poll taxes and literacy tests to disenfranchise blacks. **C.** Assess the impact of the Indian Citizenship Act of 1924 on the American Indian nations. **D.** Examine growing labor unrest and industry's reactions, including the use of sit-down strikes and court injunctions, and why socialism and communism appealed to labor. **E.** Describe the booming economy based upon access to easy credit through installment buying of appliances and inventions of modern conveniences including the automobile.

	USH.4.2 Analyze the effects of the destabilization of the American economy. **A.** Identify causes contributing to an unstable economy including the overproduction of agriculture products, greater speculation and buying on margin in the Stock Market, and the government's pro-business and laissez-faire policies. **B.** Examine the role of the Stock Market Crash and bank failures in weakening both the agricultural and manufacturing sectors of the economy leading to the Great Depression. **C.** Analyze how President Herbert Hoover's financial policies and massive unemployment as exemplified by the Bonus Army March and Hoovervilles impacted the presidential election of 1932. **D.** Compare points of view regarding the economic and social impact of the Great Depression on individuals, families, and the nation.
	USH.4.3 Analyze the impact of the New Deal in transforming the federal government's role in domestic economic policies. **A.** Assess changing viewpoints regarding the expanding role of government as expressed in President Franklin Roosevelt's *First Inaugural Address.* **B.** Examine how national policies addressed the economic crisis including John Maynard Keynes' theory of deficit spending, Roosevelt's court packing plan, and the new federal agencies of the Social Security Administration, Federal Deposit Insurance Corporation (FDIC), Works Progress Administration (WPA), Civilian Conservation Corps (CCC), and the Tennessee Valley Authority (TVA). **C.** Summarize the causes and impact of the Dust Bowl including the government's responses.
USH.5 The student will analyze the United States role in international affairs by examining the major causes, events and effects of the nation's involvement in World War II, 1933 to 1946.	**USH.5.1** Describe the transformations in American society and government policy as the nation mobilized for entry into World War II. **A.** Examine the roles of appeasement and isolationism in the United States' reluctance to respond to Fascist military aggression in Europe and Asia including the Neutrality Acts and the Lend-Lease program. **B.** Evaluate the industrial mobilization for war and the psychological preparation for war as reflected in President Franklin Roosevelt's *Four Freedoms* speech. **C.** Examine President Franklin Roosevelt's *Day Which Will Live* in Infamy speech and America's conduct of the war, including the role of women and minorities in the war effort, rationing, the internment of Americans of Japanese descent, and the treatment of Americans of German, and Italian descent, including the *Korematsu v. United States* decision.
	USH.5.2 Analyze the series of events affecting the outcome of World War II including major battles, military turning points, and key strategic decisions in both the European and Pacific Theaters of operation including Pearl Harbor, the D-Day Invasion, development and use of the atomic bomb, the island-hopping strategy, the Allied conferences at Yalta and Potsdam, and the contributions of Generals MacArthur and Eisenhower.

	USH.5.3 Summarize American reactions to the events of the Holocaust resulting in United States participation in the Nuremberg Trials which held Nazi leaders accountable for war crimes.
USH.6 The student will analyze foreign events and policies during the Cold War, 1945-1975.	**USH.6.1** Analyze the origins of international alliances and efforts at containment of Communism following World War II. **A.** Identify the origins of Cold War confrontations between the Soviet Union and the United States including the leadership of President Harry Truman, the postwar division of Berlin, the Berlin Blockade and Airlift, the Iron Curtain, and the Marshall Plan. **B.** Describe the roles and consequences of the spheres of influence created by the formation of the United Nations and NATO by the United States and the formation of the Warsaw Pact by the Soviet Union. **C.** Assess the impact and successes of the Truman Doctrine including the American military response to the invasion of South Korea. **D.** Evaluate the Kennedy administration's international goals as expressed in his *Inaugural Address* in light of the subsequent building of the Berlin Wall, the Bay of Pigs Invasion, the Cuban Missile Crisis, NASA, and the establishment of the Peace Corps.
	USH.6.2 Describe domestic events related to the Cold War and its aftermath. **A.** Summarize the reasons for the public fear of communist influence within the United States and how politicians capitalized on this fear including the leadership of President Dwight D. Eisenhower, the Army-McCarthy hearings, the Second Red Scare, the Alger Hiss controversy, and the Rosenbergs' spy trials. **B.** Examine the impact of the proliferation of nuclear weapons and the resulting nuclear arms race, the concept of brinkmanship, the doctrine of mutually assured destruction (MAD), the launching of Sputnik and the space race. **C.** Evaluate the continuing role of radio, television and other mass media in relationship to the Nixon and Kennedy debates as part of the 1960 and subsequent elections.
	USH.6.3 Analyze the series of events and long term foreign and domestic consequences of the United States' military involvement in Vietnam including the Domino Theory, the Gulf of Tonkin Resolution, the Tet Offensive, the presidential election of 1968, university student protests led by the counterculture movement, expanded television coverage of the war, the War Powers Resolution Act, and the 26th Amendment.
	USH.6.4 Analyze the political and economic impact of President Nixon's foreign policies including détente and the opening of China.

USH.7 The student will analyze the cause and effects of significant domestic events and policies from 1945 to 1975.	**USH.7.1** Analyze the major events, personalities, tactics and effects of the Civil Rights Movement. **A.** Assess the effects of President Truman's decision to desegregate the United States armed forces and the legal attacks on segregation by the NAACP and Thurgood Marshall, the United States Supreme Court decisions in the cases of Oklahomans Ada Lois Sipuel Fisher and George McLaurin, and the differences between *de jure* and *de facto* segregation. **B.** Evaluate the events arising from separate but equal, policies, such as poll taxes and literacy tests, violent responses such as the Birmingham church bombing and the assassination of Dr. Martin Luther King, Jr., and conflicts over segregation including: 1. *Brown v. Board of Education, Topeka, Kansas* decision 2. Montgomery Bus Boycott 3. desegregation of Little Rock Central High School 4. Oklahoma City lunch counter sit-ins led by Clara Luper 5. Freedom Rides 6. Marches on Washington and Selma to Montgomery 7. adoption of the 24th Amendment 8. passage of the Civil Rights Act of 1964 and the Voting Rights Act of 1965. **C.** Compare the viewpoints and the contributions of civil rights leaders and organizations linking them to events of the movement, including Dr. Martin Luther King, Jr. and his *I Have a Dream* speech, the leadership of Malcolm X, the role of organizations such as the Black Panthers; describe the tactics used at different times including civil disobedience, non-violent resistance, sit-ins, boycotts, marches, and voter registration drives.

	USH.7.2 Analyze the ongoing social and political transformations within the United States. **A.** Summarize and examine the United States Supreme Court's use of the 14th Amendment incorporation doctrine in applying the Bill of Rights to the states, thereby securing and further defining individual rights and civil liberties. **B.** Assess the rise of liberalism in the 1960s and the lasting impact of President Lyndon Johnson's civil rights initiatives, the war on poverty, and the Great Society. **C.** Describe the goals and effectiveness of the American Indian movements on tribal identity and sovereignty including the American Indian Movement (AIM) and mismanagement by the federal government causing the occupations at Wounded Knee and Alcatraz. **D.** Describe the goals and effectiveness of the social movement of the United Farm Workers and César Chávez. **E.** Compare the changing roles of women from the post-war era through the 1970s including the goals of the Women's Liberation Movement and the National Organization of Women under the leadership of Betty Friedan, various debates on the Equal Rights Amendment, and the United States Supreme Court's ruling in *Roe v. Wade*. **F.** Evaluate the impact of the Watergate Scandal on executive powers including the role of the media, the Pentagon Papers, the first use of the 25th Amendment, and President Ford's decision to pardon former President Nixon.
USH.8 The student will analyze the impact of foreign and domestic policies from 1977 to 2001.	**USH.8.1** Evaluate President Jimmy Carter's foreign policy in the Middle East including the Camp David Accords, the OPEC oil embargo, and the response to the 1979 Iranian hostage crisis.
	USH.8.2 Analyze the economic and political impact of the rise of conservatism and President Reagan's domestic and foreign policies including Reaganomics, the Iran-Contra Scandal and Reagan's *Tear Down This Wall* speech in West Berlin.
	USH.8.3 Summarize the series of events leading to the emergence of the United States as the sole superpower following the fall of the Berlin Wall and the collapse of the Soviet Empire.
	USH.8.4 Describe the goal of President George H.W. Bush's foreign policy in forming an international coalition to counter Iraqi aggression in the Persian Gulf.
	USH.8.5 Describe and evaluate the influence of William J. Clinton's presidency, including the **A.** continuing global influence of the United States including NAFTA and the NATO interventions to restore stability to the former Yugoslav republics. **B.** political impact of Clinton's impeachment.
	USH.8.6 Evaluate the rise of terrorism and its impact on the United States including the 1995 bombing of the Murrah Federal Building, the first attack on the World Trade Center Towers in 1993, the attacks on September 11, 2001, the USA PATRIOT Act, and the creation of the Department of Homeland Security.

USH.9 The student will examine contemporary challenges and successes in meeting the needs of the American citizen and society, 2002 to the present.	**USH.9.1** Assess George W. Bush's presidency, including the causes, conduct and consequences of the United States led wars in Afghanistan and Iraq, efforts to counter and combat terrorism, and domestic issues such as the FEMA response to Hurricane Katrina and the Great Recession.
	USH.9.2 Assess Barack Obama's presidency, including the significance of his election, the wars in Afghanistan and Iraq, handling of economic conditions, establishment of DACA, and reforms to healthcare.
	USH.9.3 Examine the ongoing issues to be addressed by the Donald Trump and subsequent administrations, including taxation, immigration, employment, climate change, race relations, religious discrimination and bigotry, civic engagement, and perceived biases in the media.

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

World Human Geography Content Standards

WG.1 The student will use maps and other geographic representations, tools and technologies to acquire, research, process, and solve problems from a spatial perspective.	**WG.1.1** Analyze key concepts underlying the geographical perspectives of location, space, place, scale, pattern, regionalization, and globalization.
	WG.1.2 Utilize geographic skills to understand and analyze the spatial organization of people, places, and environments on the Earth's surface.
	WG.1.3 Define regions and evaluate the regionalization process to characterize and analyze changing interconnections among places.
	WG.1.4 Utilize geographic technologies of GIS, remote sensing and GPS sources of geographical data including census data, population pyramids, cartograms, and satellite imagery.
WG.2 The student analyze how human population is organized geographically in order to understand the cultural, political, and economic systems of the world.	**WG.2.1** Analyze geographic data measuring population including density, distribution, patterns of composition (age, sex, race, and ethnicity), and population trends and projections.
	WG.2.2 Describe and summarize the push and pull theory of migration and its impact on human capital and demographic transitions including the research of major voluntary and involuntary migrations.
	WG.2.3 Compare and contrast the impact of population policies on the patterns of fertility, mortality, and health.
WG.3 The student will analyze the components and regional variations of cultural patterns and processes.	**WG.3.1** Assess the spatial dimensions of culture as defined by language, religion, ethnicity, and gender.
	WG.3.2 Analyze and summarize the role the environment plays in determining a region's culture.
	WG.3.3 Explain the processes of cultural diffusion, acculturation, assimilation, and globalization regarding their impact on defining a region.
	WG.3.4 Compare the world's major cultural landscapes to analyze cultural differences, cultural identity, social mores, and sets of beliefs which determine a sense of place.
	WG.3.5 Explain how cultural characteristics, such as language, ethnicity, and religion impact different regions.

WG.4 The student will explain the political organization of space.	**WG.4.1** Describe and summarize the different forces that shape the evolution of the world's contemporary political map including the rise of nation-states.
	WG.4.2 Analyze the concept of territoriality, the nature and meaning of boundaries, and their influence on identity, interaction, and exchange.
	WG.4.3 Compare the world's political patterns of organization including federal and unitary states.
	WG.4.4 Examine changes and challenges to political/territorial arrangements, the changing nature of sovereignty, and evolution of contemporary political patterns.
	WG.4.5 Evaluate how the forces of cooperation and conflict among people influence the division and control of territory and resources.
WG.5 The student will analyze agricultural and commercial land use.	**WG.5.1** Examine the origin and diffusion of agriculture including the Agricultural Revolutions and the Green Revolution.
	WG.5.2 Describe and summarize the characteristics of modern commercial agriculture including major production regions, variations within major zones, and effects of markets.
	WG.5.3 Analyze settlement patterns associated with major agricultural regions and linkages among regions of food production and consumption.
	WG.5.4 Describe the impact of agricultural practices including irrigation, conservation, desertification, deforestation, organic farming, pesticides and herbicides, and genetic modification on the environment and the quality of life.
	WG.5.5 Examine common characteristics of rural communities including the impact of the environment on location, the political, economic and cultural functions of rural communities, the types of transportation, communication and trade linkages among rural areas, and the impact of modern migration to urban centers.
WG.6 The student will analyze the impact of industrialization on economic development.	**WG.6.1** Examine the changing roles of natural resources, energy, and technology that resulted in the Industrial Revolution.
	WG.6.2 Evaluate the impact of industrialization and government policies of both market and command economic systems on the availability and use of natural resources, environmental concerns, and sustainable development.
	WG.6.3 Compare contemporary patterns of industrialization and development in selected regions of the world including the Pacific Rim, Central Asia, and the Arabian Peninsula.

	WG.6.4 Analyze why some economies achieve rapid growth while other economies with similar resources struggle to reach developed status.
	WG.6.5 Summarize common characteristics of developed nations including variations in levels of development, modern patterns of deindustrialization, and economic restructuring, globalization, and international division of labor.
WG.7 The student will evaluate specific textual and visual evidence to analyze cities and urban land use.	**WG.7.1** Examine the origin, development and character of cities including the impact of the environment on location, the political, economic, and cultural functions of cities, historical distribution of cities, and the types of transportation, communication, and trade linkages among cities.
	WG.7.2 Analyze contemporary patterns of rural migration on urban development including the concept of suburbanization, edge cities, megacities, and global cities.
	WG.7.3 Describe the factors that impact cities over time including uneven development, changing economic and demographic structures, transportation and infrastructure, housing and urban planning.

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

World History Content Standards

WH.1 The student will analyze and summarize the impact of the major patterns of political, economic, and cultural change over time to 1450 CE and their long-term influences.	**WH.1.1** Evaluate the impact of geography and trade on the development of culture in Africa, Asia, and Europe including religion, philosophy, and political belief.
	WH.1.2 Describe the origins, major beliefs, spread and lasting impact of the world's major religions and philosophies, including Judaism, Hinduism, Buddhism, Christianity, Islam, Confucianism, and Sikhism.
	WH.1.3 Compare the contributions of Greek and Roman philosophers, including Plato, Aristotle and Cicero including their impact on Western society.
	WH.1.4 Evaluate the economic, political, and cultural impact of interregional trade networks.
	WH.1.5 Describe the institution of slavery around the world prior to the 15th century as a widespread result of warfare and economic practices.
WH.2 The student will analyze patterns of social, economic, political, and cultural changes during the rise of Western civilization and the Global Age (1400-1750 CE).	**WH.2.1** Assess the significance of the Renaissance on politics, economics, and artistic creativity, including the works of Machiavelli, Michelangelo, and daVinci.
	WH.2.2 Summarize the causes of and influence of the theological movements of the Reformation and how those movements subsequently transformed society.
	WH.2.3 Analyze migration, settlement patterns, cultural diffusion, and the transformations caused by the competition for resources among European nations during the Age of Exploration.
	WH.2.4 Explain how slavery and the slave trade was used for the development and growth of colonial economies.
	WH.2.5 Compare the various forms of government established by: **A.** divine right rule, such as the Mandate of Heaven in China and absolutism in England and France **B.** Magna Carta in England, the English Civil War, and the Glorious Revolution **C.** enlightened monarchs such as Catherine the Great and Frederick the Great.
	WH.2.6 Compare how scientific theories and technological discoveries brought about social and cultural changes, including those made by Copernicus, Galileo, and Newton; describe the impact of Islamic learning.

	WH.2.7 Analyze the impact of the Enlightenment on modern government and economic institutions, including the theories of Hobbes, Locke, Voltaire, Rousseau, Montesquieu, and Adam Smith.
WH.3 The student will analyze the political, economic, and social transformations brought about by the events of the age of revolutions and imperialism (1750-1900 CE).	**WH.3.1** Analyze the causes and global impact of **A.** England's Glorious Revolution **B.** the American Revolution **C.** the French Revolution including the Napoleonic Wars **D.** the Congress of Vienna.
	WH.3.2 Summarize the influence and global impact of emerging democratic ideals on the Latin American and Caribbean revolutions including Haiti and Mexico and the leadership of Simon Bolivar.
	WH.3.3 Evaluate the economic and social impact of the Industrial Revolution.
	WH.3.4 Analyze how the Industrial Revolution gave rise to socialism and communism, including ideas and influence of Karl Marx.
	WH.3.5 Explain the rationales for and consequences of imperialism on Asia, Africa, and the Americas, such as colonization and the exploitation of natural resources and peoples; summarize various efforts to resist imperialism.
WH.4 The student will evaluate the global transformation created by the World Wars (1900-1945 CE).	**WH.4.1** Explain the complex and multiple causes of World War I, including militarism, nationalism, imperialism, systems of alliances, and other significant causes.
	WH.4.2 Describe the significant events of World War I, including key strategies, advancements in technology, the war's significant turning points, and its lasting impact.
	WH.4.3 Analyze the immediate and long-term global consequences of the Treaty of Versailles.
	WH.4.4 Analyze socialism, communism, and the Bolshevik Revolution as responses to capitalism.
	WH.4.5 Describe the economic, social, and political conditions that caused WWII including **A.** failure of the Treaty of Versailles **B.** impact of global depression **C.** rise of totalitarian regimes in the Soviet Union, Germany, Italy, and Japan
	WH.4.6 Examine the significant events of World War II from a global perspective, such as campaigns in Africa, Asia, and the Pacific.

	WH.4.7 Evaluate the effects of World War II including military and economic power shifts, purposes of the United Nations and NATO, and the origins and escalation of the Cold War.
	WH.4.8 Examine the causes, series of events and effects of the Holocaust through eyewitnesses such as inmates, survivors, liberators, and perpetrators.
	WH.4.9 Summarize world responses to the Holocaust, resulting in the Nuremberg Trials, the move to establish a Jewish homeland, and the creation of the Universal Declaration of Human Rights and its impact on human rights today.
WH.5 The student will evaluate post World War II regional events leading to the transformations of the modern world (1945-1990 CE).	**WH.5.1** Describe the creation of the modern state of Israel and ongoing territorial disputes, including the impact of significant regional leaders.
	WH.5.2 Evaluate the ongoing regional disputes of the Middle East, including the Iranian Revolution, the Iran-Iraq conflict, and the invasion of Kuwait.
	WH.5.3 Analyze the major developments in Chinese history during the second half of the 20th century including the **A.** Chinese Civil War and the Communist Revolution in China **B.** rise of Mao Zedong and the political, social, and economic upheavals under his leadership **C.** student protests of Tiananmen Square **D.** economic reforms under the leadership of Deng Xiaoping.
	WH.5.4 Examine the origins of India and Pakistan as independent nations, including the **A.** struggle for independence achieved through Mohandas Gandhi's non-violent civil disobedience movement **B.** development of India's industrial economy **C.** ongoing struggles in the region.
	WH.5.5 Evaluate the people, events, and conditions leading to the end of the Cold War including the **A.** effects of Poland's Solidarity Movement **B.** policies of the perestroika and glasnost **C.** fall of the Berlin Wall **D.** breakup of the Soviet Union

	WH.5.6 Assess the impact of African independence movements on human rights and the global expansion of democracy including the **A.** effects of Pan-Africanism on changing political boundaries **B.** struggle for self-government in Ghana, including the influence of Kwame Nkrumah **C.** creation and dismantling of South Africa's apartheid system, including the influence of Nelson Mandela and Desmond Tutu.
	WH.5.7 Compare multiple perspectives to examine the religious, ethnic, and political origins, as well as the lasting impact of modern genocide and conflicts including **A.** actions of the Khmer Rouge in Cambodia **B.** Northern Ireland's Troubles **C.** ethnic-cleansing in the Balkans **D.** Rwanda's mass murders **E.** crisis in Darfur
WH.6 The student will evaluate contemporary global issues and challenges.	**WH.6.1** Describe the ongoing impact of interdependence on the world's economies resulting in the creation and growth of multinational organizations, international trade agreements, and the challenges faced by the global economy.
	WH.6.2 Examine contemporary issues that impact the new global era such as the **A.** changing patterns of population **B.** cycle of disease and poverty **C.** status of women **D.** environmental issues.
	WH.6.3 Describe the impact of trade and interdependence on cultural diffusion.
	WH.6.4 Analyze responses by world governments concerning the rise and impact of international terrorism and their responses to regional disputes such as Syria.

Engage in Democratic Processes	Analyze and Address Authentic Civic Issues	Acquire, Apply, and Evaluate Evidence	Read Critically and Interpret Informational Sources	Engage in Evidence Based Writing

Sociology Content Standards

S.1 The student will recognize sociology as a social science, identify methods and strategies of research, and examine the contributions of sociology to the understanding of social issues.	**S.1.1** Describe the development of the field of sociology as a social science.
	S.1.2 Identify the contributions of leading theorists within sociology including Auguste Comte, Emile Durkheim, Harriet Martineau, Herbert Spencer, Max Weber, C. Wright Mills, Karl Marx, and W.E.B. Dubois.
	S.1.3 Evaluate different sociological research methods including participant observation, natural observation, library research, questionnaires, experiments, interviews, and case studies.
	S.1.4 Conduct research on an issue using the scientific method of inquiry including developing a hypothesis, gathering and interpreting data, and drawing conclusions.
S.2 The student will examine the influence of culture and the way cultural transmission is accomplished.	**S.2.1** Examine how relationships, structures, patterns and processes influence culture.
	S.2.2 Recognize the key components of a culture including knowledge, language and communication, customs, values, and physical artifacts.
	S.2.3 Explain the differences between a culture and a society.
	S.2.4 Analyze the influences of genetic inheritance and culture on human behavior including the debate over nature versus nurture.
	S.2.5 Compare various subcultures including counter cultures, pop cultures, ethnic cultures, and religious cultures.
	S.2.6 Describe factors that have led to cultural diversity within the United States.
S.3 The student will identify how social status influences individual and group behaviors.	**S.3.1** Describe how social status affects social order including upper class, middle class, lower class, white-collar professionals, blue-collar workers, and the unemployed.
	S.3.2 Recognize how role expectations can lead to conflict including gender, age, racial groups, and ethnic groups within different societies.

S.4 The student will examine how social groups are composed of people who share common characteristics including interests, beliefs, behaviors, and feelings.	**S.4.1** Examine why individuals become members of or associate with different social groups.
	S.4.2 Compare various types of norms including folkways, mores, laws, and taboos; explain why rules of behavior are considered important to society.
	S.4.3 Evaluate the characteristics of primary groups including small size intimate settings and enduring relationships and how members' behaviors are influenced by the primary group.
	S.4.4 Evaluate the characteristics of secondary groups including less permanence, less personal, and having a special purpose; explain how members' behaviors are influenced by the secondary groups.
	S.4.5 Investigate stereotypes of different groups including gangs, generational groups, immigrants, and the homeless.
S.5 The student will identify the effects of social institutions on individual and group behavior and explain how these institutions influence the development of the individual.	**S.5.1** Analyze the impact of social institutions on individuals, groups and organizations within society; explain how these institutions transmit the values of society including familial, religious, educational, economic, and political.
	S.5.2 Examine rites of passage within various social institutions such as religious ceremonies, school proms, quinceañeros, graduation, marriage, and retirement.
	S.5.3 Define ethnocentrism and xenophobia; analyze how they can be beneficial or destructive to a culture.
S.6 The student will examine social change over time and the various factors that lead to these changes.	**S.6.1** Examine environmental, political, economic, scientific, and technological influences upon immediate and long-term social change.
	S.6.2 Describe how collective behavior can influence and change society including sit-ins, organized demonstrations, and the use of social media.
S.7 The student will analyze social problems that affect large numbers of people or result from imbalances within a social system.	**S.7.1** Distinguish between characteristics of a social problem as compared to an individual problem.
	S.7.2 Analyze patterns of behavior found within social problems and their implications for society including juvenile crime, drug addiction, and long-term unemployment.
	S.7.3 Examine individual and group response and potential resolutions to social problems as well as the consequences of such solutions.
	S.8.1 Describe the traditions, roles, and expectations necessary for a society to continue and flourish.
	S.8.2 Examine factors that can lead to the breakdown and disruption of a society.

S.8 The student will explore both individual and collective behavior.	**S.8.3** Differentiate the impact of individual leaders of different social and political movements including Mohandas Gandhi, Dr. Martin Luther King Jr., and Susan B. Anthony.
	S.8.4 Interpret how social behavior is influenced by propaganda, the news media, and advertising.
	S.8.5 Investigate the impact of rumor, gossip, and other inaccurate communications upon group behavior.

Appendix A Social Studies Practices PK-12 Progression

1. Engage in Democratic Processes
Students will understand the principles of government, the benefits of democratic systems, and their responsibilities as citizens.

A. Students will demonstrate an understanding of the virtues that citizens should use when interacting with each other and the virtues that guide official government institutions.

PreK-Grade 1	Grades 2-3	Grades 4-5	Grades 6-8	Grades 9-12
1.A.PK-1.1 Discuss democratic principles such as equality, fairness, and respect for legitimate authority.	**1.A.2-3.1** Identify civic virtues and democratic principles such as equality, fairness, and respect for legitimate authority.	**1.A.4-5.1** Identify democratic principles in historic documents and describe examples of civic virtues and democratic principles at work in state and national settings.	**1.A.6-8.1** Compare and analyze civic virtues and democratic principles in historic and global settings, explaining how they influence various political systems.	**1.A.9-12.1** Evaluate various significant documents from the United States and other countries to compare civic virtues and principles of political systems.
1.A.PK-1.2 Discuss how people can improve their communities in the present and over time.	**1.A.2-3.2** Describe and offer examples of how people have improved their communities in the past and present.	**1.A.4-5.2** Compare the experiences that form student's and other's points of view about civic issues.	**1.A.6-8.2** Analyze the role that perspectives, civic virtues, and democratic principles play when citizens address issues or problems.	**1.A.9-12.2** Evaluate the impact of perspectives, civic virtues, democratic principles, constitutional rights, and human rights on addressing issues and problems in society.

B. Students will demonstrate an understanding of the important institutions of their society and the principles that these institutions are intended to reflect.				
PreK-Grade 1	**Grades 2-3**	**Grades 4-5**	**Grades 6-8**	**Grades 9-12**
1.B.PK-1.1 Describe roles and responsibilities of people in authority in school and community settings.	**1.B.2-3.1** Describe the basic structure of government at the local, state, and tribal levels.	**1.B.4-5.1** Explain the structure, responsibilities, and powers exercised by national officials of the branches of the United States government.	**1.B.6-8.1** Analyze the powers and responsibilities of the United States government and compare it to other forms of government.	**1.B.9-12.1** Evaluate the impact of the structure and powers exercised by local, state, tribal, national, and international institutions on public policy.
1.B.PK-1.2 Explain how all informed citizens play important roles in the community.	**1.B.2-3.2** Explain why all informed citizens should participate in their community.	**1.B.4-5.2** Explain ways in which informed and responsible citizens can and should participate in state and national government.	**1.B.6-8.2** Explain specific roles played by informed and responsible citizens (e.g. voters, jurors, taxpayers, military service, office holders) in all forms of government.	**1.B.9-12.2** Analyze the role of informed and responsible citizens in their political systems and provide examples of changes in civic participation over time.
1.B.PK-1.3 Explain the need for and purposes of rules in various settings such as the family, classroom, and school.	**1.B.2-3.3** Explain the need for and purposes of laws in the community and state.	**1.B.4-5.3** Examine the purposes of government and laws, as stated in the Constitution of the United States.	**1.B.6-8.3** Examine the origins, purposes and impact of constitutions, laws, treaties, and international agreements.	**1.B.9-12.3** Analyze the impact of constitutions, laws, treaties, and international agreements, including the concept of sovereignty, in order to maintain national and international order.
1.B.PK-1.4 Explain how rules are made and the consequences for violating those rules.	**1.B.2-3.4** Explain and provide examples of the consequences for violating laws in the community or state.	**1.B.4-5.4** Explain how laws are made in a democratic society to protect individual freedoms.	**1.B.6-8.4** Explain the concept of the rule of law and how limits on government authority guarantee individual liberties.	**1.B.9-12.4** Analyze how various governmental powers, responsibilities, and limitations are enacted and have changed over time.

C. Students will demonstrate understanding of the processes and rules by which groups of people make decisions, govern themselves, and address public problems.				
PreK-Grade 1	**Grades 2-3**	**Grades 4-5**	**Grades 6-8**	**Grades 9-12**
1.C.PK-1.1 Describe how people can work together to make decisions in the classroom and school.	**1.C.2-3.1** Explain how people can work together to make decisions in their community and state.	**1.C.4-5.1** Explain how laws have changed society in the past and present.	**1.C.6-8.1** Assess specific laws, both actual and proposed, as means of addressing historic and current national and international problems.	**1.C.9-12.1** Analyze historical, contemporary, and emerging means to promote the common good and protect individual rights.
1.C.PK-1.2 Engage in democratic processes to address authentic, real-world problems in the classroom or school.	**1.C.2-3.2** Use democratic processes to consider and propose actions to address authentic, real-world problems in the community and state.	**1.C.4-5.2** Use a range of democratic procedures to discuss and make decisions about real-world problems in the community, region, and nation.	**1.C.6-8.2** Apply a range of deliberative and democratic procedures to debate, make decisions, and propose action about authentic, real-world problems in out-of-school contexts.	**1.C.9-12.2** Engage in a range of deliberative and democratic processes to develop strategies to address authentic, real-world problems in the community and out-of-school contexts.

2. Analyze and Address Authentic Civic Issues Students will determine the kinds of sources that will be helpful in answering essential, compelling, and supporting questions addressing authentic civic issues.				
A. Students will demonstrate the capability for developing essential, compelling, and supporting questions that address authentic civic issues.				
PreK-Grade 1	**Grades 2-3**	**Grades 4-5**	**Grades 6-8**	**Grades 9-12**
2.A.PK-1.1 Collaboratively ask and respond to enduring essential questions of common concerns to the student and the community.	**2.A.2-3.1** Ask and respond to enduring essential questions of common concerns to the student, the community and the state.	**2.A.4-5.1** Create and explore essential questions that are important to others, as well as enduring across the social studies disciplines.	**2.A.6-8.1** Investigate and propose answers to essential questions representing enduring issues across the social studies disciplines.	**2.A.9-12.1** Develop, investigate and evaluate plausible answers to essential questions that reflect enduring understandings across time and all disciplines.
2.A.PK-1.2 Recognize connections between compelling and supporting questions which help answer an essential social studies question.	**2.A.2-3.2** Make connections between compelling and supporting questions which help answer an essential social studies question.	**2.A.4-5.2** Identify concepts and ideas from discipline-based compelling and supporting questions that are open to different interpretations.	**2.A.6-8.2** Compare points of agreement from reliable information and interpretations associated with discipline-based compelling and supporting questions.	**2.A.9-12.2** Compare points of agreement and disagreement from reliable information and expert interpretations associated with discipline-based compelling and supporting questions.
2.A.PK-1.3 Practice inquiry skills by responding to various levels of open-ended questions on a regular basis.	**2.A.2-3.3** Reinforce inquiry skills by asking and responding to various levels of open-ended questions on a regular basis.	**2.A.4-5.3** Demonstrate depth of knowledge by developing, exploring, and answering various levels of open-ended questions frequently.	**2.A.6-8.3** Develop deeper levels of understanding by questioning ideas and assumptions and identifying inconsistencies or errors in reasoning.	**2.A.9-12.3** Reinforce critical thinking by evaluating and challenging ideas and assumptions; analyze and explain inconsistencies in reasoning.
B. Students will demonstrate the ability to investigate problems taking into consideration multiple points of view represented in arguments, structure of an explanation and other sources.				
PreK-Grade 1	**Grades 2-3**	**Grades 4-5**	**Grades 6-8**	**Grades 9-12**

2.B.PK-1.1 Discuss local problems and ways in which people are trying to address these problems.	**2.B.2-3.1** Identify a range of local and state problems in which people are trying to address these problems.	**2.B.4-5.1** Explain the challenges people have faced and the strategies used to address local, regional, or national historical problems.	**2.B.6-8.1** Draw upon gathered information to analyze how a specific problem can manifest itself in local, regional, and global levels over time, evaluating options for individual and collective solutions.	**2.B.9-12.1** Use interdisciplinary lenses to gather and evaluate information regarding complex local, regional, and global problems; assess individual and collective actions taken to address such problems.
2.B.PK-1.2 With guidance and support, demonstrate understanding of social studies content through completion of authentic tasks and assessments.	**2.B.2-3.2** Demonstrate understanding of social studies content through completion of teacher-led authentic tasks and assessments.	**2.B.4-5.2** Reinforce understanding of social studies content through teacher-led investigations and the completion of authentic tasks and assessments.	**2.B.6-8.2** Demonstrate understanding of social studies content through the development of self-driven investigations and the completion of teacher-led authentic tasks and assessments.	**2.B.9-12.2** Demonstrate understanding of content through the development of self-driven investigations and the completion of multi-staged, authentic tasks and assessments.

3. Acquire, Apply, and Evaluate Evidence

Students will utilize interdisciplinary tools and master the basic concepts of the social studies in order to acquire and apply content understanding in all related fields of study.

A. Students will develop skills and practices which demonstrate an understanding that historical inquiry is based on the analysis and evaluation of evidence and its credibility.

PreK-Grade 1	Grades 2-3	Grades 4-5	Grades 6-8	Grades 9-12
3.A.PK-1.1 Identify a primary source of information and gather basic information from such sources.	**3.A.2-3.1** Explain the difference between a primary and secondary source of information and gather basic information from such sources.	**3.A.4-5.1** Gather, compare, and analyze information between primary and secondary sources about the past and present.	**3.A.6-8.1** Gather, compare, and analyze evidence from primary and secondary sources on the same topic, identifying possible bias and evaluating credibility.	**3.A.9-12.1** Gather, organize, and analyze various kinds of primary and secondary source evidence on related topics, evaluating the credibility of sources.
3.A.PK-1.2 Identify the author and date of a primary source using information found within the source itself with guidance and support.	**3.A.2-3.2** Identify the author and date of a primary source using information found within the source itself.	**3.A.4-5.2** Identify the intended audience and purpose of an historical primary source from information found within the source itself.	**3.A.6-8.2** Draw conclusions regarding the plausible author, date, origin, audience, and purpose of primary sources when not easily identifiable in the source.	**3.A.9-12.2** Evaluate the usefulness of primary and secondary sources for specific inquiry, based on the author, date, place of origin, intended audience, and purpose.
3.A.PK-1.3 With guidance and support, compare two primary or secondary sources about a particular event in history or contemporary events.	**3.A.2-3.3** Compare two or more primary or secondary sources about a particular event in history or contemporary events.	**3.A.4-5.3** Describe the similarities and differences between multiple historical or contemporary primary sources and their relationships to historical events.	**3.A.6-8.3** Use multiple historical or contemporary primary sources to identify further areas of inquiry and additional relevant sources.	**3.A.9-12.3** Develop questions about multiple historical and/or contemporary sources to pursue further inquiry and investigate additional sources.

3.A.PK-1.4 Make simple timelines from given information with guidance and support.	**3.A.2-3.4** Make simple timelines and identify immediate cause and effect relationships from given information.	**3.A.4-5.4** Create timelines to identify multiple causes and effects from given information.	**3.A.6-8.4** Distinguish multiple causation, immediate and long-term cause-effect relationships by constructing timelines which reflect related events.	**3.A.9-12.4** Analyze multiple causation and change over time by constructing and interpreting parallel timelines.
3.A.PK-1.5 Discuss possible reasons for an event or development in the past.	**3.A.2-3.5** Generate possible reasons for an event or development in the past.	**3.A.4-5.5** Explain multiple causes and effects of events and developments of the past or present.	**3.A.6-8.5** Distinguish between long-term causes and triggering events on historical developments or contemporary events.	**3.A.9-12.5** Evaluate how multiple, complex events are shaped by unique circumstances of time and place, as well as broader historical contexts.
3.A.PK-1.6 Discuss how individuals and groups have shaped significant historical changes.	**3.A.2-3.6** Explain and give examples of how individuals and groups have shaped significant historical changes in the community and state.	**3.A.4-5.6** Describe the specific contributions of individuals and groups who have shaped significant historical changes in regional and national events.	**3.A.6-8.6** Analyze the roles of specific individuals and groups who shaped historically significant events, both nationally, regionally, and on a global scale.	**3.A.9-12.6** Assess the significance and impact of individuals and groups throughout local, national, tribal, and world history, tracing the continuity of past events to the present.
3.A.PK-1.7 Identify point of view and give examples relevant to the student's experiences.	**3.A.2-3.7** Define point of view and give examples relevant to the student's experiences.	**3.A.4-5.7** Compare perspectives of individuals and groups during the same historical period.	**3.A.6-8.7** Describe multiple factors that influence the perspectives of individuals and groups during historical eras or toward contemporary situations.	**3.A.9-12.7** Analyze complex and interacting factors that influence multiple perspectives during different historical eras or contemporary events.
B. Students will demonstrate an understanding of geographic concepts and develop mastery of geographic tools and ways of thinking in order to become geographically informed.				
PreK-Grade 1	**Grades 2-3**	**Grades 4-5**	**Grades 6-8**	**Grades 9-12**

3.B.PK-1.1 Answer geographic questions using geographic information about the student's own community.	**3.B.2-3.1** Ask and answer geographic questions, using geographic information about the student's community and state.	**3.B.4-5.1** Answer geographic questions by organizing geographic information about regions of the United States from historical as well as contemporary perspectives.	**3.B.6-8.1** Answer geographic questions and conduct investigations by acquiring, organizing, and interpreting information about the modern world and historical events.	**3.B.9-12.1** Actively engage in asking and answering geographic questions by acquiring, organizing, and analyzing multiple sources of data and information about the world's past and its present conditions.
3.B.PK-1.2 Create and use basic maps, graphs, and other simple models to identify the physical and human features of the community.	**3.B.2-3.2** Create and use maps, graphs, and other simple geographic models to describe the physical and human features of the community and state.	**3.B.4-5.2** Create and use maps, data graphs and charts, photographs, and other geographic representations to explain spatial relationships of physical and human places.	**3.B.6-8.2** Use multiple mapping techniques and data visuals to create and analyze spatial patterns of environmental and cultural characteristics.	**3.B.9-12.2** Compare and analyze complex maps and mapping technologies to explain relationships between the environment and events, past and present.
3.B.PK-1.3 Describe the community's human and physical environment through the use of simple geographic representations and photographs.	**3.B.2-3.3** Describe the community and state's human and physical environment through the use of geographic representations, including aerial photographs.	**3.B.4-5.3** Analyze the impact of human and physical features of the Earth by drawing conclusions from digital representations, such as aerial photographs and satellite images of our nation and its regions.	**3.B.6-8.3** Make connections between spatial patterns of physical and human features of the Earth's surface by interpreting satellite images and using geographic technology.	**3.B.9-12.3** Analyze spatial patterns of human and physical environments, using geographic technology, from contemporary and historical perspectives.
3.B.PK-1.4 Identify examples of how humans modify and adapt to their physical environment using its natural resources.	**3.B.2-3.4** Identify and describe how humans modify and adapt to their physical environment, using its natural and human resources.	**3.B.4-5.4** Explain how culture, political, and economic actions can influence the ways people modify and adapt to their environment.	**3.B.6-8.4** Explain how cultural patterns, political and economic decisions can affect the physical environment, including how places and regions change over time.	**3.B.9-12.4** Evaluate the extent to which political and economic decisions have had significant historical and global impact on human and physical environments of various places and regions.

3.B.PK-1.5 Discuss how the physical environment impacts our daily lives and affects human activities.	**3.B.2-3.5** Describe how the physical environment impacts our daily lives and affects human activities in the past and present.	**3.B.4-5.5** Explain how environmental factors affected historical events and continue to impact contemporary human activities.	**3.B.6-8.5** Explain the influences of multiple environmental factors on historical events and current situations, which provide both opportunities and limitations on human development.	**3.B.9-12.5** Analyze the connections between historical events and the geographic contexts in which they have occurred, including the causes and processes of environmental changes over time.
3.B.PK-1.6 Discuss why and how people and goods move from place to place.	**3.B.2-3.6** Describe how the movement of resources, people, goods, and ideas move, connecting communities.	**3.B.4-5.6** Describe the spatial patterns of economic activities caused by interactions with other places.	**3.B.6-8.6** Explain how changes in transportation, communication, and technology affect the diffusion of ideas.	**3.B.9-12.6** Evaluate how globalization and the expanding use of scarce resources contribute to conflict and cooperation.

C. Students will analyze the principles of economic systems and develop an understanding of the benefits of a market system in local, national, and global settings.				
PreK-Grade 1	**Grades 2-3**	**Grades 4-5**	**Grades 6-8**	**Grades 9-12**
3.C.PK-1.1 Collaboratively gather simple economic data from charts and tables.	**3.C.2-3.1** Gather basic economic data from various types of graphs and charts.	**3.C.4-5.1** Interpret and draw conclusions from economic data on charts and graphs.	**3.C.6-8.1** Analyze, interpret, and compare economic data from multiple charts and graphs.	**3.C.9-12.1** Evaluate economic data from charts and graphs, noting trends and making predictions.
3.C.PK-1.2 Describe freedom of choice when determining needs and wants.	**3.C.2-3.2** Describe freedom of choice when determining needs and wants in a free market.	**3.C.4-5.2** Explain how the concepts of supply and demand operate in a market economy, using historic and contemporary examples.	**3.C.6-8.2** Compare the advantages and disadvantages of different types of economic systems.	**3.C.9-12.2** Analyze the ways in which incentives and resource availability influence what is produced and distributed in different types of economic systems.
3.C.PK-1.3 Discuss the concept that personal decisions have costs and benefits.	**3.C.2-3.3** Give examples of costs and benefits resulting from personal economic decisions.	**3.C.4-5.3** Identify positive and negative incentives that influence economic decision making.	**3.C.6-8.3** Describe alternative solutions to current economic issues in terms of benefits and costs for different groups.	**3.C.9-12.3** Construct arguments using a combination of evidence for or against an approach or solution to an economic issue.
3.C.PK-1.4 Identify examples of the goods and services that school and community workers provide.	**3.C.2-3.4** Describe examples of the goods and services that local and state governments provide.	**3.C.4-5.4** Analyze the role of innovation and entrepreneurship in a market economy.	**3.C.6-8.4** Evaluate how the advancements in technology impact economic growth and standard of living.	**3.C.9-12.4** Evaluate the impact of government policies on market outcomes at national and global levels, past and present.
3.C.PK-1.5 Explain why people in the community trade goods and services with people in other communities.	**3.C.2-3.5** Describe why people in one country trade goods and services with people in other countries.	**3.C.4-5.5** Explain how trade influences growth and progress of nations.	**3.C.6-8.5** Explain how trade impacts standard of living and leads to economic interdependence.	**3.C.9-12.5** Analyze the possible consequences, both intended and unintended, of government policies on markets and international trade.

4. Read Critically and Interpret Informational Sources
Students will engage in critical, active reading of grade level appropriate primary and secondary sources related to key social studies concepts, including frequent analysis and interpretation of informational sources.

A. Students will comprehend, evaluate, and synthesize textual sources to acquire and refine knowledge in the social studies.

PreK-Grade 1	Grades 2-3	Grades 4-5	Grades 6-8	Grades 9-12
4.A.PK-1.1 Locate the main idea and supporting details of a text.	**4.A.2-3.1** Locate and paraphrase the main idea and supporting details of a text (e.g. primary and secondary sources.)	**4.A.4-5.1** Quote accurately from a text when explaining the text explicitly and when drawing inferences from the text.	**4.A.6-8.1** Paraphrase the main idea and cite evidence from primary and secondary sources; provide an accurate summary of a source distinct from prior knowledge or opinion.	**4.A.9-12.1** Cite specific textual evidence to support analysis of primary and secondary sources, evaluating features such as author, date, and origin of information.
4.A.PK-1.2 Use titles and graphic features, including photographs and illustrations, to understand a text.	**4.A.2-3.2** Use graphic features of a text, such as photographs, titles, headings, subheadings, charts, and graphs, to understand content.	**4.A.4-5.2** Use information from multiple print or digital sources (e.g. timelines, maps, graphs, political cartoons, images) to answer a question.	**4.A.6-8.2** Integrate the use of visual information (e.g. maps, charts, photographs, videos, political cartoons) with textual information from primary and secondary sources.	**4.A.9-12.2** Analyze information from visual, oral, digital, and interactive texts (e.g. maps, charts, images, political cartoons, videos) in order to draw conclusions and defend arguments.
4.A.PK-1.3 Acquire new academic vocabulary and relate new words to prior knowledge.	**4.A.2-3.3** Acquire new academic vocabulary; relate new words to prior knowledge, and apply vocabulary in social studies.	**4.A.4-5.3** Acquire and use appropriate academic vocabulary and phrases in a social studies context.	**4.A.6-8.3** Acquire, determine the meaning, and appropriately use academic vocabulary and phrases used in social studies contexts.	**4.A.9-12.3** Appropriately apply and demonstrate understanding of academic vocabulary in a social studies context.

B. Students will apply critical reading and thinking skills to interpret, evaluate, and respond to a variety of complex texts from historical, ethnic, and global perspectives.				
PreK-Grade 1	**Grades 2-3**	**Grades 4-5**	**Grades 6-8**	**Grades 9-12**
4.B.PK-1.1 Explain and discuss the author's purpose, with guidance and support.	**4.B.2-3.1** Identify the author's purpose, including what the author wants to answer, explain, or describe in primary and secondary informational texts.	**4.B.4-5.1** Determine an author's purpose and draw conclusions to evaluate how well the author's purpose was achieved.	**4.B.6-8.1** Analyze works written on the same topic and compare methods the authors use to achieve similar or different purposes.	**4.B.9-12.1** Evaluate the extent to which historical, cultural, and/or global perspectives affect an author's stated or implied purpose.
4.B.PK-1.2 Locate facts that are clearly stated in a text (e.g. who, what, where, when, why, and how).	**4.B.2-3.2** Locate facts (e.g. who, what, where, when, why, and how) to demonstrate an understanding of key details in a text.	**4.B.4-5.2** Distinguish fact from opinion in non-fiction text and investigate facts for accuracy.	**4.B.6-8.2** Evaluate textual evidence to determine whether a claim is substantial or unsubstantial.	**4.B.9-12.2** Evaluate authors' points of view, potential bias, and how authors can reach different conclusions regarding the same issue.
4.B.PK-1.3 Ask and answer basic questions and engage in collaborative discussions about appropriate topics in a social studies text.	**4.B.2-3.3** Ask and answer questions to clarify information and engage in collaborative discussions about appropriate topics in social studies.	**4.B.4-5.3** Engage in collaborative discussions about appropriate topics and texts, expressing ideas clearly to others in diverse groups and whole class settings.	**4.B.6-8.3** Engage in collaborative discussions and debates about information presented in social studies texts, expressing ideas clearly while building on the ideas of others.	**4.B.9-12.3** Actively listen, evaluate, and analyze a speaker's message, asking questions while engaged in collaborative discussions and debates about social studies topics and texts.

5. Engage in Evidence Based Writing

Students will apply effective communication skills by demonstrating a variety of evidence based written products designed for multiple purposes and tasks, in order to demonstrate their understandings of social studies concepts, ideas, and content.

A. Students will summarize and paraphrase, integrate evidence, and cite sources to create written products, research projects, and presentations for multiple purposes related to social studies content.

PreK-Grade 1	Grades 2-3	Grades 4-5	Grades 6-8	Grades 9-12
5.A.PK-1.1 Draw, label, dictate and write a narrative with guidance and support.	**5.A.2-3.1** Compose narratives which introduce a topic, use facts to develop the topic, and provide a concluding statement.	**5.A.4-5.1** Compose narratives to develop and examine a topic in social studies, using information appropriately in a structured format.	**5.A.6-8.1** Compose narratives incorporating point of view, the use of an appropriate structure of ideas, and application of information.	**5.A.9-12.1** Compose narrative writing, when appropriate to a given purpose or task, citing evidence from informational texts.
5.A.PK-1.2 Draw, label, dictate, and write an informative product with guidance and support.	**5.A.2-3.2** Compose informative written products, focusing on the facts about a topic, including a main idea with supporting details.	**5.A.4-5.2** Compose informative essays and written products by introducing and developing a topic, incorporating evidence (e.g. facts, examples, details) and maintaining an organized structure.	**5.A.6-8.2** Compose informative essays and other written products about social studies topics, incorporating evidence (e.g. facts, examples, details) from multiple sources, maintaining an organized, formal structure.	**5.A.9-12.2** Compose informative essays and written products, developing a thesis, citing evidence from multiple sources and maintaining an organized, formal structure.
5.A.PK-1.3 With guidance and support, draw, label, dictate, and write to express an opinion, providing reasons as support.	**5.A.2-3.3** Express an opinion about a topic by composing a written product and providing logical reasons as support.	**5.A.4-5.3** Clearly state an opinion through written products, supported by commentary including examples, details, and reasoning.	**5.A.6-8.3** Compose argumentative written products by introducing a claim, recognizing an opposing viewpoint, and organizing evidence and commentary from credible sources.	**5.A.9-12.3** Compose argumentative written products, including a precise claim as distinguished from opposing claims, organizing logical reasoning, and providing credible evidence to develop a balanced argument.
5.A.PK-1.4 Express ideas independently through a	**5.A.2-3.4** Write independently over extended	**5.A.4-5.4** Write independently over extended	**5.A.6-8.4** Write independently over extended	**5.A.9-12.4** Write independently over extended

combination of drawing and emergent writing.	periods of time (e.g. time for research and reflection) and for shorter time frames (e.g. single sitting).	periods of time and for shorter time frames to communicate with different audiences for a variety of purposes.	periods of time and for shorter time frames, varying modes of expression to suit audience, purpose, and task and/or to analyze different perspectives.	periods of time, varying modes of expression to suit audience, purpose, and task; synthesize information across multiple sources and/or articulate new perspectives.
B. Students will engage in authentic inquiry to acquire, refine, and share knowledge through written presentations related to social studies.				
PreK-Grade 1	**Grades 2-3**	**Grades 4-5**	**Grades 6-8**	**Grades 9-12**
5.B.PK-1.1 With guidance and support, generate a list of topics of interest and questions about social studies.	**5.B.2-3.1** Generate a list of topics of interest and individual questions about a specific topic in social studies.	**5.B.4-5.1** Formulate a viable research question related to expanding knowledge of social studies concepts.	**5.B.6-8.1** Refine and formulate viable research questions related to social studies investigations, using well-developed theses or claims.	**5.B.9-12.1** Develop self-generated theses or claims related to independent research and investigations using credible and relevant sources.
5.B.PK-1.2 Organize information found during group research, using graphic organizers and other aids with guidance and support.	**5.B.2-3.2** Organize information found during group or individual research, using graphic organizers or other aids.	**5.B.4-5.2** Organize information from research, quoting accurately from the source, avoiding plagiarism.	**5.B.6-8.2** Quote, paraphrase, and summarize findings, avoiding plagiarism.	**5.B.9-12.2** Integrate quotes, paraphrase, and summaries of research findings into writing while avoiding plagiarism.
5.B.PK-1.3 With guidance and support, create a simple presentation, using audio, visual, or multimedia tools to communicate ideas and thoughts.	**5.B.2-3.3** Create a simple presentation, using audio, visual, and/or multimedia tools to communicate ideas and thoughts.	**5.B.4-5.3** Create presentations that integrate visual displays and other multimedia to enrich the presentation.	**5.B.6-8.3** Select, organize, and create presentations using multi-modal content (variety of written oral, visual, digital, or interactive texts) encompassing different points of view.	**5.B.9-12.3** Construct visual and/or multimedia presentations, using a variety of media forms to enhance understanding of findings and reasoning, for diverse audiences.

APPENDIX B

GLOSSARY OF ASSESSMENT TERMS

Glossary

This glossary of commonly used assessment terms can be used to help interpret and communicate test results. Note that because assessment terms evolve in terms of meaning and application, the definitions for some words may evolve beyond the sense indicated here.

Accommodation—A general term referring to changes in the setting in which a test is administered, the timing of a test, the scheduling of a test, the ways in which the test is presented, and the ways in which the student responds to the test. The term is used to refer to changes that do not alter in any significant way what the test measures or the comparability of scores.

Achievement Test—An assessment that measures a student's acquired knowledge and skills in a content area in which the student has received instruction.

Alternate Assessment—A substitute way of gathering information on the performance and progress of students who cannot participate, even with accommodations, in the regular state or district assessment programs. Alternate assessments provide a mechanism for all students to be included in the accountability system.

Analytic Scoring—A scoring procedure in which a student's writing is evaluated for selected traits or dimensions, with each trait receiving a separate score. The resulting values are combined for an overall score.

Bias—A systematic error in a test score. Bias occurs when factors irrelevant to the subject matter related to the assessment result in one or more specific groups of students being advantaged or disadvantaged relative to other groups.

Classical Test Theory—A psychometric theory based on the perspective that an individual's observed score on a test is composed of the true score of the examinee and an independent component of measurement error.

College and Career Readiness Assessment (CCRA)— The CCRA testing program is a suite of assessment for grade 11. The SAT and ACT are administered for the ELA and Mathematics assessments. There are separate assessments for Science and U.S. History.

Construct—The underlying concept or the characteristic that a test is designed to measure.

Construct Irrelevance—The extent to which test scores are affected by factors that are not relevant to the construct that the test is designed to measure.

Construct Validity (Content Validity)—Construct validity indicates the extent to which the content of the test samples the subject matter or situation about which conclusions are to be drawn; also described as "evidence based on test content."

Constructed-response Item—An assessment unit with directions, a question, or an idea that elicits a written response from a student.

Content Standard—A statement describing the knowledge and skills in a content area that is expected to be taught in classrooms and should be met at a specified point in time (e.g., at the end of the course).

Conversion Tables—Tables used to convert a student's test scores from raw-score total to scaled score.

Criterion—A standard or judgment used as a basis for quantitative and qualitative comparison; also, a variable to which a test is compared as a measure of the test's validity.

Criterion-referenced Test—An assessment that allows its users to make score interpretations of a student's performance in relation to specified performance standards or criteria, rather than in comparison to the performances of other test takers. See also performance standard/level.

Cut Score—Selected points on the score scale of a test. The points are used to determine whether a particular test score is sufficient for some purpose. For example, student performance on a test may be classified into one of several categories, such as below basic, basic, proficient or advanced on the basis of cut scores.

Differential Item Functioning (DIF)—A situation that occurs in testing when different groups of examinees (e.g., ethnic or gender groups) with the same true achievement levels have different levels of success on a particular item. Test developers reduce DIF by analyzing item data separately for each group. Items identified with DIF are carefully reviewed by content experts and culture and sensitivity committees. Items that appear to be unfair to one or more groups are discarded.

Discrimination Parameter—In the Item Response Theory (IRT) models, it indicates the degree an item distinguishes between examinees of differing abilities on the trait being measured. Low discrimination values indicate an item does not discriminate students of low and high abilities.

Distractor—An incorrect answer choice in a selected-response or multiple-choice test item.

Frequency Distribution—An ordered tabulation of individual scores (or groups of scores) showing the number of students obtaining each score or the number of students that were within each score grouping.

Holistic Scoring—A scoring procedure yielding a single score based on overall student performance rather than on an accumulation of points. Holistic scoring uses rubrics to evaluate student performance. The holistic scoring approach is utilized on the extended constructed responses for grades 5 & 8 ELA, by providing an overall score for the student's performance related to idea development and focus, organization, word choice, sentence structure, and control of grammar, usage, and mechanics.

Item—A statement, exercise, task, question, or problem on a test.

Item Pattern Scoring—A method of scoring responses on test items that is based on the IRT model (see below) and takes the item characteristics (such as item difficulty) into account. With item-pattern scoring, a student who correctly answers a number of more difficult items will get a higher score than one who answers the same number of easier items.

Item Response Theory (IRT)—A set of mathematical models that describes the relationship between performance on test items and the student's level of performance on the same scale as the ability or trait being measured. The three-parameter logistic (3PL) model is used for calibration and scaling of multiple-choice items; the graded response model (GRM) is used for polytomous items, including polytomously scored multipart items and open-response items. The various item parameters associated with each model (discrimination, difficulty, and guessing) are used to describe the statistical characteristics of each item.

Location (Difficulty) Parameter—In Item Response Theory, this parameter is the point on the ability scale at which an item discriminates, or measures, best.

Mean—The quotient obtained by dividing the sum of a set of scores by the number of scores; also called the "average." Mathematicians call it the "arithmetic mean."

Median—The middle score in a set of ranked scores. Equal numbers of ranked scores lie above and below the median. It corresponds to the 50th percentile and the 5th decile.

Mode—The score or value that occurs most frequently in a distribution.

Multiple-choice Item—A question, problem, or statement called a "stem" that appears on a test followed by two or more answer choices, called alternatives or response choices. The incorrect choices, called distractors, usually reflect common errors. The student's task is to choose the best answer to the question posed in the stem.

Normal Distribution Curve—A bell-shaped curve representing a theoretical distribution of measurements that is often approximated by a wide variety of actual data. It is often used as a basis for scaling and statistical hypothesis testing and estimation in psychology and education because it approximates the frequency distributions of sets of measurements of human characteristics.

Norm-referenced Test—A standardized assessment in which all students perform under the same conditions (e.g., carefully defined directions, time limits, materials, and scoring procedures). This type of test allows for the interpretation of the test score in relation to a specified reference group, usually others of the same grade and level.

Objective—The goals and expectations of each content standard.

Oklahoma Academic Standards—The Oklahoma Academic Standards are Oklahoma's core curriculum. Each subject/grade has a different set of standards and objectives on which students are tested.

Oklahoma Alternate Assessment Program (OAAP)—The Oklahoma Alternate Assessment Program (OAAP) is a component of the Oklahoma School Testing Program (OSTP) and is designed for students with the most significant cognitive disabilities. The OAAP mirrors the general assessment system regarding grade levels and subjects assessed and utilizes the Dynamic Learning Maps (DLM) Alternate Assessment System to measure academic content knowledge of students with significant cognitive disabilities.

Oklahoma Performance Index (OPI)—The Oklahoma Performance Index (OPI) is a scaled score resulting from the mathematical transformation of the true score, which is associated with each of the raw scores. The OPI score is used to place students in one of four performance levels: Advanced, Proficient, Basic, or Below Basic.

Oklahoma School Testing Program (OSTP)—The Oklahoma School Testing Program (OSTP) assessments are state-mandated, criterion-referenced tests that measure student proficiency in English Language Arts and mathematics in grades 3 through 8 and science for students in Grades 5 and 8. The OSTP also includes the Oklahoma Alternate Assessment Program (OAAP) for students in the same grades and content areas with the most significant cognitive disabilities. Finally, the OSTP includes a College-and-Career-Readiness Assessment (CCRA) in science and U.S. history for grade 11 students.

Open-ended Item—See constructed-response item.

Performance Level—A level of performance on a test, established by education experts, as a goal of student attainment. It may also refer to a description of the knowledge, skills, and abilities typically held by students within a performance level.

Performance-level Score Ranges—The performance-level score range is the range of scale scores that corresponds to one of the four performance levels: Advanced, Proficient, Basic, and Below Basic.

Raw Score—The number of correct answers on a test.

Reliability—The degree to which test scores obtained by a group of individuals are consistent over repeated applications. The reliability coefficient indicates the degree to which scores are free of measurement error. The conditions that the coefficient estimates may involve variations in test forms (alternate form reliability), repeated administration of the same form to the same groups after a time interval (test-retest reliability), or the statistical interrelationship of responses on separate parts of the test (internal consistency).

Rubric—A scoring tool, or set of criteria, used to evaluate a student's test performance.

Scale Scores—Scores on a single scale with intervals. The scale can be applied to all groups taking a given test, regardless of group characteristics or time of year, making it possible to compare scores from different groups of students. Scale scores are appropriate for various statistical purposes. For example, they can be added, subtracted, and averaged across test levels. Such computations permit educators to make direct comparisons among examinees or compare individual scores to groups in a way that is statistically valid. This cannot be done with percentiles or grade equivalents.

Standard—A target toward which instruction is specifically directed. In OSTP tests, standards are used to cluster key skills and/or concepts in an instructional domain.

Standard Deviation—A statistic used to express the extent of the divergence of a set of scores from the average of all the scores in the group. In a normal distribution, approximately two thirds (68.3 percent) of the scores lie within the limits of one standard deviation above and one standard deviation below the mean. The remaining scores are equally distributed more than one standard deviation above and below the mean.

Standard Error of Measurement (SEM)—Measurement error is associated with all test scores. The standard error of measurement (SEM) is an estimate of the amount of error to be expected in a score from a particular test. This statistic provides a range within which a student's true score is likely to fall. The smaller the standard error of measurement, the smaller the range in which the student's true score would likely fall and the more accurate the test score.

Standardized Test—A test that is given in exactly the same way to all children taking the test. The items are the same, the instructions are the same, the timing is the same, the method of determining correctness is the same, and the scoring is the same. No variations are allowed.

Stem—The part of an item that asks a question, provides directions, or presents a statement to be completed.

Stimulus—A passage or graphic display about which questions are asked.

Strand—The main content areas that organize the math standards. Oklahoma math standards are developed around four main content strands: Numbers and Operations, Algebraic Reasoning and Algebra, Geometry and Measurement, and Data and Probability.

Test—A device or procedure designed to elicit responses that permit an inference about what a student knows or can do.

Test Item—See item.

True Score—In classical test theory, the hypothetical average score that would result if the test could be administered repeatedly without practice or fatigue effects. In Item Response Theory, the "true score" is the error-free value of the test taker's performance.

Unscorable—Writing responses that do not meet certain criteria cannot be scored. A zero composite score is given to responses that fall into the following categories:
N – No Response/Refusal to Answer, I –Illegible/Incomprehensible, L – Language other than English, O – Off Topic.

Validity—The degree to which accumulated evidence and theory support specific interpretations of test scores proposed by users of a test.

Writing Prompt—An assessment topic, situation, or statement to which students are expected to respond in the form of an essay.

OKLAHOMA
Education

APPENDIX C
TEST BLUEPRINTS

OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT ENGLISH LANGUAGE ARTS GRADE 3

This blueprint describes the content and structure of an assessment and defines the ideal number of test items by standard of the Oklahoma Academic Standards (OAS).

IDEAL PERCENTAGE OF ITEMS	STANDARDS
38–42%	**STANDARD 2: READING AND WRITING PROCESS**** Students will use a variety of recursive reading and writing processes.
12–18%	**STANDARD 3: CRITICAL READING AND WRITING** Students will apply critical thinking skills to reading and writing.
22–26%	**STANDARD 4: VOCABULARY**** Students will expand their working vocabularies to effectively communicate and understand texts.
12–18%	**STANDARD 5: LANGUAGE** Students will apply knowledge of grammar and rhetorical style to reading and writing.
12–18%	**STANDARD 6: RESEARCH** Students will engage in inquiry to acquire, refine, and share knowledge. **Reading Comprehension and Vocabulary standards applied to determine RSA Status
100%	**TOTAL: 50 ITEMS**

*Standard 8: Independent Reading and Writing is assessed throughout the test and dually aligned to each standard.
Please note this blueprint does not include items that may be field-tested.
A minimum of 6 items is required to report a standard.

OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT ENGLISH LANGUAGE ARTS GRADE 4

This blueprint describes the content and structure of an assessment and defines the ideal number of test items by standard of the Oklahoma Academic Standards (OAS).

IDEAL PERCENTAGE OF ITEMS	STANDARDS
30–34%	**STANDARD 2: READING AND WRITING PROCESS** Students will use a variety of recursive reading and writing processes.
18–22%	**STANDARD 3: CRITICAL READING AND WRITING** Students will apply critical thinking skills to reading and writing.
22–26%	**STANDARD 4: VOCABULARY** Students will expand their working vocabularies to effectively communicate and understand texts.
12–18%	**STANDARD 5: LANGUAGE** Students will apply knowledge of grammar and rhetorical style to reading and writing.
12–18%	**STANDARD 6: RESEARCH** Students will engage in inquiry to acquire, refine, and share knowledge.
100%	**TOTAL: 50 ITEMS**

*Standard 8: Independent Reading and Writing is assessed throughout the test and dually aligned to each standard.
Please note this blueprint does not include items that may be field-tested.
A minimum of 6 items is required to report a standard.

OKLAHOMA Education

OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT ENGLISH LANGUAGE ARTS GRADE 5

This blueprint describes the content and structure of an assessment and defines the ideal number of test items by standard of the Oklahoma Academic Standards (OAS).

IDEAL PERCENTAGE OF MC ITEMS	STANDARDS
30–34%	**STANDARD 2: READING AND WRITING PROCESS** Students will use a variety of recursive reading and writing processes.
22–26%	**STANDARD 3: CRITICAL READING AND WRITING** Students will apply critical thinking skills to reading and writing.
18–22%	**STANDARD 4: VOCABULARY** Students will expand their working vocabularies to effectively communicate and understand texts.
12–18%	**STANDARD 5: LANGUAGE** Students will apply knowledge of grammar and rhetorical style to reading and writing.
12–18%	**STANDARD 6: RESEARCH** Students will engage in inquiry to acquire, refine, and share knowledge.
90% OF OVERALL SCORE	
10% OF OVERALL SCORE	**WRITING SECTION** Standard 2: Reading and Writing Process Standard 3: Critical Reading and Writing Standard 4: Vocabulary Standard 5: Language Standard 6: Research Standard 8: Independent Reading and Writing
100%	**TOTAL: 51 ITEMS**

*Standard 8: Independent Reading and Writing is assessed throughout the test and dually aligned to each standard.
Please note this blueprint does not include items that may be field-tested.
A minimum of 6 items is required to report a standard.

OKLAHOMA Education

OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT ENGLISH LANGUAGE ARTS GRADE 6

This blueprint describes the content and structure of an assessment and defines the ideal number of test items by standard of the Oklahoma Academic Standards (OAS).

IDEAL PERCENTAGE OF ITEMS	STANDARDS
34–38%	**STANDARD 2: READING AND WRITING PROCESS** Students will use a variety of recursive reading and writing processes.
18–22%	**STANDARD 3: CRITICAL READING AND WRITING** Students will apply critical thinking skills to reading and writing.
18–22%	**STANDARD 4: VOCABULARY** Students will expand their working vocabularies to effectively communicate and understand texts.
12–18%	**STANDARD 5: LANGUAGE** Students will apply knowledge of grammar and rhetorical style to reading and writing.
12–18%	**STANDARD 6: RESEARCH** Students will engage in inquiry to acquire, refine, and share knowledge.
100%	**TOTAL: 50 ITEMS**

*Standard 8: Independent Reading and Writing is assessed throughout the test and dually aligned to each standard.
Please note this blueprint does not include items that may be field-tested.
A minimum of 6 items is required to report a standard.

OKLAHOMA Education

OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT ENGLISH LANGUAGE ARTS GRADE 7

This blueprint describes the content and structure of an assessment and defines the ideal number of test items by standard of the Oklahoma Academic Standards (OAS).

IDEAL PERCENTAGE OF ITEMS	STANDARDS
34–38%	**STANDARD 2: READING AND WRITING PROCESS** Students will use a variety of recursive reading and writing processes.
18–22%	**STANDARD 3: CRITICAL READING AND WRITING** Students will apply critical thinking skills to reading and writing.
14–20%	**STANDARD 4: VOCABULARY** Students will expand their working vocabularies to effectively communicate and understand texts.
12–18%	**STANDARD 5: LANGUAGE** Students will apply knowledge of grammar and rhetorical style to reading and writing.
14–20%	**STANDARD 6: RESEARCH** Students will engage in inquiry to acquire, refine, and share knowledge.
100%	**TOTAL: 50 ITEMS**

*Standard 8: Independent Reading and Writing is assessed throughout the test and dually aligned to each standard.
Please note this blueprint does not include items that may be field-tested.
A minimum of 6 items is required to report a standard.

OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT ENGLISH LANGUAGE ARTS GRADE 8

This blueprint describes the content and structure of an assessment and defines the ideal number of test items by standard of the Oklahoma Academic Standards (OAS).

IDEAL PERCENTAGE OF MC ITEMS	STANDARDS
24–30%	**STANDARD 2: READING AND WRITING PROCESS** Students will use a variety of recursive reading and writing processes.
24–30%	**STANDARD 3: CRITICAL READING AND WRITING** Students will apply critical thinking skills to reading and writing.
14–20%	**STANDARD 4: VOCABULARY** Students will expand their working vocabularies to effectively communicate and understand texts.
12–18%	**STANDARD 5: LANGUAGE** Students will apply knowledge of grammar and rhetorical style to reading and writing.
12–18%	**STANDARD 6: RESEARCH** Students will engage in inquiry to acquire, refine, and share knowledge.
88% OF OVERALL SCORE	
12% OF OVERALL SCORE	**WRITING SECTION** Standard 2: Reading and Writing Process Standard 3: Critical Reading and Writing Standard 4: Vocabulary Standard 5: Language Standard 6: Research Standard 8: Independent Reading and Writing
100%	**TOTAL: 51 ITEMS**

*Standard 8: Independent Reading and Writing is assessed throughout the test and dually aligned to each standard.
Please note this blueprint does not include items that may be field-tested.
A minimum of 6 items is required to report a standard.

OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT MATHEMATICS GRADE 3

This blueprint describes the content and structure of an assessment and defines the ideal number of test items by strand and standard of the Oklahoma Academic Standards (OAS).

IDEAL % OF ITEMS	STRANDS AND STANDARDS
44–48%	**NUMBER AND OPERATIONS**
	3.N.1 Number Sense
	3.N.2 Number Operations
	3.N.3 Fractions
	3.N.4 Money
12–18%	**ALGEBRAIC REASONING AND ALGEBRA**
	3.A.1 Numerical and Geometric Patterns
	3.A.2 Equations
26–30%	**GEOMETRY AND MEASUREMENT**
	3.GM.1 Describe and Create Shapes
	3.GM.2 Measurement
	3.GM.3 Time
12–18%	**DATA AND PROBABILITY**
	3.D.1 Data Analysis
100%	**TOTAL: 50 ITEMS**

(Please note this blueprint does not include items that may be field-tested.)
A minimum of 6 items is required to report a strand.

OKLAHOMA Education

OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT MATHEMATICS GRADE 4

This blueprint describes the content and structure of an assessment and defines the ideal number of test items by strand and standard of the Oklahoma Academic Standards (OAS).

IDEAL % OF ITEMS	STRANDS AND STANDARDS
42–46%	**NUMBER AND OPERATIONS**
	4.N.1 Number Operations
	4.N.2 Rational Numbers
	4.N.3 Money
14–18%	**ALGEBRAIC REASONING AND ALGEBRA**
	4.A.1 Numerical Patterns
	4.A.2 Equations
26–30%	**GEOMETRY AND MEASUREMENT**
	4.GM.1 Polygons and Polyhedra
	4.GM.2 Measurement
	4.GM.3 Time
12–18%	**DATA AND PROBABILITY**
	4.D.1 Data Analysis
100%	**TOTAL: 50 ITEMS**

(Please note this blueprint does not include items that may be field-tested.)
A minimum of 6 items is required to report a strand.

OKLAHOMA Education

OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT MATHEMATICS GRADE 5

This blueprint describes the content and structure of an assessment and defines the ideal number of test items by strand and standard of the Oklahoma Academic Standards (OAS).

IDEAL % OF ITEMS	STRANDS AND STANDARDS
44–48%	**NUMBER AND OPERATIONS** 5.N.1 Division of Multi-digit Numbers 5.N.2 Fractions and Decimals 5.N.3 Add and Subtract Rational Numbers
16–20%	**ALGEBRAIC REASONING AND ALGEBRA** 5.A.1 Numerical Patterns and Graphs 5.A.2 Equations and Inequalities
22–26%	**GEOMETRY AND MEASUREMENT** 5.GM.1 Polygons and Polyhedra 5.GM.2 Volume and Surface Area 5.GM.3 Angles
12–18%	**DATA AND PROBABILITY** 5.D.1 Data Analysis
100%	**TOTAL: 50 ITEMS**

(Please note this blueprint does not include items that may be field-tested.)
A minimum of 6 items is required to report a strand.

OKLAHOMA Education

OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT MATHEMATICS GRADE 6

This blueprint describes the content and structure of an assessment and defines the ideal number of test items by strand and standard of the Oklahoma Academic Standards (OAS).

IDEAL % OF ITEMS	STRANDS AND STANDARDS
38–42%	**NUMBER AND OPERATIONS** 6.N.1 Number Sense of Integers and Rational Numbers 6.N.2 Addition and Subtraction of Integers 6.N.3 Ratios 6.N.4 Multiplication and Division of Rational Numbers
20–24%	**ALGEBRAIC REASONING AND ALGEBRA** 6.A.1 Algebraic Representations 6.A.2 Algebraic Expressions 6.A.3 Equations and Inequalities
22–26%	**GEOMETRY AND MEASUREMENT** 6.GM.1 Area of Parallelograms and Triangles 6.GM.2 Angle Relationships on Intersecting Lines 6.GM.3 Units of Measurement and Unit Conversions 6.GM.4 Congruency and Symmetry of Transformations
12–16%	**DATA AND PROBABILITY** 6.D.1 Data Analysis 6.D.2 Probability
100%	**TOTAL: 50 ITEMS**

(Please note this blueprint does not include items that may be field-tested.)
A minimum of 6 items is required to report a strand.

OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT MATHEMATICS GRADE 7

This blueprint describes the content and structure of an assessment and defines the ideal number of test items by strand and standard of the Oklahoma Academic Standards (OAS).

IDEAL % OF ITEMS	STRANDS AND STANDARDS
18–22%	**NUMBER AND OPERATIONS** 7.N.1 Representation and Comparison of Rational Numbers 7.N.2 Number Operations and Absolute Value
28–32%	**ALGEBRAIC REASONING AND ALGEBRA** 7.A.1 Proportional Relationships 7.A.2 Proportions, Rates and Ratios 7.A.3 Linear Equations and Inequalities 7.A.4 Order of Operations
28–32%	**GEOMETRY AND MEASUREMENT** 7.GM.1 Surface Area and Volume of Rectangular Prisms 7.GM.2 Trapezoids and Composite Figures 7.GM.3 Circles 7.GM.4 Transformations
18–22%	**DATA AND PROBABILITY** 7.D.1 Data Analysis 7.D.2 Probability
100%	**TOTAL: 50 ITEMS**

(Please note this blueprint does not include items that may be field-tested.)
A minimum of 6 items is required to report a strand.

OKLAHOMA Education

OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT MATHEMATICS GRADE 8

This blueprint describes the content and structure of an assessment and defines the ideal number of test items by strand and standard of the Oklahoma Academic Standards (OAS).

IDEAL % OF ITEMS	STRANDS AND STANDARDS
16–20%	**NUMBER AND OPERATIONS** PA.N.1 Real Number Operations
44–48%	**ALGEBRAIC REASONING AND ALGEBRA** PA.A.1 Linear and Non-Linear Functions PA.A.2 Linear Function Representations and Problem Solving PA.A.3 Algebraic Expressions PA.A.4 Equations and Inequalities
18–22%	**GEOMETRY AND MEASUREMENT** PA.GM.1 Pythagorean Theorem PA.GM.2 Surface Area and Volume
14–18%	**DATA AND PROBABILITY** PA.D.1 Data Analysis and Scatter Plots PA.D.2 Probability
100%	**TOTAL: 50 ITEMS**

Please note this blueprint does not include items that may be field-tested.
A minimum of 6 items is required to report a strand.

OKLAHOMA Education

This blueprint describes the content and structure of the Grade 5 Science Content Assessment and defines the ideal range of test items by reporting category of the Oklahoma Academic Standards – Science (OAS-S).

REPORTING CATEGORIES

PHYSICAL SCIENCES 27–33%

5.PS1.1	Develop a model to describe that matter is made of particles too small to be seen.
5.PS1.2	Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
5.PS1.3	Make observations and measurements to identify materials based on their properties.
5.PS1.4	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

LIFE SCIENCES 27–33%

5.LS1.1	Support an argument that plants get the materials they need for growth chiefly from air and water.
5.LS2.1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
5.LS2.2	Use models to explain factors that upset the stability of local ecosystems.
5.PS3.1[a]	Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

EARTH AND SPACE SCIENCES 33–40%

5.ESS1.1	Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.
5.ESS1.2	Represent data in graphical displays to reveal patterns of daily changes in the length and direction of shadows, in addition to different positions of the sun, moon, and stars at different times of the day, month, and year.
5.ESS2.1	Develop a model to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
5.ESS2.2	Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
5.ESS3.1	Obtain and combine information about ways individual communities use science ideas to protect Earth's resources and environments.
5.PS2.1[a]	Support an argument, with evidence, that Earth's gravitational force pulls objects downward toward the center of the earth.

Standards will be assessed using a cluster-based format: a set of three multiple-choice items linked with a common stimulus or a set of two multiple-choice items and a technology-enhanced item linked with a common stimulus. The Grade 5 test consists of some clusters containing only multiple-choice items and some clusters containing both multiple-choice and technology-enhanced items. Each cluster will align to a single standard with its associated Disciplinary Core Idea(s), Science and Engineering Practice, and Cross Cutting Concept.

The Grade 5 Science operational test will contain a total of 15 clusters.

[a]The physical science standards 5.PS3.1 and 5.PS2.1 are being reported in Life Sciences and Earth and Space Sciences, respectively. Their placement in these reporting categories reflects the way that these standards would typically be incorporated into units in classroom instruction.

OKLAHOMA Education

OKLAHOMA SCHOOL TESTING PROGRAM
TEST BLUEPRINT SCIENCE GRADE 8

This blueprint describes the content and structure of the Grade 8 Science Content Assessment and defines the ideal range of test items by reporting category of the Oklahoma Academic Standards – Science (OAS-S).

REPORTING CATEGORIES

PHYSICAL SCIENCES 33 - 40%

8.PS2.1	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
8.PS2.2	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
8.PS2.3	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
8.PS2.4	Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
8.PS2.5	Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
8.PS4.1	Use mathematical representations to describe patterns in a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
8.PS4.3	Integrate qualitative scientific and technical information to support the claim that digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.

LIFE SCIENCES 40 - 46%

8.LS1.4	Use arguments based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
8.LS1.5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
8.LS3.1	Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

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8.LS3.2	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
8.LS4.1	Analyze and interpret data to identify patterns within the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth.
8.LS4.2	Apply scientific ideas to construct an explanation for the patterns of anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer ancestral relationships.
8.LS4.3	Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.
8.LS4.4	Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
8.LS4.5	Gather and synthesize information about the practices that have changed the way humans influence the inheritance of desired traits in organisms.
8.LS4.6	Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

EARTH AND SPACE SCIENCES 21 - 27%

8.ESS1.1	Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
8.ESS1.2	Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
8.ESS1.3	Analyze and interpret data to determine scale properties of objects in the solar system.

Standards will be assessed using a cluster-based format: a set of three multiple-choice items linked with a common stimulus or a set of two multiple-choice items and a technology-enhanced item linked with a common stimulus. The Grade 8 test consists of some clusters containing only multiple-choice items and some clusters containing both multiple-choice and technology-enhanced items. Each cluster will align to a single standard with its associated Disciplinary Core Idea(s), Science and Engineering, Practice, and Cross Cutting Concept.

The Grade 8 Science operational test will contain a total of 15 clusters.

OKLAHOMA Education

This blueprint describes the content and structure of the CCR Science Content Assessment and defines the ideal range of test items by reporting category of the Oklahoma Academic Standards – Science (OAS-S).

REPORTING CATEGORIES

PHYSICAL SCIENCES 45 - 55%

PS.PS1.1	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
PS.PS1.2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, knowledge of the patterns of chemical properties, and formation of compounds.
PS.PS1.5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
PS.PS1.7	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
PS.PS2.5	Plan and conduct an investigation to provide evidence that an electric current can cause a magnetic field and that a changing magnetic field can cause an electric current.
PS.PS3.1	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
PS.PS3.2	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as either motions of particles or energy stored in fields.
PS.PS3.3	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
PS.PS3.4	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).
PS.PS4.1	Use mathematical representations to explain both qualitative and quantitative relationships among frequency, wavelength, and speed of waves traveling in various media.
PS.PS4.4	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.

LIFE SCIENCES 45 - 55%

B.LS1.1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.
B.LS1.2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
B.LS1.3	Plan and conduct an investigation to provide evidence of the importance of maintaining homeostasis in living organisms.
B.LS1.4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
B.LS1.5	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
B.LS1.6	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
B.LS1.7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
B.LS2.1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
B.LS2.2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
B.LS2.3	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
B.LS2.4	Use a mathematical representation to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
B.LS2.5	Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
B.LS2.6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
B.LS2.8	Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.
B.LS3.1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

B.LS3.2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
B.LS3.3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
B.LS4.1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
B.LS4.2	Construct an explanation based on evidence that biological diversity is influenced by (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
B.LS4.3	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
B.LS4.4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
B.LS4.5	Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergency of new species over time, and (3) the extinction of other species.

Standards will be assessed using a cluster-based format: a set of three multiple-choice items linked with a common stimulus or a set of two multiple-choice items and a technology-enhanced item linked with a common stimulus. The CCR Science Content test consists of some clusters containing only multiple-choice items and some clusters containing both multiple-choice and technology-enhanced items. Each cluster will align to a single standard with its associated Disciplinary Core Idea(s), Science and Engineering Practice, and Cross Cutting Concept.

The CCR Science Content operational test will contain a total of 20 operational clusters and 2 field test clusters.

OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT CCRA: U.S. HISTORY CONTENT

The blueprint describes the content and structure of the operational test and defines the target number of test items by reporting category for CCRA: U.S. History Content.

REPORTING CATEGORIES[1] (OKLAHOMA ACADEMIC STANDARDS)	TARGET RANGE OF SCORE POINTS[2] (PERCENTAGE OF TOTAL)
U.S. HISTORY	**45–55%**
Standard 1: 1.2.A, 1.3.A, 1.3.D	
Standard 2: 2.1.A, 2.1.B, 2.1.D, 2.1.E, 2.1.G, 2.2.B, 2.3.B	
Standard 3: 3.1.A, 3.1.B, 3.1.C, 3.2.A, 3.2.B	
Standard 4: 4.1.A, 4.1.D, 4.1.E, 4.2.A, 4.2.B, 4.2.D, 4.3.C	
Standard 5: 5.1.B, 5.2, 5.3	
Standard 6: 6.1.A, 6.1.B, 6.1.C, 6.1.D, 6.2.A, 6.2.B, 6.2.C, 6.4	
Standard 7: 7.2.D	
Standard 8: 8.1, 8.2, 8.3, 8.4, 8.5.A	
CIVICS	**45–55%**
Standard 1: 1.1, 1.2.B, 1.2.C, 1.3.B, 1.3.C	
Standard 2: 2.1.C, 2.1.F, 2.2.A, 2.2.C, 2.3.A, 2.3.C	
Standard 3: 3.1.D, 3.2.C, 3.2.D	
Standard 4: 4.1.B, 4.1.C, 4.2.C, 4.3.A, 4.3.B	
Standard 5: 5.1.A, 5.1.C	
Standard 6: 6.3	
Standard 7: 7.1.A, 7.1.B, 7.1.C, 7.2.A, 7.2.B, 7.2.C, 7.2.E, 7.2.F	
Standard 8: 8.5.B, 8.6	
TOTAL OPERATIONAL TEST	**100%**

[1] All objectives included in each reporting category are found in OAS-U.S. History.

[2] A minimum of 12 points is required to report results for a reporting category for the CCRA: U.S. History Content.

APPENDIX D
PERFORMANCE LEVEL DESCRIPTORS

Oklahoma ELA

Performance Level Descriptor Tables

Oklahoma School Testing Program: Grade 3 English Language Arts
Performance Level Descriptors

Advanced Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in depth understanding and application of all skills at the **Proficient** level, students scoring at the **Advanced** level typically:	
• Consistently choose the best summary of the text and identify the main idea and key details. • Compare and contrast details in literary and nonfiction/informational texts to describe genres. • Frequently identify literary elements, literary devices, and author's purpose and frequently distinguish fact from opinion. • Consistently infer whether a text is written in first or third person point of view. • Consistently engage in a recursive writing process to create organized written works with a purpose that is clearly communicated for an appropriate audience. • Skillfully use details that support the writing task.	• Skillfully use vocabulary knowledge and resources to analyze complex text through word parts, word relationships, and context clues. • Consistently use appropriate and meaningful vocabulary to enhance clarity and effectiveness in their writing. • Consistently identify and apply appropriate use of grammar and mechanics to provide clarity and enhance communication. • Generate a question on a specific topic and consistently locate and use information, including graphic features, to understand the text. • Determine the relevance and reliability of information. • Clearly summarize and present information in an organized and cohesive way.

Oklahoma School Testing Program: Grade 3 English Language Arts Performance Level Descriptors

Proficient

Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the **Proficient** level typically:

- Choose the best summary of the text and identify the main idea and key details.
- Compare and contrast details to classify genres.
- Identify literary elements, literary devices, and author's purpose and distinguish fact from opinion.
- Infer whether a text is written in first or third person point of view.
- Engage in a recursive writing process to create organized written works.
- Create written works for specific purposes and audiences using details that support the writing task.
- Use vocabulary knowledge and resources to interpret text through word parts, word relationships, and context clues.
- Use appropriate vocabulary to write clearly and effectively.
- Frequently identify and apply appropriate use of grammar and mechanics to provide clarity and enhance communication.
- Generate a question on a specific topic, and locate and use information, including graphic features, to understand the text.
- Summarize and present information in an organized way.

Basic

Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.
Students scoring at the **Basic** level typically:

- Inconsistently choose the best summary of the text and have difficulty identifying main ideas and key details.
- Compare and contrast but inconsistently classify genres.
- Inconsistently identify literary elements, literary devices, author's purpose, or points of view or inconsistently distinguish fact from opinion.
- Inconsistently engage in a recursive writing process to create written works that lack organization.
- Write for a specific purpose but seldom consider the audience.
- Inconsistently support their ideas with details.
- Inconsistently use vocabulary knowledge and resources to interpret text through word parts, word relationships, or context clues.
- Inconsistently use appropriate vocabulary in written works.
- Inconsistently identify and apply appropriate use of grammar and mechanics.
- Generate a question on a topic but ineffectively locate and use information, or imprecisely use graphic features, to understand the text.
- Provide an incomplete summary and present information with lack of clarity.

Below Basic

Students have not performed at least at the **Basic** level.

Oklahoma School Testing Program: Grade 4 English Language Arts
Performance Level Descriptors

Advanced

Students demonstrate superior performance on challenging subject matter.

In addition to demonstrating a broad and in depth understanding and application of all skills at the **Proficient** level, students scoring at the **Advanced** level typically:

- Consistently choose the best summary of the text and explain how the details support the main idea.
- Compare and contrast details in literary and nonfiction/informational texts to describe and analyze genres.
- Consistently recognize the paraphrase of original text.
- Consistently identify and describe literary elements, literary devices, author’s purpose, accuracy of facts, and text structure in various texts.
- Consistently infer meaning from increasingly complex text, including author’s purpose and points of view.
- Consistently engage in a recursive writing process to create purposeful and organized written works.
- Create fully developed and engaging written works for specific purposes and audiences using details that support the writing task.
- Efficiently use vocabulary knowledge and resources to analyze complex text through word parts, word relationships, and context clues.
- Consistently use appropriate and meaningful vocabulary to enhance clarity and effectiveness in their writing.
- Consistently identify and apply appropriate use of grammar and mechanics to provide clarity and enhance communication.
- Generate a viable research question on a specific topic and consistently locate and use information, including graphic features, to interpret the text.
- Organize and synthesize relevant and reliable information in order to present findings.

Oklahoma School Testing Program: Grade 4 English Language Arts
Performance Level Descriptors

<table>
<tr><th colspan="2">Proficient
Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the Proficient level typically:</th></tr>
<tr><td>

Choose the best summary of the text and identify the details that support the main idea.
Compare and contrast details in literary and nonfiction/informational texts to classify genres.
Recognize the paraphrase of original text most of the time.
Identify and describe literary elements, literary devices, author’s purpose, accuracy of facts, and text structure in various texts.
Infer meaning from a text including author’s purpose and points of view.
Engage in a recursive writing process to create purposeful written works.

</td><td>

Select and apply the organizational structure that best fits the mode, purpose, and audience.
Use vocabulary knowledge and resources to interpret text through word parts, word relationships, and context clues.
Use appropriate vocabulary to write clearly and effectively.
Frequently identify and apply appropriate use of grammar and mechanics to provide clarity and enhance communication.
Generate a viable research question on a specific topic and adequately locate and use information, including graphic features, to interpret the text.
Organize relevant and reliable information in order to present findings.

</td></tr>
</table>

Oklahoma School Testing Program: Grade 4 English Language Arts
Performance Level Descriptors

Basic Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level. Students scoring at the **Basic** level typically:	
• Inconsistently choose the best summary of the text and have difficulty differentiating main ideas from details. • Compare and contrast details in literary and nonfiction/informational texts but inconsistently classify genres. • Seldom identify the paraphrase of original text. • Inconsistently identify and describe literary elements, literary devices, author's purpose, points of view, or accuracy of facts. • Inconsistently engage in a recursive writing process to create written works. • Produce writing that lacks organizational structure.	• Create underdeveloped written works for specific purposes and audiences with inconsistent use of details. • Inconsistently use vocabulary knowledge and resources to interpret text through word parts, word relationships, or context clues. • Inconsistently use appropriate vocabulary in written works. • Inconsistently identify and apply appropriate use of grammar and mechanics. • Generate a research question on a topic but ineffectively locate and use information, or imprecisely use graphic features, to interpret the text.
Below Basic Students have not performed at least at the **Basic** level.	

Oklahoma School Testing Program: Grade 5 English Language Arts Performance Level Descriptors

Advanced Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in depth understanding and application of all skills at the **Proficient** level, students scoring at the **Advanced** level typically:	
• Analyze how summaries reflect a meaningful, text-based sequence of the main idea and supporting details. • Compare and contrast details in literary and nonfiction/informational texts to describe and analyze genres. • Consistently recognize the paraphrase of original text. • Evaluate and analyze literary devices, author's purpose, point of view, and accuracy of facts to interpret the meaning of the text as a whole. • Consistently compare and contrast texts, and ideas within and between texts, to support inferences. • Consistently engage in a recursive writing process to create purposeful and organized written works.	• Create thoroughly organized and engaging written works by selecting and applying the organizational structure that best fits the mode, purpose, and audience. • Skillfully use vocabulary knowledge and resources to analyze complex text through word parts, word relationships, and context clues. • Consistently use appropriate and meaningful vocabulary to enhance clarity and effectiveness in their writing. • Consistently identify and apply appropriate use of grammar and mechanics to provide clarity and enhance communication. • Consistently locate, record, and organize relevant and reliable information on a topic in order to synthesize and clearly present findings.

Oklahoma School Testing Program: Grade 5 English Language Arts
Performance Level Descriptors

Proficient Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level. Students scoring at the **Proficient** level typically:	
• Identify objective text-based summaries that include main idea, supporting details, and a logical sequence of events. • Compare and contrast details in literary and nonfiction/informational texts to classify genres. • Recognize the paraphrase of original text most of the time. • Explain how literary elements, literary devices, author's purpose, point of view, accuracy of facts, and text structure contribute to the meaning of the text. • Compare and contrast texts and ideas within and between texts. • Engage in a recursive writing process to create purposeful written works.	• Select and apply the organizational structure that best fits the mode, purpose, and audience. • Use vocabulary knowledge and resources to interpret text through word parts, word relationships, and context clues. • Use appropriate vocabulary to write clearly and effectively. • Frequently identify and apply appropriate use of grammar and mechanics to provide clarity and enhance communication. • Adequately locate, record, and organize relevant and reliable information on a topic in order to present findings.

Oklahoma School Testing Program: Grade 5 English Language Arts Performance Level Descriptors

<table>
<tr><th colspan="2">Basic
Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.
Students scoring at the Basic level typically:</th></tr>
<tr><td>
Inconsistently choose the best summary of the text and have difficulty differentiating main ideas from details.
Compare and contrast details in literary and nonfiction/informational texts but inconsistently classify genres.
Seldom identify the paraphrase of original text.
Identify literary elements, literary devices, author’s purpose, point of view, or accuracy of facts.
Inconsistently compare and contrast texts and ideas within or between texts.
Inconsistently engage in a recursive writing process to create written works.
</td><td>
Create written works for various purposes and audiences but inconsistently select and apply an organizational structure that fits the writing task.
Inconsistently use vocabulary knowledge and resources to interpret text through word parts, word relationships, or context clues.
Inconsistently use appropriate vocabulary in written works.
Inconsistently identify and apply appropriate use of grammar and mechanics.
Ineffectively locate, record, and organize information on a topic in order to present findings.
</td></tr>
<tr><th colspan="2">Below Basic
Students have not performed at least at the Basic level.</th></tr>
</table>

OKLAHOMA Education

Oklahoma School Testing Program: Grade 6 English Language Arts
Performance Level Descriptors

<table>
<tr><th colspan="2">Advanced
Students demonstrate superior performance on challenging subject matter.
In addition to demonstrating a broad and in depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:</th></tr>
<tr><td>
Thoroughly comprehend, interpret, evaluate, and respond to a variety of increasingly complex texts of all literary and informational genres.
Skillfully create an objective summary including main idea and supporting details.
Effectively paraphrase main ideas with supporting details in a text.
Thoroughly compare and contrast stated or implied purposes of authors’ writing.
Thoroughly evaluate literary devices, points of view, and perspectives.
Explicitly analyze how authors use key literary elements to contribute to the meaning of the text.
Consistently categorize facts included in an argument.
Analyze and evaluate complex textual evidence to support inferences and understanding within and between varied texts.
Effectively engage in a recursive writing process to compose narrative, informative, and opinion responses for varied purposes and audiences.
In opinion writing, strategically state an opinion supported with facts and details.
</td><td>
Use fully developed, complex ideas, thorough organization, purposeful word choice, a variety of fluent sentences, and appropriate voice.
Skillfully use context clues, word parts, and reference tools to determine or clarify the meaning of words.
Infer complex relationships among words with multiple meanings.
Select precise vocabulary to communicate ideas in writing and to create a specific effect according to a purpose.
Intentionally apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing.
Demonstrate a strong command of Standard English grammar, mechanics, and usage.
Recognize viable research questions and well-developed thesis statements and use them to find information on a specific topic.
Thoroughly comprehend, evaluate, and synthesize resources.
Skillfully summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.
</td></tr>
</table>

OKLAHOMA
Education

Oklahoma School Testing Program: Grade 6 English Language Arts Performance Level Descriptors

<table>
<tr><th colspan="2">Proficient
Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the Proficient level typically:</th></tr>
<tr><td>

Comprehend, interpret, evaluate, and respond to a variety of complex texts of all literary and informational genres.
Create an objective summary including main idea and supporting details.
Paraphrase main ideas with supporting details in a text.
Compare and contrast stated or implied purposes of authors' writing.
Evaluate literary devices, points of view, and perspectives.
Analyze how authors use key literary elements to contribute to the meaning of the text.
Categorize facts included in an argument.
Analyze textual evidence to support inferences and understanding within and between texts.
Engage in a recursive writing process to compose narrative, informative, and opinion responses for varied purposes and audiences.
In opinion writing, introduce a claim and organize reasons and evidence.
Use fully developed ideas, strong organization, well-chosen words, fluent sentences, and appropriate voice.

</td><td>

Use context clues, word parts, and reference tools to determine or clarify the meaning of words.
Infer the relationships among words with multiple meanings.
Select vocabulary to communicate ideas in writing and to create a specific effect according to a purpose.
Apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing.
Demonstrate a command of Standard English grammar, mechanics, and usage.
Recognize viable research questions and well-developed thesis statements and use them to find information on a topic.
Record and organize information from various sources.
Comprehend, evaluate, and synthesize resources.
Summarize and integrate information following a citation style with guidance and support.
Summarize and present information in a report.

</td></tr>
</table>

OKLAHOMA Education

Oklahoma School Testing Program: Grade 6 English Language Arts Performance Level Descriptors

Basic Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level. Students scoring at the **Basic** level typically:	
• Partially comprehend, interpret, evaluate, and respond to literary and informational texts, applying limited critical thinking skills. • Create a summary including main idea and limited supporting details. • Inconsistently paraphrase main ideas with limited supporting details in a text. • Inconsistently compare and contrast stated or implied purposes of authors' writing. • Inconsistently identify literary devices, points of view, and perspectives. • Describe how authors use key literary elements. • Inconsistently categorize facts included in an argument. • Inconsistently identify limited textual evidence to support inferences between texts. • Inconsistently engage in a writing process to compose narrative, informative, and opinion responses for varied purposes and audiences. • In opinion writing, inconsistently state an opinion supported with limited facts and details.	• Use partially developed ideas, weak organization, and ineffective word choice, sentences, and voice. • Ineffectively use context clues, word parts, and reference tools to determine the meaning of words. • Sometimes infer the relationships among words with multiple meanings. • Use a limited vocabulary to communicate ideas in writing and to create an effect according to a purpose. • Inconsistently apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing. • Demonstrate a limited command of Standard English grammar, mechanics, and usage. • Sometimes recognize viable research questions and well-developed thesis statements and use them to find information on a specific topic. • Partially comprehend, evaluate, and synthesize resources. • Ineffectively summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.
Below Basic Students have not performed at least at the **Basic** level.	

OKLAHOMA Education

Oklahoma School Testing Program: Grade 7 English Language Arts
Performance Level Descriptors

Advanced Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in depth understanding and application of all skills at the **Proficient** level, students scoring at the **Advanced** level typically:	
• Thoroughly comprehend, interpret, evaluate, and respond to a variety of increasingly complex texts of all literary and informational genres. • Skillfully create an objective summary including main idea and supporting details. • Effectively paraphrase main ideas with supporting details in a text. • Thoroughly compare and contrast stated or implied purposes of authors' writing. • Thoroughly evaluate literary devices, points of view, and perspectives. • Explicitly analyze how authors use key literary elements to contribute to the meaning of the text. • Consistently distinguish factual claims from opinions. • Analyze and evaluate complex textual evidence to support inferences and understanding within and between varied texts. • Effectively engage in a recursive writing process to compose narrative, informative, and opinion responses for varied purposes and audiences. • In argumentative writing, strategically introduce a claim and organize well-developed reasons and evidence.	• Use fully developed, complex ideas, thorough organization, purposeful word choice, a variety of fluent sentences, and appropriate voice. • Skillfully use context clues, word parts, and reference tools to determine or clarify the meaning of words. • Infer complex relationships among words with multiple meanings. • Select precise vocabulary to communicate ideas in writing and to create a specific effect according to a purpose. • Intentionally apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing. • Demonstrate a strong command of Standard English grammar, mechanics, and usage. • Recognize viable research questions and well-developed thesis statements and use them to find information on a specific topic. • Thoroughly comprehend, evaluate, and synthesize resources. • Skillfully summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.

OKLAHOMA Education

Oklahoma School Testing Program: Grade 7 English Language Arts
Performance Level Descriptors

<table>
<tr><th colspan="2">Proficient
Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the Proficient level typically:</th></tr>
<tr><td>

Read and comprehend increasingly complex literary and informational texts.
Create an objective summary including main idea and supporting details.
Paraphrase main ideas with supporting details in a text.
Compare and contrast stated or implied purposes of authors’ writing.
Evaluate literary devices, points of view, and perspectives.
Analyze how authors use key literary elements to contribute to the meaning of the text.
Distinguish factual claims from opinions.
Analyze and evaluate textual evidence to support inferences and draw simple, logical conclusions between and across multiple texts.
Engage in a recursive writing process to compose narrative, informative, and argumentative responses for varied purposes and audiences.
In argumentative writing, introduce a claim and organize reasons and evidence.

</td><td>

Use fully developed ideas, strong organization, well-chosen words, fluent sentences, and appropriate voice.
Use context clues, word parts, and reference tools to determine or clarify the meaning of words.
Infer the relationships among words with multiple meanings.
Select vocabulary to communicate ideas in writing and to create a specific effect according to a purpose.
Apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing.
Demonstrate a command of Standard English grammar, mechanics, and usage.
Recognize viable research questions and well-developed thesis statements and use them to find information on a topic.
Comprehend, evaluate, and synthesize resources.
Summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.

</td></tr>
</table>

Oklahoma School Testing Program: Grade 7 English Language Arts Performance Level Descriptors

<table>
<tr><th colspan="2">Basic
Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.
Students scoring at the Basic level typically:</th></tr>
<tr><td>
Partially comprehend, interpret, evaluate, and respond to literary and informational texts, applying limited critical thinking skills.
Create a summary including main idea and limited supporting details.
Inconsistently paraphrase main ideas with limited supporting details in a text.
Inconsistently compare and contrast stated or implied purposes of authors’ writing.
Inconsistently identify literary devices, points of view, and perspectives.
Describe how authors use key literary elements.
Inconsistently distinguish factual claims from opinions.
Inconsistently identify limited textual evidence to support inferences and draw weak conclusions between texts.
Inconsistently engage in a writing process to compose narrative, informative, and argumentative responses for varied purposes and audiences.
In argumentative writing, introduce a claim, reasons, and evidence.
</td><td>
Use partially developed ideas, weak organization, and ineffective word choice, sentences, and voice.
Ineffectively use context clues, word parts, and reference tools to determine the meaning of words.
Sometimes infer the relationships among words with multiple meanings.
Use a limited vocabulary to communicate ideas in writing and to create an effect according to a purpose.
Inconsistently apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing.
Demonstrate a limited command of Standard English grammar, mechanics, and usage.
Sometimes recognize viable research questions and well-developed thesis statements and use them to find information on a specific topic.
Partially comprehend, evaluate, and synthesize resources.
Ineffectively summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.
</td></tr>
<tr><th colspan="2">Below Basic
Students have not performed at least at the Basic level.</th></tr>
</table>

OKLAHOMA Education

Oklahoma School Testing Program: Grade 8 English Language Arts Performance Level Descriptors

Advanced Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in depth understanding and application of all skills at the **Proficient** level, students scoring at the **Advanced** level typically:	
• Thoroughly comprehend, interpret, evaluate, and respond to literary and informational texts, applying critical thinking skills. • Skillfully evaluate literary devices, points of view, and perspectives. • Skillfully analyze how authors use key literary elements to contribute to the meaning of the text. • Explicitly analyze and evaluate textual evidence to support inferences and conclusions between and across multiple texts. • Effectively engage in a recursive writing process to compose narrative, informative, and argumentative responses for varied purposes and audiences. • In argumentative writing, introduce a claim, counterclaim, and support with logical reasons and evidence. • Synthesize fully developed ideas, strong organization, well-chosen words, fluent sentences, and appropriate voice. • Skillfully use context clues, word parts, and reference tools to determine or clarify the meaning of words.	• Infer complex relationships among words with multiple meanings. • Select precise vocabulary to communicate ideas in writing and to create a specific effect according to a purpose. • Intentionally apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing. • Demonstrate a strong command of Standard English grammar, mechanics, and usage. • Recognize viable research questions and well-developed thesis statements and use them to find information on a specific topic. • Thoroughly comprehend, evaluate, and synthesize resources. • Skillfully summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.

OKLAHOMA Education

Oklahoma School Testing Program: Grade 8 English Language Arts
Performance Level Descriptors

<table>
<tr><th colspan="2">Proficient
Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the Proficient level typically:</th></tr>
<tr><td>• Read, comprehend, interpret, evaluate, and respond to literary and informational texts, applying critical thinking skills.
• Evaluate literary devices, points of view, and perspectives.
• Analyze how authors use key literary elements to contribute to the meaning of the text.
• Analyze and evaluate textual evidence to support inferences and conclusions between and across multiple texts.
• Engage in a recursive writing process to compose narrative, informative, and argumentative responses for varied purposes and audiences.
• In argumentative writing, introduce a claim, recognize a claim from an opposing viewpoint, and organize reasons and evidence.
• Use fully developed ideas, strong organization, well-chosen words, fluent sentences, and appropriate voice.</td><td>• Use context clues, word parts, and reference tools to determine or clarify the meaning of words.
• Infer the relationships among words with multiple meanings.
• Select vocabulary to communicate ideas in writing and to create a specific effect according to a purpose.
• Apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing.
• Demonstrate a command of Standard English grammar, mechanics, and usage.
• Recognize viable research questions and well-developed thesis statements and use them to find information on a specific topic.
• Comprehend, evaluate, and synthesize resources.
• Summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.</td></tr>
</table>

Oklahoma School Testing Program: Grade 8 English Language Arts Performance Level Descriptors

Basic Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level. Students scoring at the **Basic** level typically:	
• Partially comprehend, interpret, evaluate, and respond to literary and informational texts, applying limited critical thinking skills. • Inconsistently evaluate literary devices, points of view, and perspectives. • Inconsistently analyze how authors use key literary elements to contribute to the meaning of the text. • Inconsistently analyze and evaluate textual evidence to support inferences and conclusions between or across multiple texts. • Inconsistently engage in a writing process to compose narrative, informative, and argumentative responses for varied purposes and audiences. • In argumentative writing, introduce a claim and provide reasons and evidence. • Use partially developed ideas, weak organization, ineffective word choice, basic sentences, or inconsistent voice.	• Ineffectively use context clues, word parts, and reference tools to determine the meaning of words. • Sometimes infer the relationships among words with multiple meanings. • Use a limited vocabulary to communicate ideas in writing and to create an effect according to a purpose. • Inconsistently apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing. • Demonstrate a limited command of Standard English grammar, mechanics, and usage. • Sometimes recognize viable research questions and well-developed thesis statements and use them to find information on a specific topic. • Partially comprehend, evaluate, and synthesize resources. • Ineffectively summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.
Below Basic Students have not performed at least at the **Basic** level.	

OKLAHOMA Education

College- and Career-Readiness Assessment: English Language Arts
Performance Level Descriptors

Advanced

Students at this level have a 94% probability of earning a C or higher and a 75% probability of earning a B or higher in credit bearing history, literature, social sciences, or writing courses at 4 year institutions. The average first year college GPA at this level is a 3.3 or above (low B or higher). Students at this level are highly likely to be on track for success in college or career.

Students demonstrate superior performance with challenging subject matter and clearly exhibit readiness for college and career.
In addition to demonstrating broad and in depth understanding and application of all skills in the **Proficient** Level, students scoring at the **Advanced** Level typically:

- Thoroughly comprehend, analyze, and synthesize information from literary and informational texts, applying a wide range of close reading skills across a range of subject areas and complexity levels.
- Skillfully locate and paraphrase details, make logical inferences to support generalizations, grasp the central idea of texts, and understand complex thoughts and comparative relationships involving abstract concepts.
- Use knowledge about the author's craft and the text structure to interpret important features of the whole text, such as an author's rhetorical purpose; also analyze character point of view in texts.
- Skillfully integrate knowledge and ideas from across multiple related texts, analyzing the texts to find evidence in support of a claim.
- Blend multiple modes of writing to produce complex argumentative essays on substantive topics.
- Produce writing that productively and critically engages with multiple perspectives, establishes a thesis claim, and examines implications and complexities.
- Develop ideas and support claims with persuasive evidence, using reasoning and illustration to enhance the central claim.
- Purposefully engage in a recursive writing process to create a skillful organization with logical sequencing and transitions that establish and clarify relationships among ideas.
- Use language to convey subtle shades of meaning with a style that enhances the writing purpose.
- Use sentence structures that are consistently varied and clear.
- Skillfully interpret vocabulary, including figurative language, inferring the meaning of words and phrases by using context.
- Demonstrate sophisticated understanding of general academic and domain-specific vocabulary.
- Maintain a consistent and appropriate tone in their writing through subtle and effective word choices.
- Skillfully apply knowledge of the English language and rhetorical style to make meaning when analyzing, evaluating, producing, and revising texts.
- Recognize subtle disturbances in sentence structure.
- Demonstrate a thorough command of the conventions of English grammar, usage, and mechanics.

College- and Career-Readiness Assessment: English Language Arts Performance Level Descriptors

Proficient

Students at this level have approximately an 80% or higher probability of earning a C or higher in credit bearing history, literature, social sciences, or writing courses at all levels of higher education. The average first year college GPA at this level is between a 2.8 and 3.3 (high C to low B). Students at this level are likely to be on track for success in college or career.

Students demonstrate mastery with subject matter and exhibit readiness for college and career.
In addition to demonstrating understanding and application of all skills in the **Basic** Level, students scoring at the **Proficient** Level typically:

- Comprehend, analyze, and synthesize information from literary and informational texts, applying various close reading skills across a range of subject areas and complexity levels.
- Recognize accurate summaries, locate and paraphrase key details, make logical inferences, determine central ideas, and understand relationships between characters and important concepts.
- Use knowledge about the author's craft and the text structure to determine the main purpose of parts of the text and analyze the effect on the meaning produced by a specific detail.
- Integrate knowledge and ideas from across multiple related texts, analyzing elements that are similar in two passages.
- Blend multiple modes of writing to produce effective argumentative essays on substantive topics.
- Produce writing that engages with multiple perspectives, establishes a thesis claim, and provides analysis that recognizes implications and complexities.
- Develop ideas and support claims with relevant evidence, using reasoning and illustration to clarify the argument.
- Engage in a recursive writing process to create a clear organization with logical grouping and transitions that establish relationships among ideas.
- Use language to convey meaning with a style appropriate to the writing purpose.
- Use sentence structures that are clear and show some variety.
- Interpret vocabulary, including figurative language, inferring the meaning of words and phrases by using context.
- Demonstrate understanding of general academic and some domain-specific vocabulary.
- Maintain a consistent and appropriate tone in their writing through word choice.
- Apply knowledge of the English language and rhetorical style to make meaning when analyzing, evaluating, producing, and revising texts.
- Recognize disturbances in sentence structure.
- Demonstrate a command of the conventions of English grammar, usage, and mechanics.

College- and Career-Readiness Assessment: English Language Arts Performance Level Descriptors

Basic

Students at this level have a 60% or higher probability of earning a C or higher in credit bearing history, literature, social sciences, or writing courses across all levels of higher education. The average first year college GPA at this level is between a 2.4 and 2.7 (mid to high C). Students at this level likely require additional coursework and/or support to be on track for success in college or career.

Students demonstrate partial mastery with subject matter but may not exhibit readiness for college and career.
In addition to demonstrating understanding and application of all skills in the **Below Basic** Level, students scoring at the **Basic** Level typically:

- Comprehend, analyze, and synthesize information from literary and informational texts, applying limited close reading skills across a range of subject levels and complexity levels.
- Inconsistently locate explicitly stated details, make inferences about characters and actions, and identify central ideas when they are clearly stated
- Sometimes use knowledge about the author's craft and the text structure to determine the text's primary purpose and the function of key textual elements.
- Identify knowledge and ideas from across multiple related texts, comparing details that texts have in common.
- Attempt to blend multiple modes of writing to produce argumentative essays on substantive topics.
- Produce writing that responds to multiple perspectives, establishes a thesis claim that shows some clarity in thought, and provides limited analysis of the issue.
- Develop ideas and support claims with some relevant evidence that is often overly general, sometimes using basic reasoning and illustration that may be repetitious.
- Attempt to use a recursive writing process and create a simple organization with some transitions that establish relationships among ideas.
- Use language that is sometimes imprecise to convey meaning.
- Use sentence structures that are usually clear but show little variety.
- Interpret vocabulary, including basic figurative language, sometimes inferring the meaning of key words and phrases by using the context.
- Demonstrate understanding of familiar and some general academic vocabulary.
- Make inconsistent word choices and may use inappropriate tone in their writing.
- Inconsistently apply knowledge of the English language and rhetorical style to make meaning when analyzing, evaluating, producing, and revising texts.
- May recognize obvious disturbances in sentence structure.
- Demonstrate an inconsistent command of the conventions of English grammar, usage, and mechanics.

Below Basic

Students have not performed at least at the **Basic** level.

Oklahoma Mathematics

Performance Level Descriptor Tables

Oklahoma School Testing Program: Grade 3 Mathematics
Performance Level Descriptors

Advanced Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in depth understanding and application of all skills at the **Proficient** level, students scoring at the **Advanced** level typically:	
• Complete complex addition, subtraction, and multiplication problems and model division facts. • Order fractions using models and compose and decompose fractions related to the same whole. • Extend patterns and generate real-world situations to represent number sentences.	• Determine volume and elapsed time. • Summarize complex data sets and analyze the data to solve problems. • Solve complex and non-routine real-world problems, draw logical conclusions and justify solutions.
Proficient Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level. Students scoring at the **Proficient** level typically:	
• Compare and order whole numbers. • Complete addition, subtraction, and multiplication problems and recognize the relationship between multiplication and division. • Construct and compare fractions using models. • Select the fewest number of coins for a given amount of money. • Determine rules to describe basic patterns. • Determine unknowns in equations and apply number properties.	• Classify angles. • Sort three-dimensional figures and determine the perimeter of polygons. • Determine the area of two-dimensional figures. • Read and analyze length, temperature, and time. Students summarize a data set and analyze the data to solve problems. • Solve real-world problems and employ problem-solving strategies of identifying and using appropriate information.

OKLAHOMA Education

Oklahoma School Testing Program: Grade 3 Mathematics
Performance Level Descriptors

Basic Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level. Students scoring at the **Basic** level typically:	
• Represent whole numbers. • Complete simple addition, subtraction, and multiplication problems. • Read and write fractions. • Determine the value of a set of coins or bills.	• Determine rules to describe simple patterns. Students determine unknowns in simple equations. • Identify right angles. • Choose an appropriate instrument to measure an object. • Read and write time from a digital clock.
Below Basic Students have not performed at least at the **Basic** level.	

OKLAHOMA
Education

Oklahoma School Testing Program: Grade 4 Mathematics
Performance Level Descriptors

<table>
<tr><th colspan="2">Advanced
Students demonstrate superior performance on challenging subject matter.
In addition to demonstrating a broad and in depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:</th></tr>
<tr><td>• Estimate and solve complex mathematical problems and determine the unknown in non-equivalent expressions.
• Compare decimals and fractions.
• Solve complex money problems.
• Determine a rule and extend a complex pattern.
• Determine and represent unknown values in complex problems.</td><td>• Determine volume.
• Solve complex measurement problems.
• Represent complex data sets and solve problems involving the data.
• Solve complex and non-routine real-world problems, draw logical conclusions and justify solutions.</td></tr>
<tr><th colspan="2">Proficient
Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the Proficient level typically:</th></tr>
<tr><td>• Estimate and solve mathematical problems.
• Use models to determine equivalent fractions, compare and order fractions, and add and subtract fractions.
• Read and write decimals and make connections between decimals and fractions.
• Determine change using coins.
• Determine rules and extend patterns.
• Determine unknown values in mathematical problems.</td><td>• Describe parts of geometrical figures and identify similarities in three-dimensional figures.
• Decompose and determine the area of polygons.
• Solve measurement problems.
• Represent data sets and solve problems involving the data.
• Solve real-world problems and employ problem-solving strategies of identifying and using appropriate information.</td></tr>
</table>

OKLAHOMA Education

Oklahoma School Testing Program: Grade 4 Mathematics
Performance Level Descriptors

<table>
<tr><td colspan="2">Basic
Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.
Students scoring at the Basic level typically:</td></tr>
<tr><td>Demonstrate the ability to estimate and solve simple mathematical problems.
Use models to determine simple equivalent fractions, compare and order whole numbers and simple fractions, and decompose fractions.
Read and write simple decimals and compare and order whole numbers and decimals.</td><td>Determine change using whole dollars.
Determine a rule and extend a simple pattern.
Determine unknown values in simple mathematical problems.
Identify quadrilaterals and determine the area of simple polygons.
Identify appropriate units and tools to measure.</td></tr>
<tr><td colspan="2">Below Basic
Students have not performed at least at the Basic level.</td></tr>
</table>

OKLAHOMA Education

Oklahoma School Testing Program: Grade 5 Mathematics
Performance Level Descriptors

<table>
<tr><th colspan="2">Advanced
Students demonstrate superior performance on challenging subject matter.
In addition to demonstrating a broad and in depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:</th></tr>
<tr><td>Interpret the remainder of division problems within the context of the problem.
Order decimals, fractions, and whole numbers.
Evaluate complex expressions, equations, and inequalities.
Construct geometric figures and identify them in various contexts.</td><td>Compare the volume, perimeter, or surface area of geometric figures.
Analyze complex graphs.
Solve complex and non-routine real-world problems, draw logical conclusions and justify solutions.</td></tr>
<tr><th colspan="2">Proficient
Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the Proficient level typically:</th></tr>
<tr><td>Estimate and solve division problems with the remainder represented as a fraction or decimal.
Generate equivalent decimals and fractions, represent whole numbers or decimals, and compare fractions and decimals, including mixed numbers.
Estimate, add, and subtract decimals and fractions.
Describe patterns of change and graph these patterns as ordered pairs on a coordinate plane.
Evaluate expressions, equations, and inequalities.</td><td>Solve volume and perimeter problems and simple surface area problems.
Determine reasonable values for the perimeter of shapes with curves.
Compare angles.
Recognize relationships within a measurement system.
Determine the mean, median, mode, and range of a data set and analyze simple graphs.
Solve real-world problems and employ problem-solving strategies of identifying and using appropriate information.</td></tr>
</table>

OKLAHOMA Education

Oklahoma School Testing Program: Grade 5 Mathematics
Performance Level Descriptors

Basic Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level. Students scoring at the **Basic** level typically:	
• Estimate and solve division problems with remainders and solve addition and subtraction real-world problems. • Recognize basic equivalent decimals and fractions, represent whole numbers, and compare and order fractions or decimals. • Add and subtract decimals and fractions with like denominators. • Describe simple patterns of change and identify ordered pairs on a coordinate plane.	• Evaluate simple equivalent numerical expressions or equations. • Describe and classify geometric figures. • Solve simple volume and perimeter problems. • Choose an appropriate instrument to measure objects and read and analyze the length of objects. • Read and analyze the measure of angles. • Read simple graphs.
Below Basic Students have not performed at least at the **Basic** level.	

OKLAHOMA Education

Oklahoma School Testing Program: Grade 6 Mathematics
Performance Level Descriptors

<table>
<tr><td colspan="2">Advanced
Students demonstrate superior performance on challenging subject matter.
In addition to demonstrating a broad and in depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:</td></tr>
<tr><td>Estimate and solve complex problems requiring unit conversions.
Use the distance between points and transformations to solve complex problems involving congruent figures.</td><td>Analyze the differences between two outcomes of simple experiments.
Solve complex and non-routine real-world problems, draw logical conclusions and justify solutions.</td></tr>
<tr><td colspan="2">Proficient
Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the Proficient level typically:</td></tr>
<tr><td>Estimate, illustrate, and simplify the addition and subtraction of integers and assess the reasonableness of an answer.
Solve ratio and unit rate problems.
Estimate and illustrate the multiplication and division of non-negative rational numbers.
Evaluate the validity of the value of a variable.
Generate expressions, equations, and inequalities.
Interpret the solution of an equation and assess the reasonableness of the solution.
Determine the area of polygons and composite figures.
Use relationships between angles and the triangle sum theorem to solve problems.</td><td>Estimate and solve problems requiring unit conversion.
Predict transformations, analyze lines of symmetry, and use the distance between points and transformations to solve problems involving congruent figures.
Explain and justify which measure of central tendency provides the most descriptive information for a data set.
Create and analyze box-and-whisker plots and explain and compare possible outcomes of simple experiments.
Solve real-world problems and employ problem-solving strategies of identifying and using appropriate information.</td></tr>
</table>

OKLAHOMA Education

Oklahoma School Testing Program: Grade 6 Mathematics
Performance Level Descriptors

Basic Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level. Students scoring at the **Basic** level typically:	
• Read, order, represent, and explain rational numbers expressed as fractions, decimals, percents, and ratios. • Write positive integers as products of factors. • Illustrate or simplify the addition and subtraction of integers. • Identify and compare quantities, determine unit rates, and find equivalent fractions and percents. • Multiply and divide non-negative rational numbers. Students graph ordered pairs in all quadrants. • Represent reflective relationships between varying quantities.	• Evaluate the value of a variable in expressions, equations, and inequalities. • Use number sense and properties of operations to solve equations and graph the solution. • Determine the area of parallelograms and triangles. • Identify angle relationships by name. • Identify and display the effect of transformations. • Identify lines of symmetry. • Calculate measures of central tendency, determine the sample space of simple experiments, and identify possible outcomes.
Below Basic Students have not performed at least at the **Basic** level.	

Oklahoma School Testing Program: Grade 7 Mathematics
Performance Level Descriptors

Advanced

Students demonstrate superior performance on challenging subject matter.
In addition to demonstrating a broad and in depth understanding and application of all skills at the **Proficient** level, students scoring at the **Advanced** level typically:

- Interpret equations and inequalities involving variables and rational numbers.
- Make connections between circumference and area to solve problems involving circles.
- Analyze, apply, and display the effect of dilations and multiple transformations.
- Use central tendencies and range, predict data and select an appropriate data display, and predict theoretical probability.
- Solve complex and non-routine real-world problems, draw logical conclusions and justify solutions.

Proficient

Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the **Proficient** level typically:

- Estimate solutions of problems involving rational numbers and assess the reasonableness of the solutions.
- Differentiate between proportional and inversely proportional relationships and identify the constant of proportionality.
- Represent proportional relationships in a variety of ways.
- Use representations to identify and compare unit rates.
- Solve problems involving proportional relationships and assess the reasonableness of solutions.
- Represent, solve, and write equations.
- Solve simple inequalities.
- Generate and evaluate equivalent expressions with justification of steps.
- Interpret theoretical probability and draw conclusions. Students apply the effect of dilations and transformations.
- Solve real-world problems and employ problem-solving strategies of identifying and using appropriate information.

OKLAHOMA Education

Oklahoma School Testing Program: Grade 7 Mathematics
Performance Level Descriptors

Basic Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level. Students scoring at the **Basic** level typically:	
• Recognize, compare, and order rational numbers. • Create equivalent representations of rational numbers. • Calculate and model mathematical problems involving rational numbers and exponents. • Calculate the absolute value of a rational number. • Describe and identify a proportional relationship. • Identify and solve problems involving ratios and unit rates. • Represent, solve, and write simple equations. • Represent, write, and graph simple inequalities.	• Evaluate expressions using the order of operations. • Determine the surface area and volume of rectangular prisms and calculate the area and perimeter of trapezoids. • Calculate the circumference and area of circles. • Describe the effect of dilations and transformations. • Calculate the measures of central tendencies and range and determine appropriate data displays. • Calculate theoretical probability.
Below Basic Students have not performed at least at the **Basic** level.	

Oklahoma School Testing Program: Grade 8 Mathematics
Performance Level Descriptors

Advanced Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in depth understanding and application of all skills at the **Proficient** level, students scoring at the **Advanced** level typically:	
• Generate, simplify, and evaluate complex equivalent expressions. • Make connections between volume and surface area to solve problems involving solids. • Compare the volume and surface area of different solids.	• Describe the impact on central tendencies of a data set with multiple outliers and when inserting or deleting multiple data points. • Solve complex and non-routine real-world problems, draw logical conclusions and justify solutions.

Proficient Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level. Students scoring at the **Proficient** level typically:	
• Solve complex and non-routine real-world problems, draw logical conclusions and justify solutions. • Generate, simplify, and evaluate equivalent expressions. • Classify and explain operational closure of rational and irrational numbers. • Distinguish between a linear and nonlinear function. • Identify independent and dependent variables. • Describe, analyze, and represent linear functions with two variables and translate between representations.	• Use and apply the Pythagorean Theorem. • Describe the impact on central tendencies of a data set with an outlier and when inserting or deleting a data point. • Interpret a scatterplot, determine the rate of change, and use a line of best fit to make predictions. • Calculate, interpret, and predict experimental probability and generalize samples to populations. • Solve real-world problems and employ problem-solving strategies of identifying and using appropriate information.

OKLAHOMA Education

Oklahoma School Testing Program: Grade 8 Mathematics
Performance Level Descriptors

Basic Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level. Students scoring at the **Basic** level typically:	
• Simplify and generate simple equivalent expressions, including expressions in scientific notation. • Translate between standard form and scientific notation. • Identify and compare real numbers. • Recognize if a graph represents a linear function. • Identify intercepts and slope from the graph of a line. • Identify the effect on the graph of a linear function when characteristics are changed. • Solve and graph equations and inequalities.	• Use the Pythagorean Theorem to identify right triangles and to find the length of the hypotenuse. • Calculate the surface area and volume of solids. • Identify the outliers of a data set. • Identify the line of best fit from a given scatterplot and determine if the rate of change is positive or negative. • Calculate the experimental probability of single events, identify sample spaces, and classify events as independent or dependent.
Below Basic Students have not performed at least at the **Basic** level.	

OKLAHOMA Education

College- and Career-Readiness Assessment: Mathematics
Performance Level Descriptors

Advanced

Students at the Advanced level have a 90% probability of earning a C or higher and a 66% probability of earning a B or higher in credit bearing math courses at 4 year institutions. Their average first year college GPA at this level is a 3.3 or above (low B or higher). Students at this level are highly likely to be on track to be successful at the next level.

Students demonstrate superior performance with challenging subject matter and clearly exhibit readiness for college and career. In addition to demonstrating broad and in depth understanding and application of all skills in the Proficient Level, students scoring at the Advanced Level typically:

- Rewrite rational, radical, and exponential expressions.
- Find the value of i^n for any whole number n.
- Perform operations on complex numbers.
- Add, subtract, and perform scalar multiplication on matrices.
- Interpret a term in a linear function of a challenging context.
- Make connections between different representations of, linear functions, systems of two linear equations, and systems of two linear inequalities in two variables.
- Determine the conditions under which a system of two linear equations in two has no solution, one solution, or infinitely many solutions.
- Create and use a linear equation in two variables that represents a challenging context.
- Create and solve a 3-variable linear system.
- Create and use an inequality in one or two variables that represents a challenging context.
- Make connections between the graph and solution to a quadratic and linear system of equations.
- Given a graph of a quadratic or exponential function representing a context, interpret a value, variable, point, or input-output pair in terms of the context.
- Solve absolute value, logarithmic, polynomial, rational, radical, and exponential equations in real-world and mathematical problems.
- Solve quadratic equations with complex solutions.
- Analyze graphs relationships between two quantities, including relationships that are not represented by a linear, quadratic, or exponential equation.
- Identify characteristics of graphs of functions.
- Identify the effect of multiple transformations of functions.
- Find inverse functions.
- Divide polynomials.
- Solve challenging radical and rational equations.
- Solve problems involving arithmetic and geometric sequences and series.
- Identify an appropriate inference or conclusion based on information from a graph, table, or scatterplot.
- Identify the equation of a line or curve that best fits the data in a scatterplot.
- Identify the appropriate conclusion to draw from a description of a study's design and the study results.
- Compare measures of center and spread of two data distributions represented visually.

OKLAHOMA Education

Advanced (cont.)	
• Find the probability of a compound event. • Recognize the effect of standard deviation. • Count using the Fundamental Counting Principle, combinations, and permutations, including when cases overlap. • Identify the most appropriate sample or sampling method to best answer the question of interest. • Identify the population to which the results of a survey can be generalized. • Understand sampling variability when the population proportion is estimated using sample data. • Use similarity as well as theorems related to lines, angles, and triangles to solve problems. • Find the diameter, radius, center, or points on a circle in coordinate plane.	• Solve problems using properties of special right triangles, the Pythagorean Theorem or its converse, and trigonometric ratios. • Solve problems using properties and theorems relating to circles and parts of circles, such as radii, diameters, tangents, angles, arcs, arc length, and sector area. • Apply the triangle inequality theorem. • Recognize congruencies that appear through the use of auxiliary lines. • Determine an expression for the area of a regular polygon in terms of side length or apothem/altitude. • Find area and volume of composite shapes. • Convert area and volume to different units.

College- and Career-Readiness Assessment: Mathematics Performance Level Descriptors

Proficient

Students at the Proficient level have approximately a 75% or higher probability of earning a C or higher in credit bearing math courses at all levels of higher education. Their average first year college GPA at this level is between a 2.9 and 3.3 (high C to low B). Students at this level are likely to be on track to be successful at the next level.

Students demonstrate mastery with subject matter and exhibit readiness for college and career. In addition to demonstrating understanding and application of all skills in the Basic Level, students scoring at the Proficient Level typically:

- Rationalize numeric expressions.
- Convert numbers with rational exponents to radical form.
- Simplify cube roots.
- Use properties of radicals and exponents to rewrite expressions.
- Evaluate slope in given contexts.
- Interpret terms in linear functions and make connections between different representations.
- Determine the number of solutions linear systems of two equations have.
- Create and solve linear equations within context.
- Create and use inequalities within context.
- Graph compound linear inequalities.
- Interpret the constant, variable, term, solution, or input-output pair in quadratic or exponential functions in context.
- Add, subtract, and multiply polynomials.
- Solve multistep quadratic equations.
- Solve radical equations.
- Solve rational equations.
- Solve systems of equations with one linear and one quadratic equation.
- Solve literal equations for a given variable.
- Use Venn diagrams to make conclusions.
- Make connections between the various representations of quadratic or exponential functions.
- Factor polynomial expressions.
- Determine the number of solutions quadratic equations have.
- Create and/or use quadratic or exponential functions to represent real-world contexts.
- Graph polynomial functions.
- Evaluate the effects of single function transformations.
- Evaluate logarithmic, polynomial, rational, radical, and exponential functions, including where they are undefined.
- Find near terms in geometric sequences.
- Compose 2 functions.
- Evaluate conclusions of population proportions based on sample data and margins of error.
- Identify bias in sampling methods.
- Interpret scatterplots and use lines of best fit to make predictions.
- Calculate, compare, and interpret measures of central tendency in context.
- Determine probabilities of compound events.
- Find probabilities where the sample space must be determined from the context.
- Solve problems using properties of right triangles.

Proficient (cont.)	
• Make connections between the equation of a circle in a coordinate plane and the center and radius of the circle. • Solve simple problems using properties and theorems relating to circles and parts of circles. • Solve problems using properties of similar triangles. • Find the measure of interior angles of polygons. • Solve problems using the midpoint formula. • Solve problems using multiple theorems related to lines, angles, or triangles.	• Solve problems involving circumference, area, surface area, perimeter and volume. • Solve problems involving translations, rotations, and reflections. • Solve problems using the Pythagorean Theorem. • Solve problems using the distance formula. • Solve problems involving right triangles using trigonometric functions.

College- and Career-Readiness Assessment: Mathematics
Performance Level Descriptors

Basic

Students at this level have a 50% or higher probability of earning a C or higher in credit bearing math courses across all levels of higher education. Their average first year college GPA at this level is between a 2.4 to 2.8 (mid to high C student). Students at this level likely require additional coursework and/or support to be on track for college and/or career success.

Students demonstrate partial mastery with subject matter but may not exhibit readiness for college and career. In addition to demonstrating understanding and application of all skills in the Below Basic Level, students scoring at the Basic Level typically:

- Add complex numbers and add matrices.
- Simplify square roots.
- Rewrite monomials with integer exponents to have positive exponents.
- Create linear expressions, equations or inequalities to model contexts.
- Create systems of two linear equations to model contexts.
- Solve systems of two linear equations with integer coefficients.
- Make connections between different representations of linear relationships between two variables.
- Create and use linear relationships to solve a problem.
- Multiply polynomials by monomials.
- Multiply binomials.
- Factor monomials from polynomial expressions.
- Factor trinomials.
- Add and subtract polynomials.
- Solve quadratic equations in the form $aaxx^2 = bb$.
- Solve simple radical equations.
- Use function notation to represent functions.
- Evaluate absolute value functions.

- Evaluate simple algebraic expressions.
- Identify the shape of graphs from some of their points.
- Identify graphs of nonlinear relationships between two variables based on descriptions of characteristics.
- Read and interpret information presented in graphs, scatterplots, or tables.
- Find the median or mean of data sets.
- Find probabilities of simple events.
- Estimate expected population counts or proportions from sample counts or proportions.
- Find probabilities of simple compound events.
- Calculate simple conditional probabilities.
- Solve simple problems about geometric figures using the vertical angle theorem, the triangle angle sum theorem, or theorems about a transversal crossing parallel lines.
- Solve real-world problems using the Pythagorean Theorem.
- Solve simple problems involving perimeter, area and volume.
- Identify corresponding parts of congruent triangles.
- Translate points horizontally and vertically on a coordinate plane.

Below Basic

Students have not performed at least at the **Basic** level.

OKLAHOMA Education

Oklahoma Grade 5 Science

Range Performance Level Descriptor Tables

Advanced

Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in-depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:

- **analyze scale, proportion, quantity and patterns when performing computational thinking to complex data as it pertains to the distribution of water on Earth, conservation of matter, and Earth's relationship with the Sun, Moon, and stars.**
- **predict, modify, and extend complex models at various scales to analyze the movement of matter and energy between organisms, ecosystems, and Earth's systems and analyze the outcomes of these interactions.**
- **analyze and compare evidence, data, and models to engage in argument to explain the cause-and-effect relationships between an object and Earth's gravity, how scale and proportion affect the apparent brightness of the Sun and other stars, and/or how plants use matter (chiefly air and water) to grow.**
- **observe and measure phenomena to interpret and evaluate patterns that classify materials based on properties or describe complex cause-and-effect relationships when mixing substances within an investigation framework.**
- **combine and compare multiple pieces of information to explain the impacts of human activities on Earth's systems and how solutions can be designed to protect Earth's resources and environment.**

Proficient

Students demonstrate mastery over grade-level appropriate subject matter and readiness for the next grade level. Students scoring at the Proficient level typically:

- **apply scale, proportion, quantity, and/or patterns when performing computational thinking to data as it pertains to the distribution of water on Earth, conservation of matter, and Earth's relationship with the Sun, Moon, and stars.**
- **describe, use, and/or develop basic models at various scales to explain the movement of matter and energy between organisms, ecosystems, and Earth's systems and explain the outcomes of these interactions.**
- **use evidence, data, and/or models to engage in argument to explain the cause-and-effect relationships between an object and Earth's gravity, how scale and proportion affect the apparent brightness of the Sun and other stars, or how plants use matter (chiefly air and water) to grow.**
- **observe and measure phenomena to identify patterns that classify materials based on properties or describe cause-and-effect relationships when mixing substances within an investigation framework.**
- **combine or explain information about the impacts of human activities on Earth's systems and how solutions can be designed to protect Earth's resources and environment.**

Basic

Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.
Students scoring at the Basic level typically:

- **recognize scale, proportion, quantity, or patterns when performing basic computations with data as it pertains to the distribution of water on Earth, conservation of matter, and/or Earth's relationship with the Sun, Moon, and stars.**
- **identify basic models to represent common features of matter and/or energy, ecosystems, and/or Earth's systems.**
- **identify evidence, data, or models to distinguish relationships between an object and Earth's gravity, how basic scale and proportion affect the brightness of the Sun and other stars, or how plants use air and water.**
- **observe or measure phenomena to recognize patterns of materials or identify basic relationships when mixing substances within an investigation framework.**
- **identify or describe the impacts of human activities on Earth's systems and solutions that protect Earth's resources and environment.**

Below Basic

Students scoring **Below Basic** have not demonstrated they can perform at the Basic level. Students scoring athe Below Basic level should be given comprehensive science instruction. Students scoring at the Basic level typically:

- **recognize scale, proportion, quantity, or patterns when performing basic computations with data as it pertains to the distribution of water on Earth, conservation of matter, and/or Earth's relationship with the Sun, Moon, and stars.**
- **identify basic models to represent common features of matter and/or energy, ecosystems, and/or Earth's systems.**
- **identify evidence, data, or models to distinguish relationships between an object and Earth's gravity, how basic scale and proportion affect the brightness of the Sun and other stars, or how plants use air and water.**
- **observe or measure phenomena to recognize patterns of materials or identify basic relationships when mixing substances within an investigation framework.**
- **identify or describe the impacts of human activities on Earth's systems and solutions that protect Earth's resources and environment.**

PS1.2 **ESS1.2** **ESS2.2**	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Using Mathematics and Computational Thinking; Analyzing and Interpreting Data **DCI** • PS1.A Structures and Properties of Matter • PS1.B Chemical Reactions • ESS1.B Earth and the Solar System • ESS2.C The Roles of Water in Earth's Surface Processes **CCC** • Scale, Proportion, and Quantity • Patterns		**Students scoring at the Basic level typically recognize scale, proportion, quantity, or patterns when performing basic computations with data as it pertains to the distribution of water on Earth, conservation of matter, and/or Earth's relationship with the Sun, Moon, and stars.**	**Students scoring at the Proficient level typically apply scale, proportion, quantity, and/or patterns when performing computational thinking to data as it pertains to the distribution of water on Earth, conservation of matter, and Earth's relationship with the Sun, Moon, and stars.**	**Students scoring at the Advanced level typically analyze scale, proportion, quantity and patterns when performing computational thinking to complex data as it pertains to the distribution of water on Earth, conservation of matter, and Earth's relationship with the Sun, Moon, and stars.**

PS1.1 **PS3.1** **LS2.1** **ESS2.1** **LS2.2**	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Developing and Using Models **DCI** • PS1.A Structure and Properties of Matter • PS3.D Energy in Chemical Processes and Everyday Life • LS1.C Organization of Matter and Energy Flow in Organisms • LS2.A Interdependent Relationships in Ecosystems • LS2.B Cycles of Matter and Energy Transfer in Ecosystems • ESS2.A Earth Materials and Systems **CCC** • Scale, Proportion, and Quantity • Energy and Matter • Systems and System Models		**Students scoring at the Basic level typically identify basic models to represent common features of matter and/or energy, ecosystems, and/or Earth's systems.**	**Students scoring at the Proficient level typically describe, use, and/ or develop basic models at various scales to explain the movement of matter and energy between organisms, ecosystems, and Earth's systems and explain the outcomes of these interactions.**	**Students scoring at the Advanced level typically predict, modify, and extend complex models at various scales to analyze the movement of matter and energy between organisms, ecosystems, and Earth's systems and analyze the outcomes of these interactions.**

PS2.1 **LS1.1** **ESS1.1**	**Below Basic:** Student have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Engaging in Argument from Evidence **DCI** • PS2.B Types of Interactions • LS1.C Organization for Matter and Energy Flow in Organisms • ESS1.A The Universe and Its Stars **CCC** • Cause and Effect • Energy and Matter • Scale, Proportion, and Quantity		**Students scoring at the Basic level typically identify evidence, data, or models to distinguish relationships between an object and Earth's gravity, how basic scale and proportion affect the brightness of the Sun and other stars, or how plants use air and water.**	**Students scoring at the Proficient level typically use evidence, data, and/or models to engage in argument to explain the cause-and-effect relationships between an object and Earth's gravity, how scale and proportion affect the apparent brightness of the Sun and other stars, or how plants use matter (chiefly air and water) to grow.**	**Students scoring at the Advanced level typically analyze and compare evidence, data, and models to engage in argument to explain the cause-and-effect relationships between an object and Earth's gravity, how scale and proportion affect the apparent brightness of the Sun and other stars and/or how plants use matter (chiefly air and water) to grow.**

PS1.3 **PS1.4**	**Below Basic:** Student have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Planning and Carrying out Investigations **DCI** • PS1.A Structure and Properties of Matter • PS1.B Chemical Reactions **CCC** • Patterns • Cause and Effect		**Students scoring at the Basic level typically observe or measure phenomena to recognize patterns of materials or identify basic relationships when mixing substances within an investigation framework.**	**Students scoring at the Proficient level typically observe and measure phenomena to identify patterns that classify materials based on properties or describe cause-and-effect relationships when mixing substances within an investigation framework.**	**Students scoring at the Advanced level typically observe and measure phenomena to interpret and evaluate patterns that classify materials based on properties or describe complex cause-and-effect relationships when mixing substances within an investigation framework.**

ESS3.1	**Below Basic:** Student have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Obtaining, Evaluating, and Communicating Information **DCI** • ESS3 Earth and Human Activity **CCC** • Systems and System Models		**Students scoring at the Basic level typically identify or describe the impacts of human activities on Earth's systems and solutions that protect Earth's resources and environment.**	**Students scoring at the Proficient level typically combine or explain information about the impacts of human activities on Earth's systems and how solutions can be designed to protect Earth's resources and environment.**	**Students scoring at the Advanced level typically combine and compare multiple pieces of information to explain the impacts of human activities on Earth's systems and how solutions can be designed to protect Earth's resources and environment.**

Oklahoma Grade 8 Science

Range Performance Level Descriptor Tables

Advanced

Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in-depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:

- **evaluate, revise, or predict a model involving: the relationship between gene structure and protein structure; the effect of reproduction on genetic variation; cyclic patterns in relation to the position of the Earth, Sun, and Moon; the role of gravity within galaxies and the solar system.**
- **evaluate or modify investigations about: stability and change of forces and motion; the effect of fields on force interactions.**
- **analyze, infer, relate, or identify complex relationships within a system to construct or evaluate explanations for: the effect of environmental and genetic factors on growth; the common ancestry of organisms based on patterns in anatomy or the chronological order of fossils; the effect of trait variation in populations on natural selection.**
- **modify the solution to a problem with new information involving energy transfer, forces, and motions in systems where objects collide.**
- **evaluate, develop, or apply reasoning to support or refute new arguments or counterarguments about how: the structures of plants and behaviors of animals affect the likelihood of successful reproduction; gravitational interactions depend on the masses of interacting objects in a system.**
- **revise questions about data based on new evidence to determine factors that affect the strength of electric and magnetic forces.**
- **analyze mathematical representations to: describe patterns in wave models to show the relationship between amplitude and energy; explain how natural selection affects the distribution of traits in populations.**
- **evaluate data to: compare patterns of embryological similarities between species; identify how patterns in the fossil record indicate the history of life on Earth; determine the scale properties of objects in the solar system.**
- **compare competing claims or scientific explanations to communicate how: humans affect trait inheritance through artificial selection; the structure and function of digital signals contributes to those signals reliably transmitting information.**

Proficient

Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.
Students scoring at the Proficient level typically:

- **develop or use a model to describe: the relationship between gene structure and protein structure; the effect of reproduction on genetic variation; cyclic patterns in relation to the position of the Earth, Sun, and Moon; the role of gravity within galaxies and the solar system.**
- **identify, describe, or explain how to: design investigations about stability and change of forces and motion; conduct and evaluate investigations about the effect of fields on force interactions.**
- **identify, describe, or compare evidence to construct explanations for: the effect of environmental and genetic factors on growth; the common ancestry of organisms based on patterns in anatomy or the chronological order of fossils; the effect of trait variation in populations on natural selection.**
- **design or revise a solution to a problem involving energy transfer, forces, and motions in systems where objects collide.**
- **use reasoning to show that evidence supports or refutes arguments about how: the structures of plants and behaviors of animals affect the likelihood of successful reproduction; gravitational interactions depend on the masses of interacting objects in a system.**
- **use reasoning to develop questions about data to determine factors that affect the strength of electric and magnetic forces.**
- **use mathematical representations to: describe patterns in wave models to show the relationship between amplitude and energy; explain how natural selection affects the distribution of traits in populations.**
- **analyze and interpret data to: compare patterns of embryological similarities between species; identify how patterns in the fossil record indicate the history of life on Earth; determine the scale properties of objects in the solar system.**
- **gather, use, synthesize, or integrate information to communicate and support claims about how: humans affect trait inheritance through artificial selection; the structure and function of digital signals contributes to those signals reliably transmitting information.**

Basic

Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.
Students scoring at the Basic level typically:

- **identify or describe basic components or concept(s) of a model involving: the relationship between gene structure and protein structure; the effect of reproduction on genetic variation; cyclic patterns in relation to the position of the Earth, Sun, and Moon; the role of gravity within galaxies and the solar system.**
- **identify or describe basic steps or processes within investigations about: stability and change of forces and motion; the effect of fields on force interactions.**
- **identify or describe basic relationships shown in evidence of: the effect of environmental and genetic factors on growth; the common ancestry of organisms based on patterns in anatomy or the chronological order of fossils; the effect of trait variation in populations on natural selection.**
- **identify or describe basic relationships in a design solution involving energy transfer, forces, and motions in systems where objects collide.**
- **identify evidence that supports arguments about how: the structures of plants and behaviors of animals affect the likelihood of successful reproduction; gravitational interactions depend on the masses of interacting objects in a system.**
- **determine factors that affect the strength of electric and magnetic forces.**
- **identify components of mathematical representations to: describe patterns in wave models to show the relationship between amplitude and energy; explain how natural selection affects the distribution of traits in populations.**
- **use data to: recognize patterns of embryological similarities between species; identify how patterns in the fossil record indicate the history of life on Earth; determine the scale properties of objects in the solar system.**
- **describe information to support claims about how: humans affect trait inheritance through artificial selection; the structure and function of digital signals contributes to those signals reliably transmitting information.**

Below Basic

Students scoring **Below Basic** have not demonstrated they can perform at the Basic level. Students scoring at the Below Basic level should be given comprehensive science instruction. Students scoring at the Basic level typically:

- **identify or describe basic components or concept(s) of a model involving: the relationship between gene structure and protein structure; the effect of reproduction on genetic variation; cyclic patterns in relation to the position of the Earth, Sun, and Moon; the role of gravity within galaxies and the solar system.**
- **identify or describe basic steps or processes within investigations about: stability and change of forces and motion; the effect of fields on force interactions.**
- **identify or describe basic relationships shown in evidence of: the effect of environmental and genetic factors on growth; the common ancestry of organisms based on patterns in anatomy or the chronological order of fossils; the effect of trait variation in populations on natural selection.**
- **identify or describe basic relationships in a design solution involving energy transfer, forces, and motions in systems where objects collide.**
- **identify evidence that supports arguments about how: the structures of plants and behaviors of animals affect the likelihood of successful reproduction; gravitational interactions depend on the masses of interacting objects in a system.**
- **determine factors that affect the strength of electric and magnetic forces.**
- **identify components of mathematical representations to: describe patterns in wave models to show the relationship between amplitude and energy; explain how natural selection affects the distribution of traits in populations.**
- **use data to: recognize patterns of embryological similarities between species; identify how patterns in the fossil record indicate the history of life on Earth; determine the scale properties of objects in the solar system.**
- **describe information to support claims about how: humans affect trait inheritance through artificial selection; the structure and function of digital signals contributes to those signals reliably transmitting information.**

LS3.1 **LS3.2** **ESS1.1** **ESS1.2**	**Below Basic**: Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Develop and Use Models **DCI** • LS3.A Inheritance of Traits • LS1.B Growth and Development of Organisms • LS3.B Variation of Traits • ESS1.A The Universe and Its Stars **CCC** • Structure and Function • Cause and Effect • Patterns • Systems and System Models		**Students scoring at the Basic level typically identify or describe basic components or concept(s) of a model involving: the relationship between gene structure and protein structure; the effect of reproduction on genetic variation; cyclic patterns in relation to the position of the Earth, Sun, and Moon; the role of gravity within galaxies and the solar system.**	**Students scoring at the Proficient level typically develop or use a model to describe: the relationship between gene structure and protein structure; the effect of reproduction on genetic variation; cyclic patterns in relation to the position of the Earth, Sun, and Moon; the role of gravity within galaxies and the solar system.**	**Students scoring at the Advanced level typically evaluate, revise, or predict a model involving: the relationship between gene structure and protein structure; the effect of reproduction on genetic variation; cyclic patterns in relation to the position of the Earth, Sun, and Moon; the role of gravity within galaxies and the solar system.**

PS2.2 **PS2.5**	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Planning and Carrying Out Investigations **DCI** • PS2.A Forces and Motion • PS2.B Types of Interactions **CCC** • Cause and Effect • Stability and Change		**Students scoring at the Basic level typically identify or describe basic steps or processes within investigations about: stability and change of forces and motion; the effect of fields on force interactions.**	**Students scoring at the Proficient level typically identify, describe, or explain how to: design investigations about stability and change of forces and motion; conduct and evaluate investigations about the effect of fields on force interactions.**	**Students scoring at the Advanced level typically evaluate or modify investigations about: stability and change of forces and motion; the effect of fields on force interactions.**

LS1.5 LS4.2 LS4.4	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Constructing Explanations **DCI** • LS1.B Growth and Development of Organisms • LS4.A Evidence of Common Ancestry and Diversity • LS4.B Natural Selection **CCC** • Cause and Effect • Patterns		**Students scoring at the Basic level typically identify or describe basic relationships shown in evidence of: the effect of environmental and genetic factors on growth; the common ancestry of organisms based on patterns in anatomy or the chronological order of fossils; the effect of trait variation in populations on natural selection.**	**Students scoring at the Proficient level typically identify, describe, or compare evidence to construct explanations for: the effect of environmental and genetic factors on growth; the common ancestry of organisms based on patterns in anatomy or the chronological order of fossils; the effect of trait variation in populations on natural selection.**	**Students scoring at the Advanced level typically analyze, infer, relate, or identify complex relationships within a system to construct or evaluate explanations for: the effect of environmental and genetic factors on growth; the common ancestry of organisms based on patterns in anatomy or the chronological order of fossils; the effect of trait variation in populations on natural selection.**

PS2.1	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Designing Solutions **DCI** • PS2.A Forces and Motion **CCC** • Systems and System Models		**Students scoring at the Basic level typically identify or describe basic relationships in a design solution involving energy transfer, forces, and motions in systems where objects collide.**	**Students scoring at the Proficient level typically design or revise a solution to a problem involving energy transfer, forces, and motions in systems where objects collide.**	**Students scoring at the Advanced level typically modify the solution to a problem with new information involving energy transfer, forces, and motions in systems where objects collide.**

LS1.4 **PS2.4**	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Engaging in Argument from Evidence **DCI** • LS1.B Growth and Development of Organisms • PS2.B Types of Interactions **CCC** • Cause of Effect • Systems and System Models		**Students scoring at the Basic level typically identify evidence that supports arguments about how: the structures of plants and behaviors of animals affect the likelihood of successful reproduction; gravitational interactions depend on the masses of interacting objects in a system.**	**Student scoring at the Proficient level typically use reasoning to show that evidence supports or refutes arguments about how: the structures of plants and behaviors of animals affect the likelihood of successful reproduction; gravitational interactions depend on the masses of interacting objects in a system.**	**Students scoring at the Advanced level typically evaluate, develop, or apply reasoning to support or refute new arguments or counterarguments about how: the structures of plants and behaviors of animals affect the likelihood of successful reproduction; gravitational interactions depend on the masses of interacting objects in a system.**

PS2.3	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Asking Questions **DCI** • PS2.B Types of Interactions **CCC** • Cause and Effect		**Students scoring at the Basic level typically determine factors that affect the strength of electric and magnetic forces.**	**Students scoring at the Proficient level typically use reasoning to develop questions about data to determine factors that affect the strength of electric and magnetic forces.**	**Students scoring at the Advanced level typically revise questions about data based on new evidence to determine factors that affect the strength of electric and magnetic forces.**

PS4.1 **LS4.6**	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Using Mathematics and Computational Thinking **DCI** • PS4.A Wave Properties • LS4.C Adaptation **CCC** • Patterns • Cause and Effect		**Students scoring at the Basic level typically identify components of mathematical representations to: describe patterns in wave models to show the relationship between amplitude and energy; explain how natural selection affects the distribution of traits in populations.**	**Students scoring at the Proficient level typically use mathematical representations to: describe patterns in wave models to show the relationship between amplitude and energy; explain how natural selection affects the distribution of traits in populations.**	**Students scoring at the Advanced level typically analyze mathematical representations to: describe patterns in wave models to show the relationship between amplitude and energy; explain how natural selection affects the distribution of traits in populations.**

LS4.3 LS4.1 ESS1.3	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Analyzing and Interpreting Data **DCI** • LS4.A Evidence of Common Ancestry and Diversity • ESS1.B Earth and the Solar System • ETS1: Interdependence of Science, Engineering, and Technology **CCC** • Patterns • Scale, Proportion, and Quantity		**Students scoring at the Basic level typically use data to: recognize patterns of embryological similarities between species; identify how patterns in the fossil record indicate the history of life on Earth; determine the scale properties of objects in the solar system.**	**Students scoring at the Proficient level typically analyze and interpret data to: compare patterns of embryological similarities between species; identify how patterns in the fossil record indicate the history of life on Earth; determine the scale properties of objects in the solar system.**	**Students scoring at the Advanced level typically evaluate data to: compare patterns of embryological similarities between species; identify how patterns in the fossil record indicate the history of life on Earth; determine the scale properties of objects in the solar system.**

LS4.5 **PS4.3**	**Below Basic**: Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Obtaining, Evaluating, and Communication of Evidence **DCI** • LS4.B Natural Selection • ETS2.A Interdependence of Science, Engineering, and Technology • PS4.C Information Technologies and Instrumentation **CCC** • Structure and Function • Cause and Effect		**Students scoring at the Basic level typically describe information to support claims about how: humans affect trait inheritance through artificial selection; the structure and function of digital signals contributes to those signals reliably transmitting information.**	**Students scoring at the Proficient level typically gather, use, synthesize, or integrate information to communicate and support claims about how: humans affect trait inheritance through artificial selection; the structure and function of digital signals contributes to those signals reliably transmitting information.**	**Students scoring at the Advanced level typically compare competing claims or scientific explanations to communicate how: humans affect trait inheritance through artificial selection; the structure and function of digital signals contributes to those signals reliably transmitting information.**

Oklahoma Grade 11 Life Science

Range Performance Level Descriptor Tables

Advanced

Students demonstrate superior performance on challenging subject matter and clearly exhibit readiness for college and career. In addition to demonstrating a broad and in-depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:

- **develop and use models to interpret and evaluate components and relationships among components within and between complex systems and system models related to structure, function, growth, and/or development of organisms, organization of matter and energy flow in organisms, cycles of matter and energy transfer in ecosystems, and/or energy in chemistry processes.**
- **plan and conduct investigations to produce reliable data considering the types, amounts, and accuracy of data needed; analyze and interpret complex data sets to support explanations or claims about the stability related to structure and function of organisms, interdependent relationships in ecosystems at different scales, the cycling of matter and flow of energy among organisms in an ecosystem, the effect variation of traits has in a population, patterns that show evidence of natural selection or adaptation.**
- **compare multiple pieces of scientific information to communicate an understanding of the patterns that show evidence of common ancestry and diversity, or adaptation.**
- **ask questions to analyze relationships about the effect of structure and function on inheritance of traits; or support and/or evaluate the merits of arguments to synthesize and communicate understanding and defend them based on empirical evidence about stability and change in ecosystem dynamics, function and resilience, the cause-and-effect relationships of social interactions, group behaviors, adaptation, and variation of traits.**
- **construct, evaluate, make inferences and revise an explanation based on valid and reliable evidence from a variety of sources regarding the cause-and-effect relationships in natural selection, adaptation, and how the structure of DNA determines protein structure and impacts the function of the cell; or evaluate or refine explanations derived from evidence from a variety of sources for how matter and energy is organized, cycled, and transferred within an organism or ecosystem.**

Proficient

Students demonstrate mastery with subject matter and exhibit readiness for college and career. In addition to demonstrating understanding and application of all skills in the Basic Level, students scoring at the Proficient level typically:

- **develop and use models describing components and relationships among components of a system, related to structure and function, growth, and development of organisms, organization of matter and energy flow in organisms, cycles of matter and energy transfer In ecosystems, and energy in chemistry processes, including hierarchical structures and inputs and outputs of a system. Use the models to represent basic aspects of phenomena that result from changes in energy and matter.**
- **plan and conduct investigations to produce reliable data; analyze and interpret provided data to support explanations or claims about the stability related to structure and function of organisms, interdependent relationships in ecosystems at different scales, the cycling of matter and flow of energy among organisms in an ecosystem, the effect variation of traits has in a population, patterns that show evidence of natural selection or adaptation.**
- **evaluate multiple pieces of scientific information to communicate an understanding of the patterns that show evidence of common ancestry and diversity, or adaptation.**
- **ask questions to clarify relationships about the effect of structure and function on inheritance of traits; or evaluate arguments based on evidence as students synthesize and communicate understanding of stability and change in ecosystem dynamics, function and resilience, the cause-and-effect relationships of social interactions, group behaviors, adaptation, and variation of traits.**
- **construct an explanation based on valid and reliable evidence from sources of the cause-and-effect relationships in natural selection, adaptation, and how the structure of DNA determines protein structure and impacts the function of the cell; or construct and revise explanations from evidence from sources for how matter and energy is organized, cycled, and transferred within an organism or ecosystem.**

Basic

Students demonstrate partial mastery with subject matter and may not exhibit readiness for college and career. Students scoring at the Basic level typically:

- identify or describe basic components or relationships among components within systems and system models related to structure, function, growth and/or development of organisms, organization of matter and energy flow in organisms, cycles of matter and energy transfer in ecosystems, or energy in chemistry processes.
- conduct investigations to produce data; use provided data to support explanations or claims about the stability related to structure and function of organisms, interdependent relationships in ecosystems at different scales, the cycling of matter and flow of energy among organisms in an ecosystem, the effect variation of traits has in a population, patterns that show evidence of natural selection or adaptation.
- synthesize scientific information to communicate using a partial understanding of the patterns that show evidence of common ancestry, diversity, or adaptation.
- ask questions to identify relationships about the effect of structure and function on inheritance of traits; or describe arguments based on evidence to communicate understanding of stability and change in ecosystem dynamics, function and resilience, the cause-and-effect relationships of social interactions, group behaviors, adaptation, and variation of traits.
- identify and describe basic relationships based on evidence of the cause-and-effect relationships in natural selection, adaptation, and how the structure of DNA determines protein structure and impacts the function of the cell; or identify and describe explanations from evidence for how matter and energy is organized, cycled, and transferred within an organism or ecosystem.

Below Basic

Students scoring **Below Basic** have not demonstrated they can perform at the Basic level. Students scoring at the Basic level typically**:**

- identify or describe basic components or relationships among components within systems and system models related to structure, function, growth and/or development of organisms, organization of matter and energy flow in organisms, cycles of matter and energy transfer in ecosystems, or energy in chemistry processes.
- conduct investigations to produce data; use provided data to support explanations or claims about the stability related to structure and function of organisms, interdependent relationships in ecosystems at different scales, the cycling of matter and flow of energy among organisms in an ecosystem, the effect variation of traits has in a population, patterns that show evidence of natural selection or adaptation.
- synthesize scientific information to communicate using a partial understanding of the patterns that show evidence of common ancestry, diversity, or adaptation.
- ask questions to identify relationships about the effect of structure and function on inheritance of traits; or describe arguments based on evidence to communicate understanding of stability and change in ecosystem dynamics, function and resilience, the cause-and-effect relationships of social interactions, group behaviors, adaptation, and variation of traits.
- identify and describe basic relationships based on evidence of the cause-and-effect relationships in natural selection, adaptation, and how the structure of DNA determines protein structure and impacts the function of the cell; or identify and describe explanations from evidence for how matter and energy is organized, cycled, and transferred within an organism or ecosystem.

LS1.2 LS1.4 LS1.5 LS1.7 LS2.5	**Below Basic**: Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college-and career-ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career-ready (CCR).	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Develop and Use Models **DCI** • LS1.A Structure and function • LS1.B Growth and Development of Organisms • LS1.C Organization for Matter and Energy Flow in Organisms • LS2.B Cycles of Matter and Energy Transfer In Ecosystems • PS3.D Energy in Chemistry Processes **CCC** • Systems and System Models • Energy and Matter		**Students scoring at the Basic level typically identify or describe basic components or relationships among components within systems and system models related to structure, function, growth and/or development of organisms, organization of matter and energy flow in organisms, cycles of matter and energy transfer in ecosystems, or energy in chemistry processes.**	**Students scoring at the Proficient level typically develop and use models describing components and relationships among components of a system, related to structure and function, growth and development of organisms, organization of matter and energy flow in organisms, cycles of matter and energy transfer In ecosystems, and energy in chemistry processes, including hierarchical structures and inputs and outputs of a system. Use the models to represent basic aspects of phenomena that result from changes in energy and matter.**	**Students scoring at the Advanced level typically develop and use models to interpret and evaluate components and relationships among components within and between complex systems and system models related to structure, function, growth and/or development of organisms, organization of matter and energy flow in organisms, cycles of matter and energy transfer in ecosystems, and/or energy in chemistry processes.**

LS1.3 **LS2.1** **LS2.2** **LS2.4** **LS3.3** **LS4.3**	**Below Basic**: Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college-and career-ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college-and career-ready (CCR).	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Planning and Carrying Out Investigations, Using Mathematics and Computational Thinking, Analyzing and Interpreting Data **DCI** • LS1.A Structure and Function • LS2.A Interdependent Relationships in Ecosystems • LS2.B Cycles of Matter and Energy Transfer in Ecosystems • LS2.C Ecosystem Dynamics, Functioning and Resilience • LS3.B Variation of Traits • LS4.B Natural Selection • LS4.C Adaptation **CCC** • Patterns • Scale, Proportion, and Quantity • Energy and Matter • Stability and Change		**Students scoring at the Basic level typically conduct investigations to produce data; use provided data to support explanations or claims about the stability related to structure and function of organisms, interdependent relationships in ecosystems at different scales, the cycling of matter and flow of energy among organisms in an ecosystem, the effect variation of traits has in a population, patterns that show evidence of natural selection or adaptation.**	**Students scoring at the Proficient level typically plan and conduct investigations to produce reliable data; analyze and interpret provided data to support explanations or claims about the stability related to structure and function of organisms, interdependent relationships in ecosystems at different scales, the cycling of matter and flow of energy among organisms in an ecosystem, the effect variation of traits has in a population, patterns that show evidence of natural selection or adaptation.**	**Students scoring at the Advanced level typically plan and conduct investigations; produce reliable data considering the types, amounts, and accuracy of data needed; analyze and interpret complex data sets to support explanations or claims about the stability related to structure and function of organisms, interdependent relationships in ecosystems at different scales, the cycling of matter and flow of energy among organisms in an ecosystem, the effect variation of traits has in a population, patterns that show evidence of natural selection or adaptation.**

LS4.1	**Below Basic**: Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college-and career-ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career-ready (CCR).	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Obtaining, Evaluating, and Communicating Information **DCI** • LS4.A Evidence of Common Ancestry and Diversity • LS4.C: Adaptation **CCC** • Patterns		**Students scoring at the Basic level typically synthesize scientific information to communicate using a partial understanding of the patterns that show evidence of common ancestry, diversity, or adaptation.**	**Students scoring at the Proficient level typically evaluate multiple pieces of scientific information to communicate an understanding of the patterns that show evidence of common ancestry and diversity, or adaptation.**	**Students scoring at the Advanced level typically compare multiple pieces of scientific information to communicate an understanding of the patterns that show evidence of common ancestry and diversity, or adaptation.**

LS2.6 **LS2.8** **LS3.1** **LS3.2** **LS4.5**	**Below Basic**: Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college- and career-ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career-ready.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Asking Questions, Engaging in Argument from Evidence (make and defend a claim, evaluate a claim) **DCI** • LS2.C Ecosystem Dynamics, Functioning and Resilience • LS2.D Social Interactions and Group Behavior • LS3.A Inheritance of Traits • LS1.A Structure and Function • LS3.B Variation of Traits • LS4.C Adaptation **CCC** • Stability and Change • Cause and Effect		**Students scoring at the Basic level typically ask questions to identify relationshipsabout the effect of structure and function on inheritance of traits; or describe arguments based on evidence to communicate understanding of stability and change in ecosystem dynamics, function and resilience, the cause-and-effect relationships of social interactions, group behaviors, adaptation, and variation of traits.**	**Students scoring at the Proficient level typically ask questions to clarify relationships about the effect of structure and function on inheritance of traits; or evaluate arguments based on evidence as students synthesize and communicate understanding of stability and change in ecosystem dynamics, function and resilience, the cause-and-effect relationships of social interactions, group behaviors, adaptation, and variation of traits.**	**Students scoring at the Advanced level typically ask questions to analyze relationships about the effect of structure and function on inheritance of traits; or support, evaluate, and defend arguments based on evidence as students synthesize and communicate understanding of stability and change in ecosystem dynamics, function and resilience, the cause-and-effect relationships of social interactions, group behaviors, adaptation, and variation of traits.**

LS1.1 **LS1.6** **LS2.3** **LS4.2** **LS4.4**	**Below Basic**: Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college- and career-ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career-ready.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Constructing Explanations **DCI** • LS1.A Structure and Function • LS1.C Organization for Matter and Energy Flow in Organisms • LS2.B Cycles of Matter and Energy Transfer in Ecosystems • LS4.B Natural Selection • LS4.C Adaptation **CCC** • Structure and Function • Energy and Matter • Cause and Effect		**Students scoring at the Basic level typically identify and describe basic relationships based on evidence of the cause-and-effect relationships in natural selection, adaptation, and how the structure of DNA determines protein structure and impacts the function of the cell; or identify and describe explanations from evidence for how matter and energy is organized, cycled, and transferred within an organism or ecosystem.**	**Students scoring at the Proficient level typically construct an explanation based on valid and reliable evidence from sources of the cause-and-effect relationships in natural selection, adaptation, and how the structure of DNA determines protein structure and impacts the function of the cell; or construct and revise explanations from evidence from sources for how matter and energy is organized, cycled, and transferred within an organism or ecosystem.**	**Students scoring at the Advanced level typically construct, evaluate, or draw inferences from an explanation based on valid and reliable evidence from a variety of sources of the cause-and-effect relationships in natural selection, adaptation, and how the structure of DNA determines protein structure and impacts the function of the cell; or evaluate or refine explanations from evidence from a variety of sources for how matter and energy is organized, cycled, and transferred within an organism or ecosystem.**

Oklahoma Grade 11 Physical Science

Range Performance Level Descriptor Tables

Advanced

Students demonstrate superior performance on challenging subject matter and clearly exhibit readiness for college and career. In addition to demonstrating a broad and in-depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:

- **evaluate multiple patterns to develop and use models to predict how components between or within systems are related to the energy of motion and the structure and properties of matter, and the relationships between energy and matter.**
- **use complex mathematical models and plan and conduct investigations to produce and refine reliable data considering the types, amounts, accuracy and limitations of data needed; analyze and interpret complex data sets to support explanations or claims about the conservation of energy and matter during chemical reactions, the effects of different types of interactions, definitions of energy, conservation of energy and energy transfer within a system and/or system model, and how matter affects wave properties.**
- **evaluate the validity and reliability of complex claims about the effects of electromagnetic radiation on matter from a variety of published sources, including complex texts.**
- **construct, evaluate, make inferences, and revise an explanation based on scientific principles using valid and reliable evidence obtained from a variety of sources to identify patterns relating to the structure and properties of matter; predict how temperature or concentration affects the rate of chemical reactions; and define energy and matter in order to design, refine, and evaluate solutions taking into account unanticipated effects around defining and delimiting engineering problems and interdependence of science, engineering, and technology.**

Proficient

Students demonstrate mastery with subject matter and exhibit readiness for college and career. In addition to demonstrating understanding and application of all skills in the Basic level, students scoring at the Proficient level typically:

- **use patterns and models to predict how components between or within systems are related to the energy of motion and the structure and properties of matter, and the relationships between energy and matter.**
- **use mathematical models and plan and conduct investigations to produce and use reliable data to serve as a basis for evidence to support explanations or claims about the conservation of energy and matter during chemical reactions, the effects of different types of interactions, definitions of energy, conservation of energy and energy transfer within a system and/or system model, and how matter affects wave properties.**
- **evaluate the validity and reliability of claims about the effects of electromagnetic radiation on matter from a variety of published sources.**
- **construct and revise an explanation based on scientific principles using valid and reliable evidence obtained from a variety of sources to identify patterns relating to the structure and properties of matter; explain how temperature or concentration affects the rate of chemical reactions; and define energy and matter in order to design and refine solutions around defining and delimiting engineering problems and interdependence of science, engineering, and technology.**

Basic

Students demonstrate partial mastery with subject matter and may not exhibit readiness for college and career. Students scoring at the Basic level typically:

- **use basic patterns and models to identify and describe components between or within systems related to the energy of motion and the structure and properties of matter, and the relationships between energy and matter.**
- **use simple mathematical models and conduct investigations to produce data or use provided data to support explanations or claims about the conservation of energy and matter during chemical reactions, the effects of different types of interactions, definitions of energy, conservation of energy and energy transfer within a system and/or system model, and how matter affects wave properties.**
- **evaluate the validity and/or reliability of a simple claim about the effects of electromagnetic radiation on matter from a published source.**
- **identify and describe basic relationships and construct explanations based on evidence from a variety of sources about patterns relating to the structure and properties of matter; identify how temperature or concentration affects the rate of chemical reactions; and define energy and matter in order to design solutions around defining and delimiting engineering problems and interdependence of science, engineering, and technology.**

Below Basic

Students scoring **Below Basic** have not demonstrated they can perform at the Basic level. Students scoring at the Basic level typically**:**

- **use basic patterns and models to identify and describe components between or within systems related to the energy of motion and the structure and properties of matter, and the relationships between energy and matter.**
- **use simple mathematical models and conduct investigations to produce data or use provided data to support explanations or claims about the conservation of energy and matter during chemical reactions, the effects of different types of interactions, definitions of energy, conservation of energy and energy transfer within a system and/or system model, and how matter affects wave properties.**
- **evaluate the validity and/or reliability of a simple claim about the effects of electromagnetic radiation on matter from a published source.**
- **identify and describe basic relationships and construct explanations based on evidence from a variety of sources about patterns relating to the structure and properties of matter; identify how temperature or concentration affects the rate of chemical reactions; and define energy and matter in order to design solutions around defining and delimiting engineering problems and interdependence of science, engineering, and technology.**

PS1.1 **PS3.2**	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college- and career- ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career- ready (CCR).	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Develop and Use Models **DCI** • PS1.A Structure and Properties of Matter • PS3.A Definitions of Energy **CCC** • Patterns • Energy and matter		**Students scoring at the Basic level typically use basic patterns and models to identify and describe components between or within systems related to the energy of motion and the structure and properties of matter, and the relationships between energy and matter.**	**Students scoring at the Proficient level typically use patterns and models to predict how components between or within systems related to the energy of motion and the structure and properties of matter, and the relationships between energy and matter.**	**Students scoring at the Advanced level typically evaluate multiple patterns to develop and use models to predict how components between or within systems are related to the energy of motion and the structure and properties of matter, and the relationships between energy and matter.**

PS1.7 **PS2.5** **PS3.1** **PS3.4** **PS4.1**	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college- and career- ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career- ready (CCR).	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Planning and Carrying Out Investigations, Using Mathematics and Computational Thinking **DCI** • PS1.B Chemical Reactions • PS2.B Types of Interactions • PS3.A Definitions of Energy • PS3.B Conservation of Energy and Energy Transfer • PS4.A Wave Properties **CCC** • Energy and Matter • Cause and Effect • Systems and System Models		**Students scoring at the Basic level typically use simple mathematical models and conduct investigations to produce data or use provided data to support explanations or claims about the conservation of energy and matter during chemical reactions, the effects of different types of interactions, definitions of energy, conservation of energy and energy transfer within a system and/or system model, and how matter affects wave properties.**	**Students scoring at the Proficient level typically use mathematical models and plan and conduct investigations to produce and use reliable data to serve as a basis for evidence to support explanations or claims about the conservation of energy and matter during chemical reactions, the effects of different types of interactions, definitions of energy, conservation of energy and energy transfer within a system and/or system model, and how matter affects wave properties.**	**Students scoring at the Advanced level typically use complex mathematical models and plan and conduct investigations to produce and refine reliable data considering the types, amounts, accuracy and limitations of data needed; analyze and interpret complex data sets to support explanations or claims about the conservation of energy and matter during chemical reactions, the effects of different types of interactions, definitions of energy, conservation of energy and energy transfer within a system and/or system model, and how matter affects wave properties.**

PS4.4	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college- and career- ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career- ready (CCR).	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Obtaining, Evaluating, and Communicating Information **DCI** • PS4.B Electromagnetic Radiation **CCC** • Cause and Effect		**Students scoring at the Basic level typically evaluate the validity and/or reliability of a simple claim about the effects of electromagnetic radiation on matter from a published source.**	**Students scoring at the Proficient level typically evaluate the validity and reliability of claims about the effects of electromagnetic radiation on matter from a variety of published source.**	**Students scoring at the Advanced level typically evaluate the validity and reliability of complex claims about the effects of electromagnetic radiation on matter from a variety of published sources, including complex texts.**

PS1.2 PS1.5 PS3.3	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college- and career- ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career- ready (CCR).	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Constructing Explanations and Designing Solutions **DCI** • PS1.A Structure and Properties of Matter • PS1.B Chemical Reactions • PS3.A Definitions of Energy • ETS1.A Defining and Delimiting Engineering Problems • ETS2.B Interdependence of Science, Engineering, and Technology **CCC** • Patterns • Cause and Effect • Energy and Matter		**Students scoring at the Basic level typically identify and describe basic relationships and construct explanations based on evidence from a variety of sources about patterns relating to the structure and properties of matter; identify how temperature or concentration affects the rate of chemical reactions; and define energy and matter in order to design solutions around defining and delimiting engineering problems and interdependence of science, engineering, and technology.**	**Students scoring at the Proficient level typically construct and revise an explanation based on scientific principles using valid and reliable evidence obtained from a variety of sources to identify patterns relating to the structure and properties of matter; explain how temperature or concentration affects the rate of chemical reactions; and define energy and matter in order to design and refine solutions around defining and delimiting engineering problems and interdependence of science, engineering, and technology.**	**Students scoring at the Advanced level typically construct, evaluate, make inferences, and revise an explanation based on scientific principles using valid and reliable evidence obtained from a variety of sources to identify patterns relating to the structure and properties of matter; predict how temperature or concentration affects the rate of chemical reactions; and define energy and matter in order to design, refine, and evaluate solutions taking into account unanticipated effects around defining and delimiting engineering problems and interdependence of science, engineering, and technology.**

APPENDIX D
PERFORMANCE LEVEL DESCRIPTORS

Oklahoma ELA

Performance Level Descriptor Tables

Oklahoma School Testing Program: Grade 3 English Language Arts Performance Level Descriptors

<table>
<tr><th colspan="2">Advanced
Students demonstrate superior performance on challenging subject matter.
In addition to demonstrating a broad and in depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:</th></tr>
<tr><td>
Consistently choose the best summary of the text and identify the main idea and key details.
Compare and contrast details in literary and nonfiction/informational texts to describe genres.
Frequently identify literary elements, literary devices, and author’s purpose and frequently distinguish fact from opinion.
Consistently infer whether a text is written in first or third person point of view.
Consistently engage in a recursive writing process to create organized written works with a purpose that is clearly communicated for an appropriate audience.
Skillfully use details that support the writing task.
</td><td>
Skillfully use vocabulary knowledge and resources to analyze complex text through word parts, word relationships, and context clues.
Consistently use appropriate and meaningful vocabulary to enhance clarity and effectiveness in their writing.
Consistently identify and apply appropriate use of grammar and mechanics to provide clarity and enhance communication.
Generate a question on a specific topic and consistently locate and use information, including graphic features, to understand the text.
Determine the relevance and reliability of information.
Clearly summarize and present information in an organized and cohesive way.
</td></tr>
</table>

OKLAHOMA Education

Oklahoma School Testing Program: Grade 3 English Language Arts
Performance Level Descriptors

Proficient

Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the **Proficient** level typically:

- Choose the best summary of the text and identify the main idea and key details.
- Compare and contrast details to classify genres.
- Identify literary elements, literary devices, and author’s purpose and distinguish fact from opinion.
- Infer whether a text is written in first or third person point of view.
- Engage in a recursive writing process to create organized written works.
- Create written works for specific purposes and audiences using details that support the writing task.
- Use vocabulary knowledge and resources to interpret text through word parts, word relationships, and context clues.
- Use appropriate vocabulary to write clearly and effectively.
- Frequently identify and apply appropriate use of grammar and mechanics to provide clarity and enhance communication.
- Generate a question on a specific topic, and locate and use information, including graphic features, to understand the text.
- Summarize and present information in an organized way.

Basic

Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.
Students scoring at the **Basic** level typically:

- Inconsistently choose the best summary of the text and have difficulty identifying main ideas and key details.
- Compare and contrast but inconsistently classify genres.
- Inconsistently identify literary elements, literary devices, author’s purpose, or points of view or inconsistently distinguish fact from opinion.
- Inconsistently engage in a recursive writing process to create written works that lack organization.
- Write for a specific purpose but seldom consider the audience.
- Inconsistently support their ideas with details.
- Inconsistently use vocabulary knowledge and resources to interpret text through word parts, word relationships, or context clues.
- Inconsistently use appropriate vocabulary in written works.
- Inconsistently identify and apply appropriate use of grammar and mechanics.
- Generate a question on a topic but ineffectively locate and use information, or imprecisely use graphic features, to understand the text.
- Provide an incomplete summary and present information with lack of clarity.

Below Basic

Students have not performed at least at the **Basic** level.

OKLAHOMA Education

Oklahoma School Testing Program: Grade 4 English Language Arts Performance Level Descriptors

Advanced Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in depth understanding and application of all skills at the **Proficient** level, students scoring at the **Advanced** level typically:	
• Consistently choose the best summary of the text and explain how the details support the main idea. • Compare and contrast details in literary and nonfiction/informational texts to describe and analyze genres. • Consistently recognize the paraphrase of original text. • Consistently identify and describe literary elements, literary devices, author's purpose, accuracy of facts, and text structure in various texts. • Consistently infer meaning from increasingly complex text, including author's purpose and points of view. • Consistently engage in a recursive writing process to create purposeful and organized written works. • Create fully developed and engaging written works for specific purposes and audiences using details that support the writing task.	• Efficiently use vocabulary knowledge and resources to analyze complex text through word parts, word relationships, and context clues. • Consistently use appropriate and meaningful vocabulary to enhance clarity and effectiveness in their writing. • Consistently identify and apply appropriate use of grammar and mechanics to provide clarity and enhance communication. • Generate a viable research question on a specific topic and consistently locate and use information, including graphic features, to interpret the text. • Organize and synthesize relevant and reliable information in order to present findings.

OKLAHOMA Education

Oklahoma School Testing Program: Grade 4 English Language Arts
Performance Level Descriptors

<table>
<tr><th colspan="2">Proficient
Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the Proficient level typically:</th></tr>
<tr><td>

- Choose the best summary of the text and identify the details that support the main idea.
- Compare and contrast details in literary and nonfiction/informational texts to classify genres.
- Recognize the paraphrase of original text most of the time.
- Identify and describe literary elements, literary devices, author's purpose, accuracy of facts, and text structure in various texts.
- Infer meaning from a text including author's purpose and points of view.
- Engage in a recursive writing process to create purposeful written works.

</td><td>

- Select and apply the organizational structure that best fits the mode, purpose, and audience.
- Use vocabulary knowledge and resources to interpret text through word parts, word relationships, and context clues.
- Use appropriate vocabulary to write clearly and effectively.
- Frequently identify and apply appropriate use of grammar and mechanics to provide clarity and enhance communication.
- Generate a viable research question on a specific topic and adequately locate and use information, including graphic features, to interpret the text.
- Organize relevant and reliable information in order to present findings.

</td></tr>
</table>

Oklahoma School Testing Program: Grade 4 English Language Arts Performance Level Descriptors

<table>
<tr><td colspan="2">Basic
Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.
Students scoring at the Basic level typically:</td></tr>
<tr><td>

Inconsistently choose the best summary of the text and have difficulty differentiating main ideas from details.
Compare and contrast details in literary and nonfiction/informational texts but inconsistently classify genres.
Seldom identify the paraphrase of original text.
Inconsistently identify and describe literary elements, literary devices, author’s purpose, points of view, or accuracy of facts.
Inconsistently engage in a recursive writing process to create written works.
Produce writing that lacks organizational structure.

</td><td>

Create underdeveloped written works for specific purposes and audiences with inconsistent use of details.
Inconsistently use vocabulary knowledge and resources to interpret text through word parts, word relationships, or context clues.
Inconsistently use appropriate vocabulary in written works.
Inconsistently identify and apply appropriate use of grammar and mechanics.
Generate a research question on a topic but ineffectively locate and use information, or imprecisely use graphic features, to interpret the text.

</td></tr>
<tr><td colspan="2">Below Basic
Students have not performed at least at the Basic level.</td></tr>
</table>

OKLAHOMA Education

Oklahoma School Testing Program: Grade 5 English Language Arts Performance Level Descriptors

Advanced Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in depth understanding and application of all skills at the **Proficient** level, students scoring at the **Advanced** level typically:	
• Analyze how summaries reflect a meaningful, text-based sequence of the main idea and supporting details. • Compare and contrast details in literary and nonfiction/informational texts to describe and analyze genres. • Consistently recognize the paraphrase of original text. • Evaluate and analyze literary devices, author's purpose, point of view, and accuracy of facts to interpret the meaning of the text as a whole. • Consistently compare and contrast texts, and ideas within and between texts, to support inferences. • Consistently engage in a recursive writing process to create purposeful and organized written works.	• Create thoroughly organized and engaging written works by selecting and applying the organizational structure that best fits the mode, purpose, and audience. • Skillfully use vocabulary knowledge and resources to analyze complex text through word parts, word relationships, and context clues. • Consistently use appropriate and meaningful vocabulary to enhance clarity and effectiveness in their writing. • Consistently identify and apply appropriate use of grammar and mechanics to provide clarity and enhance communication. • Consistently locate, record, and organize relevant and reliable information on a topic in order to synthesize and clearly present findings.

OKLAHOMA Education

Oklahoma School Testing Program: Grade 5 English Language Arts Performance Level Descriptors

Proficient Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level. Students scoring at the **Proficient** level typically:	
• Identify objective text-based summaries that include main idea, supporting details, and a logical sequence of events. • Compare and contrast details in literary and nonfiction/informational texts to classify genres. • Recognize the paraphrase of original text most of the time. • Explain how literary elements, literary devices, author's purpose, point of view, accuracy of facts, and text structure contribute to the meaning of the text. • Compare and contrast texts and ideas within and between texts. • Engage in a recursive writing process to create purposeful written works.	• Select and apply the organizational structure that best fits the mode, purpose, and audience. • Use vocabulary knowledge and resources to interpret text through word parts, word relationships, and context clues. • Use appropriate vocabulary to write clearly and effectively. • Frequently identify and apply appropriate use of grammar and mechanics to provide clarity and enhance communication. • Adequately locate, record, and organize relevant and reliable information on a topic in order to present findings.

Oklahoma School Testing Program: Grade 5 English Language Arts Performance Level Descriptors

<table>
<tr><td colspan="2">Basic
Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.
Students scoring at the Basic level typically:</td></tr>
<tr><td>Inconsistently choose the best summary of the text and have difficulty differentiating main ideas from details.
Compare and contrast details in literary and nonfiction/informational texts but inconsistently classify genres.
Seldom identify the paraphrase of original text.
Identify literary elements, literary devices, author’s purpose, point of view, or accuracy of facts.
Inconsistently compare and contrast texts and ideas within or between texts.
Inconsistently engage in a recursive writing process to create written works.</td><td>Create written works for various purposes and audiences but inconsistently select and apply an organizational structure that fits the writing task.
Inconsistently use vocabulary knowledge and resources to interpret text through word parts, word relationships, or context clues.
Inconsistently use appropriate vocabulary in written works.
Inconsistently identify and apply appropriate use of grammar and mechanics.
Ineffectively locate, record, and organize information on a topic in order to present findings.</td></tr>
<tr><td colspan="2">Below Basic
Students have not performed at least at the Basic level.</td></tr>
</table>

OKLAHOMA Education

Oklahoma School Testing Program: Grade 6 English Language Arts
Performance Level Descriptors

<table>
<tr><th colspan="2">Advanced
Students demonstrate superior performance on challenging subject matter.
In addition to demonstrating a broad and in depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:</th></tr>
<tr><td>

Thoroughly comprehend, interpret, evaluate, and respond to a variety of increasingly complex texts of all literary and informational genres.
Skillfully create an objective summary including main idea and supporting details.
Effectively paraphrase main ideas with supporting details in a text.
Thoroughly compare and contrast stated or implied purposes of authors’ writing.
Thoroughly evaluate literary devices, points of view, and perspectives.
Explicitly analyze how authors use key literary elements to contribute to the meaning of the text.
Consistently categorize facts included in an argument.
Analyze and evaluate complex textual evidence to support inferences and understanding within and between varied texts.
Effectively engage in a recursive writing process to compose narrative, informative, and opinion responses for varied purposes and audiences.
In opinion writing, strategically state an opinion supported with facts and details.

</td><td>

Use fully developed, complex ideas, thorough organization, purposeful word choice, a variety of fluent sentences, and appropriate voice.
Skillfully use context clues, word parts, and reference tools to determine or clarify the meaning of words.
Infer complex relationships among words with multiple meanings.
Select precise vocabulary to communicate ideas in writing and to create a specific effect according to a purpose.
Intentionally apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing.
Demonstrate a strong command of Standard English grammar, mechanics, and usage.
Recognize viable research questions and well-developed thesis statements and use them to find information on a specific topic.
Thoroughly comprehend, evaluate, and synthesize resources.
Skillfully summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.

</td></tr>
</table>

Oklahoma School Testing Program: Grade 6 English Language Arts Performance Level Descriptors

Proficient

Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the **Proficient** level typically:

- Comprehend, interpret, evaluate, and respond to a variety of complex texts of all literary and informational genres.
- Create an objective summary including main idea and supporting details.
- Paraphrase main ideas with supporting details in a text.
- Compare and contrast stated or implied purposes of authors' writing.
- Evaluate literary devices, points of view, and perspectives.
- Analyze how authors use key literary elements to contribute to the meaning of the text.
- Categorize facts included in an argument.
- Analyze textual evidence to support inferences and understanding within and between texts.
- Engage in a recursive writing process to compose narrative, informative, and opinion responses for varied purposes and audiences.
- In opinion writing, introduce a claim and organize reasons and evidence.
- Use fully developed ideas, strong organization, well-chosen words, fluent sentences, and appropriate voice.
- Use context clues, word parts, and reference tools to determine or clarify the meaning of words.
- Infer the relationships among words with multiple meanings.
- Select vocabulary to communicate ideas in writing and to create a specific effect according to a purpose.
- Apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing.
- Demonstrate a command of Standard English grammar, mechanics, and usage.
- Recognize viable research questions and well-developed thesis statements and use them to find information on a topic.
- Record and organize information from various sources.
- Comprehend, evaluate, and synthesize resources.
- Summarize and integrate information following a citation style with guidance and support.
- Summarize and present information in a report.

Oklahoma School Testing Program: Grade 6 English Language Arts Performance Level Descriptors

Basic

Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.

Students scoring at the **Basic** level typically:

- Partially comprehend, interpret, evaluate, and respond to literary and informational texts, applying limited critical thinking skills.
- Create a summary including main idea and limited supporting details.
- Inconsistently paraphrase main ideas with limited supporting details in a text.
- Inconsistently compare and contrast stated or implied purposes of authors' writing.
- Inconsistently identify literary devices, points of view, and perspectives.
- Describe how authors use key literary elements.
- Inconsistently categorize facts included in an argument.
- Inconsistently identify limited textual evidence to support inferences between texts.
- Inconsistently engage in a writing process to compose narrative, informative, and opinion responses for varied purposes and audiences.
- In opinion writing, inconsistently state an opinion supported with limited facts and details.
- Use partially developed ideas, weak organization, and ineffective word choice, sentences, and voice.
- Ineffectively use context clues, word parts, and reference tools to determine the meaning of words.
- Sometimes infer the relationships among words with multiple meanings.
- Use a limited vocabulary to communicate ideas in writing and to create an effect according to a purpose.
- Inconsistently apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing.
- Demonstrate a limited command of Standard English grammar, mechanics, and usage.
- Sometimes recognize viable research questions and well-developed thesis statements and use them to find information on a specific topic.
- Partially comprehend, evaluate, and synthesize resources.
- Ineffectively summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.

Below Basic

Students have not performed at least at the **Basic** level.

Oklahoma School Testing Program: Grade 7 English Language Arts
Performance Level Descriptors

Advanced Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in depth understanding and application of all skills at the **Proficient** level, students scoring at the **Advanced** level typically:	
• Thoroughly comprehend, interpret, evaluate, and respond to a variety of increasingly complex texts of all literary and informational genres. • Skillfully create an objective summary including main idea and supporting details. • Effectively paraphrase main ideas with supporting details in a text. • Thoroughly compare and contrast stated or implied purposes of authors' writing. • Thoroughly evaluate literary devices, points of view, and perspectives. • Explicitly analyze how authors use key literary elements to contribute to the meaning of the text. • Consistently distinguish factual claims from opinions. • Analyze and evaluate complex textual evidence to support inferences and understanding within and between varied texts. • Effectively engage in a recursive writing process to compose narrative, informative, and opinion responses for varied purposes and audiences. • In argumentative writing, strategically introduce a claim and organize well-developed reasons and evidence.	• Use fully developed, complex ideas, thorough organization, purposeful word choice, a variety of fluent sentences, and appropriate voice. • Skillfully use context clues, word parts, and reference tools to determine or clarify the meaning of words. • Infer complex relationships among words with multiple meanings. • Select precise vocabulary to communicate ideas in writing and to create a specific effect according to a purpose. • Intentionally apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing. • Demonstrate a strong command of Standard English grammar, mechanics, and usage. • Recognize viable research questions and well-developed thesis statements and use them to find information on a specific topic. • Thoroughly comprehend, evaluate, and synthesize resources. • Skillfully summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.

OKLAHOMA Education

Oklahoma School Testing Program: Grade 7 English Language Arts
Performance Level Descriptors

<table>
<tr><th colspan="2">Proficient
Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the Proficient level typically:</th></tr>
<tr><td>
Read and comprehend increasingly complex literary and informational texts.
Create an objective summary including main idea and supporting details.
Paraphrase main ideas with supporting details in a text.
Compare and contrast stated or implied purposes of authors' writing.
Evaluate literary devices, points of view, and perspectives.
Analyze how authors use key literary elements to contribute to the meaning of the text.
Distinguish factual claims from opinions.
Analyze and evaluate textual evidence to support inferences and draw simple, logical conclusions between and across multiple texts.
Engage in a recursive writing process to compose narrative, informative, and argumentative responses for varied purposes and audiences.
In argumentative writing, introduce a claim and organize reasons and evidence.
</td><td>
Use fully developed ideas, strong organization, well-chosen words, fluent sentences, and appropriate voice.
Use context clues, word parts, and reference tools to determine or clarify the meaning of words.
Infer the relationships among words with multiple meanings.
Select vocabulary to communicate ideas in writing and to create a specific effect according to a purpose.
Apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing.
Demonstrate a command of Standard English grammar, mechanics, and usage.
Recognize viable research questions and well-developed thesis statements and use them to find information on a topic.
Comprehend, evaluate, and synthesize resources.
Summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.
</td></tr>
</table>

OKLAHOMA Education

Oklahoma School Testing Program: Grade 7 English Language Arts Performance Level Descriptors

<table>
<tr><td colspan="2">Basic
Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.
Students scoring at the Basic level typically:</td></tr>
<tr><td>
• Partially comprehend, interpret, evaluate, and respond to literary and informational texts, applying limited critical thinking skills.
• Create a summary including main idea and limited supporting details.
• Inconsistently paraphrase main ideas with limited supporting details in a text.
• Inconsistently compare and contrast stated or implied purposes of authors’ writing.
• Inconsistently identify literary devices, points of view, and perspectives.
• Describe how authors use key literary elements.
• Inconsistently distinguish factual claims from opinions.
• Inconsistently identify limited textual evidence to support inferences and draw weak conclusions between texts.
• Inconsistently engage in a writing process to compose narrative, informative, and argumentative responses for varied purposes and audiences.
• In argumentative writing, introduce a claim, reasons, and evidence.
</td><td>
• Use partially developed ideas, weak organization, and ineffective word choice, sentences, and voice.
• Ineffectively use context clues, word parts, and reference tools to determine the meaning of words.
• Sometimes infer the relationships among words with multiple meanings.
• Use a limited vocabulary to communicate ideas in writing and to create an effect according to a purpose.
• Inconsistently apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing.
• Demonstrate a limited command of Standard English grammar, mechanics, and usage.
• Sometimes recognize viable research questions and well-developed thesis statements and use them to find information on a specific topic.
• Partially comprehend, evaluate, and synthesize resources.
• Ineffectively summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.
</td></tr>
<tr><td colspan="2">Below Basic
Students have not performed at least at the Basic level.</td></tr>
</table>

OKLAHOMA Education

Oklahoma School Testing Program: Grade 8 English Language Arts
Performance Level Descriptors

<table>
<tr><th colspan="2">Advanced
Students demonstrate superior performance on challenging subject matter.
In addition to demonstrating a broad and in depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:</th></tr>
<tr><td>
Thoroughly comprehend, interpret, evaluate, and respond to literary and informational texts, applying critical thinking skills.
Skillfully evaluate literary devices, points of view, and perspectives.
Skillfully analyze how authors use key literary elements to contribute to the meaning of the text.
Explicitly analyze and evaluate textual evidence to support inferences and conclusions between and across multiple texts.
Effectively engage in a recursive writing process to compose narrative, informative, and argumentative responses for varied purposes and audiences.
In argumentative writing, introduce a claim, counterclaim, and support with logical reasons and evidence.
Synthesize fully developed ideas, strong organization, well-chosen words, fluent sentences, and appropriate voice.
Skillfully use context clues, word parts, and reference tools to determine or clarify the meaning of words.
</td><td>
Infer complex relationships among words with multiple meanings.
Select precise vocabulary to communicate ideas in writing and to create a specific effect according to a purpose.
Intentionally apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing.
Demonstrate a strong command of Standard English grammar, mechanics, and usage.
Recognize viable research questions and well-developed thesis statements and use them to find information on a specific topic.
Thoroughly comprehend, evaluate, and synthesize resources.
Skillfully summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.
</td></tr>
</table>

Oklahoma School Testing Program: Grade 8 English Language Arts Performance Level Descriptors

Proficient Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level. Students scoring at the **Proficient** level typically:	
• Read, comprehend, interpret, evaluate, and respond to literary and informational texts, applying critical thinking skills. • Evaluate literary devices, points of view, and perspectives. • Analyze how authors use key literary elements to contribute to the meaning of the text. • Analyze and evaluate textual evidence to support inferences and conclusions between and across multiple texts. • Engage in a recursive writing process to compose narrative, informative, and argumentative responses for varied purposes and audiences. • In argumentative writing, introduce a claim, recognize a claim from an opposing viewpoint, and organize reasons and evidence. • Use fully developed ideas, strong organization, well-chosen words, fluent sentences, and appropriate voice.	• Use context clues, word parts, and reference tools to determine or clarify the meaning of words. • Infer the relationships among words with multiple meanings. • Select vocabulary to communicate ideas in writing and to create a specific effect according to a purpose. • Apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing. • Demonstrate a command of Standard English grammar, mechanics, and usage. • Recognize viable research questions and well-developed thesis statements and use them to find information on a specific topic. • Comprehend, evaluate, and synthesize resources. • Summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.

OKLAHOMA Education

Oklahoma School Testing Program: Grade 8 English Language Arts
Performance Level Descriptors

Basic Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level. Students scoring at the **Basic** level typically:	
• Partially comprehend, interpret, evaluate, and respond to literary and informational texts, applying limited critical thinking skills. • Inconsistently evaluate literary devices, points of view, and perspectives. • Inconsistently analyze how authors use key literary elements to contribute to the meaning of the text. • Inconsistently analyze and evaluate textual evidence to support inferences and conclusions between or across multiple texts. • Inconsistently engage in a writing process to compose narrative, informative, and argumentative responses for varied purposes and audiences. • In argumentative writing, introduce a claim and provide reasons and evidence. • Use partially developed ideas, weak organization, ineffective word choice, basic sentences, or inconsistent voice.	• Ineffectively use context clues, word parts, and reference tools to determine the meaning of words. • Sometimes infer the relationships among words with multiple meanings. • Use a limited vocabulary to communicate ideas in writing and to create an effect according to a purpose. • Inconsistently apply knowledge of grammar and rhetorical style to analyze and evaluate a variety of texts in reading and writing. • Demonstrate a limited command of Standard English grammar, mechanics, and usage. • Sometimes recognize viable research questions and well-developed thesis statements and use them to find information on a specific topic. • Partially comprehend, evaluate, and synthesize resources. • Ineffectively summarize and paraphrase, integrate evidence, and cite sources to create written works for multiple purposes.
Below Basic Students have not performed at least at the **Basic** level.	

OKLAHOMA Education

College- and Career-Readiness Assessment: English Language Arts Performance Level Descriptors

Advanced

Students at this level have a 94% probability of earning a C or higher and a 75% probability of earning a B or higher in credit bearing history, literature, social sciences, or writing courses at 4 year institutions. The average first year college GPA at this level is a 3.3 or above (low B or higher). Students at this level are highly likely to be on track for success in college or career.

Students demonstrate superior performance with challenging subject matter and clearly exhibit readiness for college and career. In addition to demonstrating broad and in depth understanding and application of all skills in the **Proficient** Level, students scoring at the **Advanced** Level typically:

- Thoroughly comprehend, analyze, and synthesize information from literary and informational texts, applying a wide range of close reading skills across a range of subject areas and complexity levels.
- Skillfully locate and paraphrase details, make logical inferences to support generalizations, grasp the central idea of texts, and understand complex thoughts and comparative relationships involving abstract concepts.
- Use knowledge about the author's craft and the text structure to interpret important features of the whole text, such as an author's rhetorical purpose; also analyze character point of view in texts.
- Skillfully integrate knowledge and ideas from across multiple related texts, analyzing the texts to find evidence in support of a claim.
- Blend multiple modes of writing to produce complex argumentative essays on substantive topics.
- Produce writing that productively and critically engages with multiple perspectives, establishes a thesis claim, and examines implications and complexities.
- Develop ideas and support claims with persuasive evidence, using reasoning and illustration to enhance the central claim.
- Purposefully engage in a recursive writing process to create a skillful organization with logical sequencing and transitions that establish and clarify relationships among ideas.
- Use language to convey subtle shades of meaning with a style that enhances the writing purpose.
- Use sentence structures that are consistently varied and clear.
- Skillfully interpret vocabulary, including figurative language, inferring the meaning of words and phrases by using context.
- Demonstrate sophisticated understanding of general academic and domain-specific vocabulary.
- Maintain a consistent and appropriate tone in their writing through subtle and effective word choices.
- Skillfully apply knowledge of the English language and rhetorical style to make meaning when analyzing, evaluating, producing, and revising texts.
- Recognize subtle disturbances in sentence structure.
- Demonstrate a thorough command of the conventions of English grammar, usage, and mechanics.

OKLAHOMA Education

College- and Career-Readiness Assessment: English Language Arts
Performance Level Descriptors

Proficient

Students at this level have approximately an 80% or higher probability of earning a C or higher in credit bearing history, literature, social sciences, or writing courses at all levels of higher education. The average first year college GPA at this level is between a 2.8 and 3.3 (high C to low B). Students at this level are likely to be on track for success in college or career.

Students demonstrate mastery with subject matter and exhibit readiness for college and career.
In addition to demonstrating understanding and application of all skills in the **Basic** Level, students scoring at the **Proficient** Level typically:

- Comprehend, analyze, and synthesize information from literary and informational texts, applying various close reading skills across a range of subject areas and complexity levels.
- Recognize accurate summaries, locate and paraphrase key details, make logical inferences, determine central ideas, and understand relationships between characters and important concepts.
- Use knowledge about the author's craft and the text structure to determine the main purpose of parts of the text and analyze the effect on the meaning produced by a specific detail.
- Integrate knowledge and ideas from across multiple related texts, analyzing elements that are similar in two passages.
- Blend multiple modes of writing to produce effective argumentative essays on substantive topics.
- Produce writing that engages with multiple perspectives, establishes a thesis claim, and provides analysis that recognizes implications and complexities.
- Develop ideas and support claims with relevant evidence, using reasoning and illustration to clarify the argument.
- Engage in a recursive writing process to create a clear organization with logical grouping and transitions that establish relationships among ideas.
- Use language to convey meaning with a style appropriate to the writing purpose.
- Use sentence structures that are clear and show some variety.
- Interpret vocabulary, including figurative language, inferring the meaning of words and phrases by using context.
- Demonstrate understanding of general academic and some domain-specific vocabulary.
- Maintain a consistent and appropriate tone in their writing through word choice.
- Apply knowledge of the English language and rhetorical style to make meaning when analyzing, evaluating, producing, and revising texts.
- Recognize disturbances in sentence structure.
- Demonstrate a command of the conventions of English grammar, usage, and mechanics.

OKLAHOMA Education

College- and Career-Readiness Assessment: English Language Arts
Performance Level Descriptors

Basic

Students at this level have a 60% or higher probability of earning a C or higher in credit bearing history, literature, social sciences, or writing courses across all levels of higher education. The average first year college GPA at this level is between a 2.4 and 2.7 (mid to high C). Students at this level likely require additional coursework and/or support to be on track for success in college or career.

Students demonstrate partial mastery with subject matter but may not exhibit readiness for college and career.
In addition to demonstrating understanding and application of all skills in the **Below Basic** Level, students scoring at the **Basic** Level typically:

- Comprehend, analyze, and synthesize information from literary and informational texts, applying limited close reading skills across a range of subject levels and complexity levels.
- Inconsistently locate explicitly stated details, make inferences about characters and actions, and identify central ideas when they are clearly stated
- Sometimes use knowledge about the author's craft and the text structure to determine the text's primary purpose and the function of key textual elements.
- Identify knowledge and ideas from across multiple related texts, comparing details that texts have in common.
- Attempt to blend multiple modes of writing to produce argumentative essays on substantive topics.
- Produce writing that responds to multiple perspectives, establishes a thesis claim that shows some clarity in thought, and provides limited analysis of the issue.
- Develop ideas and support claims with some relevant evidence that is often overly general, sometimes using basic reasoning and illustration that may be repetitious.
- Attempt to use a recursive writing process and create a simple organization with some transitions that establish relationships among ideas.
- Use language that is sometimes imprecise to convey meaning.
- Use sentence structures that are usually clear but show little variety.
- Interpret vocabulary, including basic figurative language, sometimes inferring the meaning of key words and phrases by using the context.
- Demonstrate understanding of familiar and some general academic vocabulary.
- Make inconsistent word choices and may use inappropriate tone in their writing.
- Inconsistently apply knowledge of the English language and rhetorical style to make meaning when analyzing, evaluating, producing, and revising texts.
- May recognize obvious disturbances in sentence structure.
- Demonstrate an inconsistent command of the conventions of English grammar, usage, and mechanics.

Below Basic

Students have not performed at least at the **Basic** level.

OKLAHOMA Education

Oklahoma Mathematics

Performance Level Descriptor Tables

Oklahoma School Testing Program: Grade 3 Mathematics
Performance Level Descriptors

Advanced

Students demonstrate superior performance on challenging subject matter.
In addition to demonstrating a broad and in depth understanding and application of all skills at the **Proficient** level, students scoring at the **Advanced** level typically:

- Complete complex addition, subtraction, and multiplication problems and model division facts.
- Order fractions using models and compose and decompose fractions related to the same whole.
- Extend patterns and generate real-world situations to represent number sentences.
- Determine volume and elapsed time.
- Summarize complex data sets and analyze the data to solve problems.
- Solve complex and non-routine real-world problems, draw logical conclusions and justify solutions.

Proficient

Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the **Proficient** level typically:

- Compare and order whole numbers.
- Complete addition, subtraction, and multiplication problems and recognize the relationship between multiplication and division.
- Construct and compare fractions using models.
- Select the fewest number of coins for a given amount of money.
- Determine rules to describe basic patterns.
- Determine unknowns in equations and apply number properties.
- Classify angles.
- Sort three-dimensional figures and determine the perimeter of polygons.
- Determine the area of two-dimensional figures.
- Read and analyze length, temperature, and time. Students summarize a data set and analyze the data to solve problems.
- Solve real-world problems and employ problem-solving strategies of identifying and using appropriate information.

OKLAHOMA Education

Oklahoma School Testing Program: Grade 3 Mathematics
Performance Level Descriptors

Basic Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level. Students scoring at the **Basic** level typically:	
• Represent whole numbers. • Complete simple addition, subtraction, and multiplication problems. • Read and write fractions. • Determine the value of a set of coins or bills.	• Determine rules to describe simple patterns. Students determine unknowns in simple equations. • Identify right angles. • Choose an appropriate instrument to measure an object. • Read and write time from a digital clock.
Below Basic Students have not performed at least at the **Basic** level.	

Oklahoma School Testing Program: Grade 4 Mathematics
Performance Level Descriptors

<table>
<tr><th colspan="2">Advanced
Students demonstrate superior performance on challenging subject matter.
In addition to demonstrating a broad and in depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:</th></tr>
<tr><td>Estimate and solve complex mathematical problems and determine the unknown in non-equivalent expressions.
Compare decimals and fractions.
Solve complex money problems.
Determine a rule and extend a complex pattern.
Determine and represent unknown values in complex problems.</td><td>Determine volume.
Solve complex measurement problems.
Represent complex data sets and solve problems involving the data.
Solve complex and non-routine real-world problems, draw logical conclusions and justify solutions.</td></tr>
<tr><th colspan="2">Proficient
Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the Proficient level typically:</th></tr>
<tr><td>Estimate and solve mathematical problems.
Use models to determine equivalent fractions, compare and order fractions, and add and subtract fractions.
Read and write decimals and make connections between decimals and fractions.
Determine change using coins.
Determine rules and extend patterns.
Determine unknown values in mathematical problems.</td><td>Describe parts of geometrical figures and identify similarities in three-dimensional figures.
Decompose and determine the area of polygons.
Solve measurement problems.
Represent data sets and solve problems involving the data.
Solve real-world problems and employ problem-solving strategies of identifying and using appropriate information.</td></tr>
</table>

OKLAHOMA
Education

Oklahoma School Testing Program: Grade 4 Mathematics
Performance Level Descriptors

Basic Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level. Students scoring at the **Basic** level typically:	
• Demonstrate the ability to estimate and solve simple mathematical problems. • Use models to determine simple equivalent fractions, compare and order whole numbers and simple fractions, and decompose fractions. • Read and write simple decimals and compare and order whole numbers and decimals.	• Determine change using whole dollars. • Determine a rule and extend a simple pattern. • Determine unknown values in simple mathematical problems. • Identify quadrilaterals and determine the area of simple polygons. • Identify appropriate units and tools to measure.
Below Basic Students have not performed at least at the **Basic** level.	

Oklahoma School Testing Program: Grade 5 Mathematics
Performance Level Descriptors

<table>
<tr><th colspan="2">Advanced
Students demonstrate superior performance on challenging subject matter.
In addition to demonstrating a broad and in depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:</th></tr>
<tr><td>• Interpret the remainder of division problems within the context of the problem.
• Order decimals, fractions, and whole numbers.
• Evaluate complex expressions, equations, and inequalities.
• Construct geometric figures and identify them in various contexts.</td><td>• Compare the volume, perimeter, or surface area of geometric figures.
• Analyze complex graphs.
• Solve complex and non-routine real-world problems, draw logical conclusions and justify solutions.</td></tr>
<tr><th colspan="2">Proficient
Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the Proficient level typically:</th></tr>
<tr><td>• Estimate and solve division problems with the remainder represented as a fraction or decimal.
• Generate equivalent decimals and fractions, represent whole numbers or decimals, and compare fractions and decimals, including mixed numbers.
• Estimate, add, and subtract decimals and fractions.
• Describe patterns of change and graph these patterns as ordered pairs on a coordinate plane.
• Evaluate expressions, equations, and inequalities.</td><td>• Solve volume and perimeter problems and simple surface area problems.
• Determine reasonable values for the perimeter of shapes with curves.
• Compare angles.
• Recognize relationships within a measurement system.
• Determine the mean, median, mode, and range of a data set and analyze simple graphs.
• Solve real-world problems and employ problem-solving strategies of identifying and using appropriate information.</td></tr>
</table>

OKLAHOMA Education

Oklahoma School Testing Program: Grade 5 Mathematics
Performance Level Descriptors

Basic
Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.
Students scoring at the **Basic** level typically:

- Estimate and solve division problems with remainders and solve addition and subtraction real-world problems.
- Recognize basic equivalent decimals and fractions, represent whole numbers, and compare and order fractions or decimals.
- Add and subtract decimals and fractions with like denominators.
- Describe simple patterns of change and identify ordered pairs on a coordinate plane.
- Evaluate simple equivalent numerical expressions or equations.
- Describe and classify geometric figures.
- Solve simple volume and perimeter problems.
- Choose an appropriate instrument to measure objects and read and analyze the length of objects.
- Read and analyze the measure of angles.
- Read simple graphs.

Below Basic
Students have not performed at least at the **Basic** level.

Oklahoma School Testing Program: Grade 6 Mathematics
Performance Level Descriptors

Advanced Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in depth understanding and application of all skills at the **Proficient** level, students scoring at the **Advanced** level typically:	
• Estimate and solve complex problems requiring unit conversions. • Use the distance between points and transformations to solve complex problems involving congruent figures.	• Analyze the differences between two outcomes of simple experiments. • Solve complex and non-routine real-world problems, draw logical conclusions and justify solutions.
Proficient Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level. Students scoring at the **Proficient** level typically:	
• Estimate, illustrate, and simplify the addition and subtraction of integers and assess the reasonableness of an answer. • Solve ratio and unit rate problems. • Estimate and illustrate the multiplication and division of non-negative rational numbers. • Evaluate the validity of the value of a variable. • Generate expressions, equations, and inequalities. • Interpret the solution of an equation and assess the reasonableness of the solution. • Determine the area of polygons and composite figures. • Use relationships between angles and the triangle sum theorem to solve problems.	• Estimate and solve problems requiring unit conversion. • Predict transformations, analyze lines of symmetry, and use the distance between points and transformations to solve problems involving congruent figures. • Explain and justify which measure of central tendency provides the most descriptive information for a data set. • Create and analyze box-and-whisker plots and explain and compare possible outcomes of simple experiments. • Solve real-world problems and employ problem-solving strategies of identifying and using appropriate information.

OKLAHOMA Education

Oklahoma School Testing Program: Grade 6 Mathematics
Performance Level Descriptors

<table>
<tr><th colspan="2">Basic
Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.
Students scoring at the Basic level typically:</th></tr>
<tr><td>

Read, order, represent, and explain rational numbers expressed as fractions, decimals, percents, and ratios.
Write positive integers as products of factors.
Illustrate or simplify the addition and subtraction of integers.
Identify and compare quantities, determine unit rates, and find equivalent fractions and percents.
Multiply and divide non-negative rational numbers. Students graph ordered pairs in all quadrants.
Represent reflective relationships between varying quantities.

</td><td>

Evaluate the value of a variable in expressions, equations, and inequalities.
Use number sense and properties of operations to solve equations and graph the solution.
Determine the area of parallelograms and triangles.
Identify angle relationships by name.
Identify and display the effect of transformations.
Identify lines of symmetry.
Calculate measures of central tendency, determine the sample space of simple experiments, and identify possible outcomes.

</td></tr>
<tr><th colspan="2">Below Basic
Students have not performed at least at the Basic level.</th></tr>
</table>

Oklahoma School Testing Program: Grade 7 Mathematics
Performance Level Descriptors

<table>
<tr><th colspan="2">Advanced
Students demonstrate superior performance on challenging subject matter.
In addition to demonstrating a broad and in depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:</th></tr>
<tr><td>• Interpret equations and inequalities involving variables and rational numbers.
• Make connections between circumference and area to solve problems involving circles.
• Analyze, apply, and display the effect of dilations and multiple transformations.</td><td>• Use central tendencies and range, predict data and select an appropriate data display, and predict theoretical probability.
• Solve complex and non-routine real-world problems, draw logical conclusions and justify solutions.</td></tr>
<tr><th colspan="2">Proficient
Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level.
Students scoring at the Proficient level typically:</th></tr>
<tr><td>• Estimate solutions of problems involving rational numbers and assess the reasonableness of the solutions.
• Differentiate between proportional and inversely proportional relationships and identify the constant of proportionality.
• Represent proportional relationships in a variety of ways.
• Use representations to identify and compare unit rates.
• Solve problems involving proportional relationships and assess the reasonableness of solutions.</td><td>• Represent, solve, and write equations.
• Solve simple inequalities.
• Generate and evaluate equivalent expressions with justification of steps.
• Interpret theoretical probability and draw conclusions. Students apply the effect of dilations and transformations.
• Solve real-world problems and employ problem-solving strategies of identifying and using appropriate information.</td></tr>
</table>

OKLAHOMA Education

Oklahoma School Testing Program: Grade 7 Mathematics
Performance Level Descriptors

Basic Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level. Students scoring at the **Basic** level typically:	
• Recognize, compare, and order rational numbers. • Create equivalent representations of rational numbers. • Calculate and model mathematical problems involving rational numbers and exponents. • Calculate the absolute value of a rational number. • Describe and identify a proportional relationship. • Identify and solve problems involving ratios and unit rates. • Represent, solve, and write simple equations. • Represent, write, and graph simple inequalities.	• Evaluate expressions using the order of operations. • Determine the surface area and volume of rectangular prisms and calculate the area and perimeter of trapezoids. • Calculate the circumference and area of circles. • Describe the effect of dilations and transformations. • Calculate the measures of central tendencies and range and determine appropriate data displays. • Calculate theoretical probability.
Below Basic Students have not performed at least at the **Basic** level.	

Oklahoma School Testing Program: Grade 8 Mathematics
Performance Level Descriptors

Advanced Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in depth understanding and application of all skills at the **Proficient** level, students scoring at the **Advanced** level typically:	
• Generate, simplify, and evaluate complex equivalent expressions. • Make connections between volume and surface area to solve problems involving solids. • Compare the volume and surface area of different solids.	• Describe the impact on central tendencies of a data set with multiple outliers and when inserting or deleting multiple data points. • Solve complex and non-routine real-world problems, draw logical conclusions and justify solutions.

Proficient Students demonstrate mastery over appropriate grade level subject matter and readiness for the next grade level. Students scoring at the **Proficient** level typically:	
• Solve complex and non-routine real-world problems, draw logical conclusions and justify solutions. • Generate, simplify, and evaluate equivalent expressions. • Classify and explain operational closure of rational and irrational numbers. • Distinguish between a linear and nonlinear function. • Identify independent and dependent variables. • Describe, analyze, and represent linear functions with two variables and translate between representations.	• Use and apply the Pythagorean Theorem. • Describe the impact on central tendencies of a data set with an outlier and when inserting or deleting a data point. • Interpret a scatterplot, determine the rate of change, and use a line of best fit to make predictions. • Calculate, interpret, and predict experimental probability and generalize samples to populations. • Solve real-world problems and employ problem-solving strategies of identifying and using appropriate information.

OKLAHOMA Education

Oklahoma School Testing Program: Grade 8 Mathematics
Performance Level Descriptors

Basic

Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.
Students scoring at the **Basic** level typically:

- Simplify and generate simple equivalent expressions, including expressions in scientific notation.
- Translate between standard form and scientific notation.
- Identify and compare real numbers.
- Recognize if a graph represents a linear function.
- Identify intercepts and slope from the graph of a line.
- Identify the effect on the graph of a linear function when characteristics are changed.
- Solve and graph equations and inequalities.
- Use the Pythagorean Theorem to identify right triangles and to find the length of the hypotenuse.
- Calculate the surface area and volume of solids.
- Identify the outliers of a data set.
- Identify the line of best fit from a given scatterplot and determine if the rate of change is positive or negative.
- Calculate the experimental probability of single events, identify sample spaces, and classify events as independent or dependent.

Below Basic

Students have not performed at least at the **Basic** level.

College- and Career-Readiness Assessment: Mathematics
Performance Level Descriptors

Advanced

Students at the Advanced level have a 90% probability of earning a C or higher and a 66% probability of earning a B or higher in credit bearing math courses at 4 year institutions. Their average first year college GPA at this level is a 3.3 or above (low B or higher). Students at this level are highly likely to be on track to be successful at the next level.

Students demonstrate superior performance with challenging subject matter and clearly exhibit readiness for college and career. In addition to demonstrating broad and in depth understanding and application of all skills in the Proficient Level, students scoring at the Advanced Level typically:

- Rewrite rational, radical, and exponential expressions.
- Find the value of i^n for any whole number n.
- Perform operations on complex numbers.
- Add, subtract, and perform scalar multiplication on matrices.
- Interpret a term in a linear function of a challenging context.
- Make connections between different representations of, linear functions, systems of two linear equations, and systems of two linear inequalities in two variables.
- Determine the conditions under which a system of two linear equations in two has no solution, one solution, or infinitely many solutions.
- Create and use a linear equation in two variables that represents a challenging context.
- Create and solve a 3-variable linear system.
- Create and use an inequality in one or two variables that represents a challenging context.
- Make connections between the graph and solution to a quadratic and linear system of equations.
- Given a graph of a quadratic or exponential function representing a context, interpret a value, variable, point, or input-output pair in terms of the context.
- Solve absolute value, logarithmic, polynomial, rational, radical, and exponential equations in real-world and mathematical problems.
- Solve quadratic equations with complex solutions.
- Analyze graphs relationships between two quantities, including relationships that are not represented by a linear, quadratic, or exponential equation.
- Identify characteristics of graphs of functions.
- Identify the effect of multiple transformations of functions.
- Find inverse functions.
- Divide polynomials.
- Solve challenging radical and rational equations.
- Solve problems involving arithmetic and geometric sequences and series.
- Identify an appropriate inference or conclusion based on information from a graph, table, or scatterplot.
- Identify the equation of a line or curve that best fits the data in a scatterplot.
- Identify the appropriate conclusion to draw from a description of a study's design and the study results.
- Compare measures of center and spread of two data distributions represented visually.

Advanced (cont.)	
• Find the probability of a compound event. • Recognize the effect of standard deviation. • Count using the Fundamental Counting Principle, combinations, and permutations, including when cases overlap. • Identify the most appropriate sample or sampling method to best answer the question of interest. • Identify the population to which the results of a survey can be generalized. • Understand sampling variability when the population proportion is estimated using sample data. • Use similarity as well as theorems related to lines, angles, and triangles to solve problems. • Find the diameter, radius, center, or points on a circle in coordinate plane.	• Solve problems using properties of special right triangles, the Pythagorean Theorem or its converse, and trigonometric ratios. • Solve problems using properties and theorems relating to circles and parts of circles, such as radii, diameters, tangents, angles, arcs, arc length, and sector area. • Apply the triangle inequality theorem. • Recognize congruencies that appear through the use of auxiliary lines. • Determine an expression for the area of a regular polygon in terms of side length or apothem/altitude. • Find area and volume of composite shapes. • Convert area and volume to different units.

College- and Career-Readiness Assessment: Mathematics
Performance Level Descriptors

Proficient

Students at the Proficient level have approximately a 75% or higher probability of earning a C or higher in credit bearing math courses at all levels of higher education. Their average first year college GPA at this level is between a 2.9 and 3.3 (high C to low B). Students at this level are likely to be on track to be successful at the next level.

Students demonstrate mastery with subject matter and exhibit readiness for college and career. In addition to demonstrating understanding and application of all skills in the Basic Level, students scoring at the Proficient Level typically:

- Rationalize numeric expressions.
- Convert numbers with rational exponents to radical form.
- Simplify cube roots.
- Use properties of radicals and exponents to rewrite expressions.
- Evaluate slope in given contexts.
- Interpret terms in linear functions and make connections between different representations.
- Determine the number of solutions linear systems of two equations have.
- Create and solve linear equations within context.
- Create and use inequalities within context.
- Graph compound linear inequalities.
- Interpret the constant, variable, term, solution, or input-output pair in quadratic or exponential functions in context.
- Add, subtract, and multiply polynomials.
- Solve multistep quadratic equations.
- Solve radical equations.
- Solve rational equations.
- Solve systems of equations with one linear and one quadratic equation.
- Solve literal equations for a given variable.
- Use Venn diagrams to make conclusions.
- Make connections between the various representations of quadratic or exponential functions.
- Factor polynomial expressions.
- Determine the number of solutions quadratic equations have.
- Create and/or use quadratic or exponential functions to represent real-world contexts.
- Graph polynomial functions.
- Evaluate the effects of single function transformations.
- Evaluate logarithmic, polynomial, rational, radical, and exponential functions, including where they are undefined.
- Find near terms in geometric sequences.
- Compose 2 functions.
- Evaluate conclusions of population proportions based on sample data and margins of error.
- Identify bias in sampling methods.
- Interpret scatterplots and use lines of best fit to make predictions.
- Calculate, compare, and interpret measures of central tendency in context.
- Determine probabilities of compound events.
- Find probabilities where the sample space must be determined from the context.
- Solve problems using properties of right triangles.

Proficient (cont.)	
• Make connections between the equation of a circle in a coordinate plane and the center and radius of the circle. • Solve simple problems using properties and theorems relating to circles and parts of circles. • Solve problems using properties of similar triangles. • Find the measure of interior angles of polygons. • Solve problems using the midpoint formula. • Solve problems using multiple theorems related to lines, angles, or triangles.	• Solve problems involving circumference, area, surface area, perimeter and volume. • Solve problems involving translations, rotations, and reflections. • Solve problems using the Pythagorean Theorem. • Solve problems using the distance formula. • Solve problems involving right triangles using trigonometric functions.

College- and Career-Readiness Assessment: Mathematics
Performance Level Descriptors

Basic

Students at this level have a 50% or higher probability of earning a C or higher in credit bearing math courses across all levels of higher education. Their average first year college GPA at this level is between a 2.4 to 2.8 (mid to high C student). Students at this level likely require additional coursework and/or support to be on track for college and/or career success.

Students demonstrate partial mastery with subject matter but may not exhibit readiness for college and career. In addition to demonstrating understanding and application of all skills in the Below Basic Level, students scoring at the Basic Level typically:

- Add complex numbers and add matrices.
- Simplify square roots.
- Rewrite monomials with integer exponents to have positive exponents.
- Create linear expressions, equations or inequalities to model contexts.
- Create systems of two linear equations to model contexts.
- Solve systems of two linear equations with integer coefficients.
- Make connections between different representations of linear relationships between two variables.
- Create and use linear relationships to solve a problem.
- Multiply polynomials by monomials.
- Multiply binomials.
- Factor monomials from polynomial expressions.
- Factor trinomials.
- Add and subtract polynomials.
- Solve quadratic equations in the form $aaxx^2 = bb$.
- Solve simple radical equations.
- Use function notation to represent functions.
- Evaluate absolute value functions.
- Evaluate simple algebraic expressions.
- Identify the shape of graphs from some of their points.
- Identify graphs of nonlinear relationships between two variables based on descriptions of characteristics.
- Read and interpret information presented in graphs, scatterplots, or tables.
- Find the median or mean of data sets.
- Find probabilities of simple events.
- Estimate expected population counts or proportions from sample counts or proportions.
- Find probabilities of simple compound events.
- Calculate simple conditional probabilities.
- Solve simple problems about geometric figures using the vertical angle theorem, the triangle angle sum theorem, or theorems about a transversal crossing parallel lines.
- Solve real-world problems using the Pythagorean Theorem.
- Solve simple problems involving perimeter, area and volume.
- Identify corresponding parts of congruent triangles.
- Translate points horizontally and vertically on a coordinate plane.

Below Basic

Students have not performed at least at the **Basic** level.

OKLAHOMA Education

Oklahoma Grade 5 Science

Range Performance Level Descriptor Tables

Advanced

Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in-depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:

- **analyze scale, proportion, quantity and patterns when performing computational thinking to complex data as it pertains to the distribution of water on Earth, conservation of matter, and Earth's relationship with the Sun, Moon, and stars.**
- **predict, modify, and extend complex models at various scales to analyze the movement of matter and energy between organisms, ecosystems, and Earth's systems and analyze the outcomes of these interactions.**
- **analyze and compare evidence, data, and models to engage in argument to explain the cause-and-effect relationships between an object and Earth's gravity, how scale and proportion affect the apparent brightness of the Sun and other stars, and/or how plants use matter (chiefly air and water) to grow.**
- **observe and measure phenomena to interpret and evaluate patterns that classify materials based on properties or describe complex cause-and-effect relationships when mixing substances within an investigation framework.**
- **combine and compare multiple pieces of information to explain the impacts of human activities on Earth's systems and how solutions can be designed to protect Earth's resources and environment.**

Proficient

Students demonstrate mastery over grade-level appropriate subject matter and readiness for the next grade level. Students scoring at the Proficient level typically:

- **apply scale, proportion, quantity, and/or patterns when performing computational thinking to data as it pertains to the distribution of water on Earth, conservation of matter, and Earth's relationship with the Sun, Moon, and stars.**
- **describe, use, and/or develop basic models at various scales to explain the movement of matter and energy between organisms, ecosystems, and Earth's systems and explain the outcomes of these interactions.**
- **use evidence, data, and/or models to engage in argument to explain the cause-and-effect relationships between an object and Earth's gravity, how scale and proportion affect the apparent brightness of the Sun and other stars, or how plants use matter (chiefly air and water) to grow.**
- **observe and measure phenomena to identify patterns that classify materials based on properties or describe cause-and-effect relationships when mixing substances within an investigation framework.**
- **combine or explain information about the impacts of human activities on Earth's systems and how solutions can be designed to protect Earth's resources and environment.**

Basic

Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.
Students scoring at the Basic level typically:

- **recognize scale, proportion, quantity, or patterns when performing basic computations with data as it pertains to the distribution of water on Earth, conservation of matter, and/or Earth's relationship with the Sun, Moon, and stars.**
- **identify basic models to represent common features of matter and/or energy, ecosystems, and/or Earth's systems.**
- **identify evidence, data, or models to distinguish relationships between an object and Earth's gravity, how basic scale and proportion affect the brightness of the Sun and other stars, or how plants use air and water.**
- **observe or measure phenomena to recognize patterns of materials or identify basic relationships when mixing substances within an investigation framework.**
- **identify or describe the impacts of human activities on Earth's systems and solutions that protect Earth's resources and environment.**

Below Basic

Students scoring **Below Basic** have not demonstrated they can perform at the Basic level. Students scoring athe Below Basic level should be given comprehensive science instruction. Students scoring at the Basic level typically:

- **recognize scale, proportion, quantity, or patterns when performing basic computations with data as it pertains to the distribution of water on Earth, conservation of matter, and/or Earth's relationship with the Sun, Moon, and stars.**
- **identify basic models to represent common features of matter and/or energy, ecosystems, and/or Earth's systems.**
- **identify evidence, data, or models to distinguish relationships between an object and Earth's gravity, how basic scale and proportion affect the brightness of the Sun and other stars, or how plants use air and water.**
- **observe or measure phenomena to recognize patterns of materials or identify basic relationships when mixing substances within an investigation framework.**
- **identify or describe the impacts of human activities on Earth's systems and solutions that protect Earth's resources and environment.**

PS1.2 ESS1.2 ESS2.2	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Using Mathematics and Computational Thinking; Analyzing and Interpreting Data **DCI** • PS1.A Structures and Properties of Matter • PS1.B Chemical Reactions • ESS1.B Earth and the Solar System • ESS2.C The Roles of Water in Earth's Surface Processes **CCC** • Scale, Proportion, and Quantity • Patterns		**Students scoring at the Basic level typically recognize scale, proportion, quantity, or patterns when performing basic computations with data as it pertains to the distribution of water on Earth, conservation of matter, and/or Earth's relationship with the Sun, Moon, and stars.**	**Students scoring at the Proficient level typically apply scale, proportion, quantity, and/or patterns when performing computational thinking to data as it pertains to the distribution of water on Earth, conservation of matter, and Earth's relationship with the Sun, Moon, and stars.**	**Students scoring at the Advanced level typically analyze scale, proportion, quantity and patterns when performing computational thinking to complex data as it pertains to the distribution of water on Earth, conservation of matter, and Earth's relationship with the Sun, Moon, and stars.**

PS1.1 **PS3.1** **LS2.1** **ESS2.1** **LS2.2**	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Developing and Using Models **DCI** • PS1.A Structure and Properties of Matter • PS3.D Energy in Chemical Processes and Everyday Life • LS1.C Organization of Matter and Energy Flow in Organisms • LS2.A Interdependent Relationships in Ecosystems • LS2.B Cycles of Matter and Energy Transfer in Ecosystems • ESS2.A Earth Materials and Systems **CCC** • Scale, Proportion, and Quantity • Energy and Matter • Systems and System Models		**Students scoring at the Basic level typically identify basic models to represent common features of matter and/or energy, ecosystems, and/or Earth's systems.**	**Students scoring at the Proficient level typically describe, use, and/ or develop basic models at various scales to explain the movement of matter and energy between organisms, ecosystems, and Earth's systems and explain the outcomes of these interactions.**	**Students scoring at the Advanced level typically predict, modify, and extend complex models at various scales to analyze the movement of matter and energy between organisms, ecosystems, and Earth's systems and analyze the outcomes of these interactions.**

PS2.1 **LS1.1** **ESS1.1**	**Below Basic:** Student have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Engaging in Argument from Evidence **DCI** • PS2.B Types of Interactions • LS1.C Organization for Matter and Energy Flow in Organisms • ESS1.A The Universe and Its Stars **CCC** • Cause and Effect • Energy and Matter • Scale, Proportion, and Quantity		**Students scoring at the Basic level typically identify evidence, data, or models to distinguish relationships between an object and Earth's gravity, how basic scale and proportion affect the brightness of the Sun and other stars, or how plants use air and water.**	**Students scoring at the Proficient level typically use evidence, data, and/or models to engage in argument to explain the cause-and-effect relationships between an object and Earth's gravity, how scale and proportion affect the apparent brightness of the Sun and other stars, or how plants use matter (chiefly air and water) to grow.**	**Students scoring at the Advanced level typically analyze and compare evidence, data, and models to engage in argument to explain the cause-and-effect relationships between an object and Earth's gravity, how scale and proportion affect the apparent brightness of the Sun and other stars and/or how plants use matter (chiefly air and water) to grow.**

PS1.3 **PS1.4**	**Below Basic:** Student have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Planning and Carrying out Investigations **DCI** • PS1.A Structure and Properties of Matter • PS1.B Chemical Reactions **CCC** • Patterns • Cause and Effect		**Students scoring at the Basic level typically observe or measure phenomena to recognize patterns of materials or identify basic relationships when mixing substances within an investigation framework.**	**Students scoring at the Proficient level typically observe and measure phenomena to identify patterns that classify materials based on properties or describe cause-and-effect relationships when mixing substances within an investigation framework.**	**Students scoring at the Advanced level typically observe and measure phenomena to interpret and evaluate patterns that classify materials based on properties or describe complex cause-and-effect relationships when mixing substances within an investigation framework.**

ESS3.1	**Below Basic:** Student have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Obtaining, Evaluating, and Communicating Information **DCI** • ESS3 Earth and Human Activity **CCC** • Systems and System Models		**Students scoring at the Basic level typically identify or describe the impacts of human activities on Earth's systems and solutions that protect Earth's resources and environment.**	**Students scoring at the Proficient level typically combine or explain information about the impacts of human activities on Earth's systems and how solutions can be designed to protect Earth's resources and environment.**	**Students scoring at the Advanced level typically combine and compare multiple pieces of information to explain the impacts of human activities on Earth's systems and how solutions can be designed to protect Earth's resources and environment.**

OKLAHOMA STATE DEPARTMENT OF EDUCATION
CHAMPION EXCELLENCE

Oklahoma Grade 8 Science

Range Performance Level Descriptor Tables

Advanced

Students demonstrate superior performance on challenging subject matter. In addition to demonstrating a broad and in-depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:

- **evaluate, revise, or predict a model involving: the relationship between gene structure and protein structure; the effect of reproduction on genetic variation; cyclic patterns in relation to the position of the Earth, Sun, and Moon; the role of gravity within galaxies and the solar system.**
- **evaluate or modify investigations about: stability and change of forces and motion; the effect of fields on force interactions.**
- **analyze, infer, relate, or identify complex relationships within a system to construct or evaluate explanations for: the effect of environmental and genetic factors on growth; the common ancestry of organisms based on patterns in anatomy or the chronological order of fossils; the effect of trait variation in populations on natural selection.**
- **modify the solution to a problem with new information involving energy transfer, forces, and motions in systems where objects collide.**
- **evaluate, develop, or apply reasoning to support or refute new arguments or counterarguments about how: the structures of plants and behaviors of animals affect the likelihood of successful reproduction; gravitational interactions depend on the masses of interacting objects in a system.**
- **revise questions about data based on new evidence to determine factors that affect the strength of electric and magnetic forces.**
- **analyze mathematical representations to: describe patterns in wave models to show the relationship between amplitude and energy; explain how natural selection affects the distribution of traits in populations.**
- **evaluate data to: compare patterns of embryological similarities between species; identify how patterns in the fossil record indicate the history of life on Earth; determine the scale properties of objects in the solar system.**
- **compare competing claims or scientific explanations to communicate how: humans affect trait inheritance through artificial selection; the structure and function of digital signals contributes to those signals reliably transmitting information.**

Proficient

Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.
Students scoring at the Proficient level typically:

- **develop or use a model to describe: the relationship between gene structure and protein structure; the effect of reproduction on genetic variation; cyclic patterns in relation to the position of the Earth, Sun, and Moon; the role of gravity within galaxies and the solar system.**
- **identify, describe, or explain how to: design investigations about stability and change of forces and motion; conduct and evaluate investigations about the effect of fields on force interactions.**
- **identify, describe, or compare evidence to construct explanations for: the effect of environmental and genetic factors on growth; the common ancestry of organisms based on patterns in anatomy or the chronological order of fossils; the effect of trait variation in populations on natural selection.**
- **design or revise a solution to a problem involving energy transfer, forces, and motions in systems where objects collide.**
- **use reasoning to show that evidence supports or refutes arguments about how: the structures of plants and behaviors of animals affect the likelihood of successful reproduction; gravitational interactions depend on the masses of interacting objects in a system.**
- **use reasoning to develop questions about data to determine factors that affect the strength of electric and magnetic forces.**
- **use mathematical representations to: describe patterns in wave models to show the relationship between amplitude and energy; explain how natural selection affects the distribution of traits in populations.**
- **analyze and interpret data to: compare patterns of embryological similarities between species; identify how patterns in the fossil record indicate the history of life on Earth; determine the scale properties of objects in the solar system.**
- **gather, use, synthesize, or integrate information to communicate and support claims about how: humans affect trait inheritance through artificial selection; the structure and function of digital signals contributes to those signals reliably transmitting information.**

Basic

Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.
Students scoring at the Basic level typically:

- **identify or describe basic components or concept(s) of a model involving: the relationship between gene structure and protein structure; the effect of reproduction on genetic variation; cyclic patterns in relation to the position of the Earth, Sun, and Moon; the role of gravity within galaxies and the solar system.**
- **identify or describe basic steps or processes within investigations about: stability and change of forces and motion; the effect of fields on force interactions.**
- **identify or describe basic relationships shown in evidence of: the effect of environmental and genetic factors on growth; the common ancestry of organisms based on patterns in anatomy or the chronological order of fossils; the effect of trait variation in populations on natural selection.**
- **identify or describe basic relationships in a design solution involving energy transfer, forces, and motions in systems where objects collide.**
- **identify evidence that supports arguments about how: the structures of plants and behaviors of animals affect the likelihood of successful reproduction; gravitational interactions depend on the masses of interacting objects in a system.**
- **determine factors that affect the strength of electric and magnetic forces.**
- **identify components of mathematical representations to: describe patterns in wave models to show the relationship between amplitude and energy; explain how natural selection affects the distribution of traits in populations.**
- **use data to: recognize patterns of embryological similarities between species; identify how patterns in the fossil record indicate the history of life on Earth; determine the scale properties of objects in the solar system.**
- **describe information to support claims about how: humans affect trait inheritance through artificial selection; the structure and function of digital signals contributes to those signals reliably transmitting information.**

Below Basic

Students scoring **Below Basic** have not demonstrated they can perform at the Basic level. Students scoring at the Below Basic level should be given comprehensive science instruction. Students scoring at the Basic level typically:

- **identify or describe basic components or concept(s) of a model involving: the relationship between gene structure and protein structure; the effect of reproduction on genetic variation; cyclic patterns in relation to the position of the Earth, Sun, and Moon; the role of gravity within galaxies and the solar system.**
- **identify or describe basic steps or processes within investigations about: stability and change of forces and motion; the effect of fields on force interactions.**
- **identify or describe basic relationships shown in evidence of: the effect of environmental and genetic factors on growth; the common ancestry of organisms based on patterns in anatomy or the chronological order of fossils; the effect of trait variation in populations on natural selection.**
- **identify or describe basic relationships in a design solution involving energy transfer, forces, and motions in systems where objects collide.**
- **identify evidence that supports arguments about how: the structures of plants and behaviors of animals affect the likelihood of successful reproduction; gravitational interactions depend on the masses of interacting objects in a system.**
- **determine factors that affect the strength of electric and magnetic forces.**
- **identify components of mathematical representations to: describe patterns in wave models to show the relationship between amplitude and energy; explain how natural selection affects the distribution of traits in populations.**
- **use data to: recognize patterns of embryological similarities between species; identify how patterns in the fossil record indicate the history of life on Earth; determine the scale properties of objects in the solar system.**
- **describe information to support claims about how: humans affect trait inheritance through artificial selection; the structure and function of digital signals contributes to those signals reliably transmitting information.**

LS3.1 **LS3.2** **ESS1.1** **ESS1.2**	**Below Basic**: Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Develop and Use Models **DCI** • LS3.A Inheritance of Traits • LS1.B Growth and Development of Organisms • LS3.B Variation of Traits • ESS1.A The Universe and Its Stars **CCC** • Structure and Function • Cause and Effect • Patterns • Systems and System Models		**Students scoring at the Basic level typically identify or describe basic components or concept(s) of a model involving: the relationship between gene structure and protein structure; the effect of reproduction on genetic variation; cyclic patterns in relation to the position of the Earth, Sun, and Moon; the role of gravity within galaxies and the solar system.**	**Students scoring at the Proficient level typically develop or use a model to describe: the relationship between gene structure and protein structure; the effect of reproduction on genetic variation; cyclic patterns in relation to the position of the Earth, Sun, and Moon; the role of gravity within galaxies and the solar system.**	**Students scoring at the Advanced level typically evaluate, revise, or predict a model involving: the relationship between gene structure and protein structure; the effect of reproduction on genetic variation; cyclic patterns in relation to the position of the Earth, Sun, and Moon; the role of gravity within galaxies and the solar system.**

PS2.2 **PS2.5**	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Planning and Carrying Out Investigations **DCI** • PS2.A Forces and Motion • PS2.B Types of Interactions **CCC** • Cause and Effect • Stability and Change		**Students scoring at the Basic level typically identify or describe basic steps or processes within investigations about: stability and change of forces and motion; the effect of fields on force interactions.**	**Students scoring at the Proficient level typically identify, describe, or explain how to: design investigations about stability and change of forces and motion; conduct and evaluate investigations about the effect of fields on force interactions.**	**Students scoring at the Advanced level typically evaluate or modify investigations about: stability and change of forces and motion; the effect of fields on force interactions.**

LS1.5 **LS4.2** **LS4.4**	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Constructing Explanations **DCI** • LS1.B Growth and Development of Organisms • LS4.A Evidence of Common Ancestry and Diversity • LS4.B Natural Selection **CCC** • Cause and Effect • Patterns		**Students scoring at the Basic level typically identify or describe basic relationships shown in evidence of: the effect of environmental and genetic factors on growth; the common ancestry of organisms based on patterns in anatomy or the chronological order of fossils; the effect of trait variation in populations on natural selection.**	**Students scoring at the Proficient level typically identify, describe, or compare evidence to construct explanations for: the effect of environmental and genetic factors on growth; the common ancestry of organisms based on patterns in anatomy or the chronological order of fossils; the effect of trait variation in populations on natural selection.**	**Students scoring at the Advanced level typically analyze, infer, relate, or identify complex relationships within a system to construct or evaluate explanations for: the effect of environmental and genetic factors on growth; the common ancestry of organisms based on patterns in anatomy or the chronological order of fossils; the effect of trait variation in populations on natural selection.**

PS2.1	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Designing Solutions **DCI** • PS2.A Forces and Motion **CCC** • Systems and System Models		**Students scoring at the Basic level typically identify or describe basic relationships in a design solution involving energy transfer, forces, and motions in systems where objects collide.**	**Students scoring at the Proficient level typically design or revise a solution to a problem involving energy transfer, forces, and motions in systems where objects collide.**	**Students scoring at the Advanced level typically modify the solution to a problem with new information involving energy transfer, forces, and motions in systems where objects collide.**

LS1.4 **PS2.4**	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Engaging in Argument from Evidence **DCI** • LS1.B Growth and Development of Organisms • PS2.B Types of Interactions **CCC** • Cause of Effect • Systems and System Models		**Students scoring at the Basic level typically identify evidence that supports arguments about how: the structures of plants and behaviors of animals affect the likelihood of successful reproduction; gravitational interactions depend on the masses of interacting objects in a system.**	**Student scoring at the Proficient level typically use reasoning to show that evidence supports or refutes arguments about how: the structures of plants and behaviors of animals affect the likelihood of successful reproduction; gravitational interactions depend on the masses of interacting objects in a system.**	**Students scoring at the Advanced level typically evaluate, develop, or apply reasoning to support or refute new arguments or counterarguments about how: the structures of plants and behaviors of animals affect the likelihood of successful reproduction; gravitational interactions depend on the masses of interacting objects in a system.**

PS2.3	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Asking Questions **DCI** • PS2.B Types of Interactions **CCC** • Cause and Effect		**Students scoring at the Basic level typically determine factors that affect the strength of electric and magnetic forces.**	**Students scoring at the Proficient level typically use reasoning to develop questions about data to determine factors that affect the strength of electric and magnetic forces.**	**Students scoring at the Advanced level typically revise questions about data based on new evidence to determine factors that affect the strength of electric and magnetic forces.**

PS4.1 **LS4.6**	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Using Mathematics and Computational Thinking **DCI** • PS4.A Wave Properties • LS4.C Adaptation **CCC** • Patterns • Cause and Effect		**Students scoring at the Basic level typically identify components of mathematical representations to: describe patterns in wave models to show the relationship between amplitude and energy; explain how natural selection affects the distribution of traits in populations.**	**Students scoring at the Proficient level typically use mathematical representations to: describe patterns in wave models to show the relationship between amplitude and energy; explain how natural selection affects the distribution of traits in populations.**	**Students scoring at the Advanced level typically analyze mathematical representations to: describe patterns in wave models to show the relationship between amplitude and energy; explain how natural selection affects the distribution of traits in populations.**

LS4.3 **LS4.1** **ESS1.3**	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Analyzing and Interpreting Data **DCI** • LS4.A Evidence of Common Ancestry and Diversity • ESS1.B Earth and the Solar System • ETS1: Interdependence of Science, Engineering, and Technology **CCC** • Patterns • Scale, Proportion, and Quantity		**Students scoring at the Basic level typically use data to: recognize patterns of embryological similarities between species; identify how patterns in the fossil record indicate the history of life on Earth; determine the scale properties of objects in the solar system.**	**Students scoring at the Proficient level typically analyze and interpret data to: compare patterns of embryological similarities between species; identify how patterns in the fossil record indicate the history of life on Earth; determine the scale properties of objects in the solar system.**	**Students scoring at the Advanced level typically evaluate data to: compare patterns of embryological similarities between species; identify how patterns in the fossil record indicate the history of life on Earth; determine the scale properties of objects in the solar system.**

LS4.5 **PS4.3**	**Below Basic**: Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills appropriate to their grade level.	**Proficient:** Students demonstrate mastery over appropriate grade-level subject matter and readiness for the next grade level.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Obtaining, Evaluating, and Communication of Evidence **DCI** • LS4.B Natural Selection • ETS2.A Interdependence of Science, Engineering, and Technology • PS4.C Information Technologies and Instrumentation **CCC** • Structure and Function • Cause and Effect		**Students scoring at the Basic level typically describe information to support claims about how: humans affect trait inheritance through artificial selection; the structure and function of digital signals contributes to those signals reliably transmitting information.**	**Students scoring at the Proficient level typically gather, use, synthesize, or integrate information to communicate and support claims about how: humans affect trait inheritance through artificial selection; the structure and function of digital signals contributes to those signals reliably transmitting information.**	**Students scoring at the Advanced level typically compare competing claims or scientific explanations to communicate how: humans affect trait inheritance through artificial selection; the structure and function of digital signals contributes to those signals reliably transmitting information.**

Oklahoma Grade 11 Life Science

Range Performance Level Descriptor Tables

Advanced

Students demonstrate superior performance on challenging subject matter and clearly exhibit readiness for college and career. In addition to demonstrating a broad and in-depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:

- **develop and use models to interpret and evaluate components and relationships among components within and between complex systems and system models related to structure, function, growth, and/or development of organisms, organization of matter and energy flow in organisms, cycles of matter and energy transfer in ecosystems, and/or energy in chemistry processes.**
- **plan and conduct investigations to produce reliable data considering the types, amounts, and accuracy of data needed; analyze and interpret complex data sets to support explanations or claims about the stability related to structure and function of organisms, interdependent relationships in ecosystems at different scales, the cycling of matter and flow of energy among organisms in an ecosystem, the effect variation of traits has in a population, patterns that show evidence of natural selection or adaptation.**
- **compare multiple pieces of scientific information to communicate an understanding of the patterns that show evidence of common ancestry and diversity, or adaptation.**
- **ask questions to analyze relationships about the effect of structure and function on inheritance of traits; or support and/or evaluate the merits of arguments to synthesize and communicate understanding and defend them based on empirical evidence about stability and change in ecosystem dynamics, function and resilience, the cause-and-effect relationships of social interactions, group behaviors, adaptation, and variation of traits.**
- **construct, evaluate, make inferences and revise an explanation based on valid and reliable evidence from a variety of sources regarding the cause-and-effect relationships in natural selection, adaptation, and how the structure of DNA determines protein structure and impacts the function of the cell; or evaluate or refine explanations derived from evidence from a variety of sources for how matter and energy is organized, cycled, and transferred within an organism or ecosystem.**

Proficient

Students demonstrate mastery with subject matter and exhibit readiness for college and career. In addition to demonstrating understanding and application of all skills in the Basic Level, students scoring at the Proficient level typically:

- **develop and use models describing components and relationships among components of a system, related to structure and function, growth, and development of organisms, organization of matter and energy flow in organisms, cycles of matter and energy transfer In ecosystems, and energy in chemistry processes, including hierarchical structures and inputs and outputs of a system. Use the models to represent basic aspects of phenomena that result from changes in energy and matter.**
- **plan and conduct investigations to produce reliable data; analyze and interpret provided data to support explanations or claims about the stability related to structure and function of organisms, interdependent relationships in ecosystems at different scales, the cycling of matter and flow of energy among organisms in an ecosystem, the effect variation of traits has in a population, patterns that show evidence of natural selection or adaptation.**
- **evaluate multiple pieces of scientific information to communicate an understanding of the patterns that show evidence of common ancestry and diversity, or adaptation.**
- **ask questions to clarify relationships about the effect of structure and function on inheritance of traits; or evaluate arguments based on evidence as students synthesize and communicate understanding of stability and change in ecosystem dynamics, function and resilience, the cause-and-effect relationships of social interactions, group behaviors, adaptation, and variation of traits.**
- **construct an explanation based on valid and reliable evidence from sources of the cause-and-effect relationships in natural selection, adaptation, and how the structure of DNA determines protein structure and impacts the function of the cell; or construct and revise explanations from evidence from sources for how matter and energy is organized, cycled, and transferred within an organism or ecosystem.**

Basic

Students demonstrate partial mastery with subject matter and may not exhibit readiness for college and career. Students scoring at the Basic level typically:

- **identify or describe basic components or relationships among components within systems and system models related to structure, function, growth and/or development of organisms, organization of matter and energy flow in organisms, cycles of matter and energy transfer in ecosystems, or energy in chemistry processes.**
- **conduct investigations to produce data; use provided data to support explanations or claims about the stability related to structure and function of organisms, interdependent relationships in ecosystems at different scales, the cycling of matter and flow of energy among organisms in an ecosystem, the effect variation of traits has in a population, patterns that show evidence of natural selection or adaptation.**
- **synthesize scientific information to communicate using a partial understanding of the patterns that show evidence of common ancestry, diversity, or adaptation.**
- **ask questions to identify relationships about the effect of structure and function on inheritance of traits; or describe arguments based on evidence to communicate understanding of stability and change in ecosystem dynamics, function and resilience, the cause-and-effect relationships of social interactions, group behaviors, adaptation, and variation of traits.**
- **identify and describe basic relationships based on evidence of the cause-and-effect relationships in natural selection, adaptation, and how the structure of DNA determines protein structure and impacts the function of the cell; or identify and describe explanations from evidence for how matter and energy is organized, cycled, and transferred within an organism or ecosystem.**

Below Basic

Students scoring **Below Basic** have not demonstrated they can perform at the Basic level. Students scoring at the Basic level typically**:**

- **identify or describe basic components or relationships among components within systems and system models related to structure, function, growth and/or development of organisms, organization of matter and energy flow in organisms, cycles of matter and energy transfer in ecosystems, or energy in chemistry processes.**
- **conduct investigations to produce data; use provided data to support explanations or claims about the stability related to structure and function of organisms, interdependent relationships in ecosystems at different scales, the cycling of matter and flow of energy among organisms in an ecosystem, the effect variation of traits has in a population, patterns that show evidence of natural selection or adaptation.**
- **synthesize scientific information to communicate using a partial understanding of the patterns that show evidence of common ancestry, diversity, or adaptation.**
- **ask questions to identify relationships about the effect of structure and function on inheritance of traits; or describe arguments based on evidence to communicate understanding of stability and change in ecosystem dynamics, function and resilience, the cause-and-effect relationships of social interactions, group behaviors, adaptation, and variation of traits.**
- **identify and describe basic relationships based on evidence of the cause-and-effect relationships in natural selection, adaptation, and how the structure of DNA determines protein structure and impacts the function of the cell; or identify and describe explanations from evidence for how matter and energy is organized, cycled, and transferred within an organism or ecosystem.**

LS1.2 **LS1.4** **LS1.5** **LS1.7** **LS2.5**	**Below Basic**: Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college-and career-ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career-ready (CCR).	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Develop and Use Models **DCI** • LS1.A Structure and function • LS1.B Growth and Development of Organisms • LS1.C Organization for Matter and Energy Flow in Organisms • LS2.B Cycles of Matter and Energy Transfer In Ecosystems • PS3.D Energy in Chemistry Processes **CCC** • Systems and System Models • Energy and Matter		**Students scoring at the Basic level typically identify or describe basic components or relationships among components within systems and system models related to structure, function, growth and/or development of organisms, organization of matter and energy flow in organisms, cycles of matter and energy transfer in ecosystems, or energy in chemistry processes.**	**Students scoring at the Proficient level typically develop and use models describing components and relationships among components of a system, related to structure and function, growth and development of organisms, organization of matter and energy flow in organisms, cycles of matter and energy transfer In ecosystems, and energy in chemistry processes, including hierarchical structures and inputs and outputs of a system. Use the models to represent basic aspects of phenomena that result from changes in energy and matter.**	**Students scoring at the Advanced level typically develop and use models to interpret and evaluate components and relationships among components within and between complex systems and system models related to structure, function, growth and/or development of organisms, organization of matter and energy flow in organisms, cycles of matter and energy transfer in ecosystems, and/or energy in chemistry processes.**

LS1.3 **LS2.1** **LS2.2** **LS2.4** **LS3.3** **LS4.3**	**Below Basic**: Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college-and career-ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career-ready (CCR).	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Planning and Carrying Out Investigations, Using Mathematics and Computational Thinking, Analyzing and Interpreting Data **DCI** • LS1.A Structure and Function • LS2.A Interdependent Relationships in Ecosystems • LS2.B Cycles of Matter and Energy Transfer in Ecosystems • LS2.C Ecosystem Dynamics, Functioning and Resilience • LS3.B Variation of Traits • LS4.B Natural Selection • LS4.C Adaptation **CCC** • Patterns • Scale, Proportion, and Quantity • Energy and Matter • Stability and Change		**Students scoring at the Basic level typically conduct investigations to produce data; use provided data to support explanations or claims about the stability related to structure and function of organisms, interdependent relationships in ecosystems at different scales, the cycling of matter and flow of energy among organisms in an ecosystem, the effect variation of traits has in a population, patterns that show evidence of natural selection or adaptation.**	**Students scoring at the Proficient level typically plan and conduct investigations to produce reliable data; analyze and interpret provided data to support explanations or claims about the stability related to structure and function of organisms, interdependent relationships in ecosystems at different scales, the cycling of matter and flow of energy among organisms in an ecosystem, the effect variation of traits has in a population, patterns that show evidence of natural selection or adaptation.**	**Students scoring at the Advanced level typically plan and conduct investigations; produce reliable data considering the types, amounts, and accuracy of data needed; analyze and interpret complex data sets to support explanations or claims about the stability related to structure and function of organisms, interdependent relationships in ecosystems at different scales, the cycling of matter and flow of energy among organisms in an ecosystem, the effect variation of traits has in a population, patterns that show evidence of natural selection or adaptation.**

LS4.1	**Below Basic**: Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college-and career-ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career-ready (CCR).	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Obtaining, Evaluating, and Communicating Information **DCI** • LS4.A Evidence of Common Ancestry and Diversity • LS4.C: Adaptation **CCC** • Patterns		**Students scoring at the Basic level typically synthesize scientific information to communicate using a partial understanding of the patterns that show evidence of common ancestry, diversity, or adaptation.**	**Students scoring at the Proficient level typically evaluate multiple pieces of scientific information to communicate an understanding of the patterns that show evidence of common ancestry and diversity, or adaptation.**	**Students scoring at the Advanced level typically compare multiple pieces of scientific information to communicate an understanding of the patterns that show evidence of common ancestry and diversity, or adaptation.**

LS2.6 LS2.8 LS3.1 LS3.2 LS4.5	**Below Basic**: Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college- and career-ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career-ready.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Asking Questions, Engaging in Argument from Evidence (make and defend a claim, evaluate a claim) **DCI** • LS2.C Ecosystem Dynamics, Functioning and Resilience • LS2.D Social Interactions and Group Behavior • LS3.A Inheritance of Traits • LS1.A Structure and Function • LS3.B Variation of Traits • LS4.C Adaptation **CCC** • Stability and Change • Cause and Effect		**Students scoring at the Basic level typically ask questions to identify relationshipsabout the effect of structure and function on inheritance of traits; or describe arguments based on evidence to communicate understanding of stability and change in ecosystem dynamics, function and resilience, the cause-and-effect relationships of social interactions, group behaviors, adaptation, and variation of traits.**	**Students scoring at the Proficient level typically ask questions to clarify relationships about the effect of structure and function on inheritance of traits; or evaluate arguments based on evidence as students synthesize and communicate understanding of stability and change in ecosystem dynamics, function and resilience, the cause-and-effect relationships of social interactions, group behaviors, adaptation, and variation of traits.**	**Students scoring at the Advanced level typically ask questions to analyze relationships about the effect of structure and function on inheritance of traits; or support, evaluate, and defend arguments based on evidence as students synthesize and communicate understanding of stability and change in ecosystem dynamics, function and resilience, the cause-and-effect relationships of social interactions, group behaviors, adaptation, and variation of traits.**

LS1.1 LS1.6 LS2.3 LS4.2 LS4.4	**Below Basic**: Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college- and career-ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career-ready.	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Constructing Explanations **DCI** • LS1.A Structure and Function • LS1.C Organization for Matter and Energy Flow in Organisms • LS2.B Cycles of Matter and Energy Transfer in Ecosystems • LS4.B Natural Selection • LS4.C Adaptation **CCC** • Structure and Function • Energy and Matter • Cause and Effect		**Students scoring at the Basic level typically identify and describe basic relationships based on evidence of the cause-and-effect relationships in natural selection, adaptation, and how the structure of DNA determines protein structure and impacts the function of the cell; or identify and describe explanations from evidence for how matter and energy is organized, cycled, and transferred within an organism or ecosystem.**	**Students scoring at the Proficient level typically construct an explanation based on valid and reliable evidence from sources of the cause-and-effect relationships in natural selection, adaptation, and how the structure of DNA determines protein structure and impacts the function of the cell; or construct and revise explanations from evidence from sources for how matter and energy is organized, cycled, and transferred within an organism or ecosystem.**	**Students scoring at the Advanced level typically construct, evaluate, or draw inferences from an explanation based on valid and reliable evidence from a variety of sources of the cause-and-effect relationships in natural selection, adaptation, and how the structure of DNA determines protein structure and impacts the function of the cell; or evaluate or refine explanations from evidence from a variety of sources for how matter and energy is organized, cycled, and transferred within an organism or ecosystem.**

Oklahoma Grade 11 Physical Science

Range Performance Level Descriptor Tables

Advanced

Students demonstrate superior performance on challenging subject matter and clearly exhibit readiness for college and career. In addition to demonstrating a broad and in-depth understanding and application of all skills at the Proficient level, students scoring at the Advanced level typically:

- **evaluate multiple patterns to develop and use models to predict how components between or within systems are related to the energy of motion and the structure and properties of matter, and the relationships between energy and matter.**
- **use complex mathematical models and plan and conduct investigations to produce and refine reliable data considering the types, amounts, accuracy and limitations of data needed; analyze and interpret complex data sets to support explanations or claims about the conservation of energy and matter during chemical reactions, the effects of different types of interactions, definitions of energy, conservation of energy and energy transfer within a system and/or system model, and how matter affects wave properties.**
- **evaluate the validity and reliability of complex claims about the effects of electromagnetic radiation on matter from a variety of published sources, including complex texts.**
- **construct, evaluate, make inferences, and revise an explanation based on scientific principles using valid and reliable evidence obtained from a variety of sources to identify patterns relating to the structure and properties of matter; predict how temperature or concentration affects the rate of chemical reactions; and define energy and matter in order to design, refine, and evaluate solutions taking into account unanticipated effects around defining and delimiting engineering problems and interdependence of science, engineering, and technology.**

Proficient

Students demonstrate mastery with subject matter and exhibit readiness for college and career. In addition to demonstrating understanding and application of all skills in the Basic level, students scoring at the Proficient level typically:

- **use patterns and models to predict how components between or within systems are related to the energy of motion and the structure and properties of matter, and the relationships between energy and matter.**
- **use mathematical models and plan and conduct investigations to produce and use reliable data to serve as a basis for evidence to support explanations or claims about the conservation of energy and matter during chemical reactions, the effects of different types of interactions, definitions of energy, conservation of energy and energy transfer within a system and/or system model, and how matter affects wave properties.**
- **evaluate the validity and reliability of claims about the effects of electromagnetic radiation on matter from a variety of published sources.**
- **construct and revise an explanation based on scientific principles using valid and reliable evidence obtained from a variety of sources to identify patterns relating to the structure and properties of matter; explain how temperature or concentration affects the rate of chemical reactions; and define energy and matter in order to design and refine solutions around defining and delimiting engineering problems and interdependence of science, engineering, and technology.**

Basic

Students demonstrate partial mastery with subject matter and may not exhibit readiness for college and career. Students scoring at the Basic level typically:

- use basic patterns and models to identify and describe components between or within systems related to the energy of motion and the structure and properties of matter, and the relationships between energy and matter.
- use simple mathematical models and conduct investigations to produce data or use provided data to support explanations or claims about the conservation of energy and matter during chemical reactions, the effects of different types of interactions, definitions of energy, conservation of energy and energy transfer within a system and/or system model, and how matter affects wave properties.
- evaluate the validity and/or reliability of a simple claim about the effects of electromagnetic radiation on matter from a published source.
- identify and describe basic relationships and construct explanations based on evidence from a variety of sources about patterns relating to the structure and properties of matter; identify how temperature or concentration affects the rate of chemical reactions; and define energy and matter in order to design solutions around defining and delimiting engineering problems and interdependence of science, engineering, and technology.

Below Basic

Students scoring **Below Basic** have not demonstrated they can perform at the Basic level. Students scoring at the Basic level typically**:**

- use basic patterns and models to identify and describe components between or within systems related to the energy of motion and the structure and properties of matter, and the relationships between energy and matter.
- use simple mathematical models and conduct investigations to produce data or use provided data to support explanations or claims about the conservation of energy and matter during chemical reactions, the effects of different types of interactions, definitions of energy, conservation of energy and energy transfer within a system and/or system model, and how matter affects wave properties.
- evaluate the validity and/or reliability of a simple claim about the effects of electromagnetic radiation on matter from a published source.
- identify and describe basic relationships and construct explanations based on evidence from a variety of sources about patterns relating to the structure and properties of matter; identify how temperature or concentration affects the rate of chemical reactions; and define energy and matter in order to design solutions around defining and delimiting engineering problems and interdependence of science, engineering, and technology.

PS1.1 **PS3.2**	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college- and career- ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career- ready (CCR).	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Develop and Use Models **DCI** • PS1.A Structure and Properties of Matter • PS3.A Definitions of Energy **CCC** • Patterns • Energy and matter		**Students scoring at the Basic level typically use basic patterns and models to identify and describe components between or within systems related to the energy of motion and the structure and properties of matter, and the relationships between energy and matter.**	**Students scoring at the Proficient level typically use patterns and models to predict how components between or within systems related to the energy of motion and the structure and properties of matter, and the relationships between energy and matter.**	**Students scoring at the Advanced level typically evaluate multiple patterns to develop and use models to predict how components between or within systems are related to the energy of motion and the structure and properties of matter, and the relationships between energy and matter.**

PS1.7 PS2.5 PS3.1 PS3.4 PS4.1	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college- and career- ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career- ready (CCR).	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Planning and Carrying Out Investigations, Using Mathematics and Computational Thinking **DCI** • PS1.B Chemical Reactions • PS2.B Types of Interactions • PS3.A Definitions of Energy • PS3.B Conservation of Energy and Energy Transfer • PS4.A Wave Properties **CCC** • Energy and Matter • Cause and Effect • Systems and System Models		**Students scoring at the Basic level typically use simple mathematical models and conduct investigations to produce data or use provided data to support explanations or claims about the conservation of energy and matter during chemical reactions, the effects of different types of interactions, definitions of energy, conservation of energy and energy transfer within a system and/or system model, and how matter affects wave properties.**	**Students scoring at the Proficient level typically use mathematical models and plan and conduct investigations to produce and use reliable data to serve as a basis for evidence to support explanations or claims about the conservation of energy and matter during chemical reactions, the effects of different types of interactions, definitions of energy, conservation of energy and energy transfer within a system and/or system model, and how matter affects wave properties.**	**Students scoring at the Advanced level typically use complex mathematical models and plan and conduct investigations to produce and refine reliable data considering the types, amounts, accuracy and limitations of data needed; analyze and interpret complex data sets to support explanations or claims about the conservation of energy and matter during chemical reactions, the effects of different types of interactions, definitions of energy, conservation of energy and energy transfer within a system and/or system model, and how matter affects wave properties.**

PS4.4	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college- and career- ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career- ready (CCR).	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Obtaining, Evaluating, and Communicating Information **DCI** • PS4.B Electromagnetic Radiation **CCC** • Cause and Effect		**Students scoring at the Basic level typically evaluate the validity and/or reliability of a simple claim about the effects of electromagnetic radiation on matter from a published source.**	**Students scoring at the Proficient level typically evaluate the validity and reliability of claims about the effects of electromagnetic radiation on matter from a variety of published source.**	**Students scoring at the Advanced level typically evaluate the validity and reliability of complex claims about the effects of electromagnetic radiation on matter from a variety of published sources, including complex texts.**

PS1.2 **PS1.5** **PS3.3**	**Below Basic:** Students have not demonstrated they can perform at the Basic level.	**Basic:** Students demonstrate partial mastery of the essential knowledge and skills that are foundational for proficient work at their grade level or course, and that students are not on track to be college- and career- ready (CCR).	**Proficient:** Students demonstrate mastery over challenging grade-level subject matter, can analyze and apply such knowledge to real-world situations, are ready for the next grade, course, or level, and are on track to be college- and career- ready (CCR).	**Advanced:** Students demonstrate superior performance on challenging subject matter.
Constructing Explanations and Designing Solutions **DCI** • PS1.A Structure and Properties of Matter • PS1.B Chemical Reactions • PS3.A Definitions of Energy • ETS1.A Defining and Delimiting Engineering Problems • ETS2.B Interdependence of Science, Engineering, and Technology **CCC** • Patterns • Cause and Effect • Energy and Matter		**Students scoring at the Basic level typically identify and describe basic relationships and construct explanations based on evidence from a variety of sources about patterns relating to the structure and properties of matter; identify how temperature or concentration affects the rate of chemical reactions; and define energy and matter in order to design solutions around defining and delimiting engineering problems and interdependence of science, engineering, and technology.**	**Students scoring at the Proficient level typically construct and revise an explanation based on scientific principles using valid and reliable evidence obtained from a variety of sources to identify patterns relating to the structure and properties of matter; explain how temperature or concentration affects the rate of chemical reactions; and define energy and matter in order to design and refine solutions around defining and delimiting engineering problems and interdependence of science, engineering, and technology.**	**Students scoring at the Advanced level typically construct, evaluate, make inferences, and revise an explanation based on scientific principles using valid and reliable evidence obtained from a variety of sources to identify patterns relating to the structure and properties of matter; predict how temperature or concentration affects the rate of chemical reactions; and define energy and matter in order to design, refine, and evaluate solutions taking into account unanticipated effects around defining and delimiting engineering problems and interdependence of science, engineering, and technology.**

APPENDIX E
TEST ACCOMMODATIONS

OKLAHOMA SCHOOL TESTING PROGRAM (OSTP)

ACCOMMODATIONS *for* STUDENTS *with an* INDIVIDUALIZED EDUCATION PROGRAM (IEP) *or* SECTION 504 PLAN

2023-2024

OKLAHOMA Education

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Definition & Purpose of Oklahoma School Testing Program (OSTP)/College and Career Readiness Assessment (CCRA) Accommodations

A test accommodation is a change in the way a test is administered or in the way a student responds to test questions. Similar to instructional accommodations, test accommodations are intended to offset the effects of a student's disability and to provide him/her with the opportunity to demonstrate knowledge and skills on statewide assessments.

Eligibility for Accommodations

OSTP Grades 3-8 & Grade 11 CCRA: Science & U.S. History Content Accommodations

The right of a student with a disability to receive allowable accommodations on statewide assessments is protected by both federal and state laws. The student's current Individualized Education Program/Section 504 Plan must specify precisely which test accommodation(s) they will receive. In cases where an IEP/504 Plan is under development, the school personnel responsible for writing the plan must have already met and agreed upon the necessary accommodation(s) before a student may be provided the accommodation(s).

A student who does not have a documented disability or is not served by a current IEP/504 Plan is not eligible to receive accommodations on statewide assessments, except for Emergency Accommodation situations.

Scribes may be provided for any student (with or without an IEP or Section 504 Plan) who has a short-term medical condition that affects his/her physical dexterity which impedes his/her ability to respond to the assessment format.

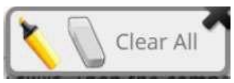
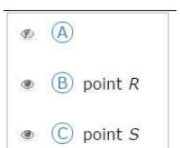
Accommodations

For a student to receive an accommodation for statewide assessments the accommodation needs to be utilized by the student in the classroom daily. The accommodations listed on an IEP/504 Plan for statewide assessments should mirror the accommodations listed under classroom accommodations as closely as possible. If changes need to be made to accommodations, please try to make changes prior to pre-code.

Universal Accessibility Features

Universal Accessibility Features are tools and supports that are available to *all* students who are assessed on the OSTP computer-based test platform or provided by a test administrator on the computer-based assessment.

Universal Accessibility Features Available to All Students

Computer-Based Testing
Highlighter tool 
Guideline tool  Masks text so only part of the text can be viewed at one time
Answer masking  Student selects which answer choices will be shown on the screen
Sketch  Use the sketch tool to sketch, highlight, or underline text on the screen.
Blank scratch paper for notes or calculations

Designated Accessibility Features (DFs)

Although most students will be tested in their general education classrooms according to the guidelines and schedule intended for all students, principals have the flexibility to test any student, including non-disabled and non-EL students, using the designated accessibility features described below, as long as all requirements for testing conditions, test security, and staffing are met.

Designated Accessibility Features available to any student, at the principal's discretion.

If a student has an Individualized Education Plan (IEP) or 504 plan and requires accommodations that are listed below in the Designated Accessibility Features, it should be documented in their plan.

Designated Accessibility Features
Small group test administration (Best practice is no more than 5 students, but the absolute maximum is 10 students.)
Individual (one-to-one) test administration (Student must be tested in a separate setting.)
Separate or alternate test location
Seating in a specified area of the testing room, including the use of a study carrel

ACT Accommodations

All students enrolled in the 11th grade will participate in the College- and Career-Readiness Assessment (CCRA), which includes the ACT plus writing, **except** students participating in the Oklahoma Alternate Assessment Program (OAAP).

ACT requires an approval process for accommodations. ACT considers accommodation requests for examinees who have a valid, current IEP or Section 504 plan. Accommodation needs and requests must be based off documented student characteristics, classroom/instructional supports, and accessibility needs. Accommodation needs should be addressed during the development of the student's IEP/504 Plan or through an amendment process as necessary.

Accommodation requests must be submitted to ACT during the designated window and approved before a student can be provided their ACT specific accommodations. Assessment accommodations requested on behalf of the student must be regularly used in classroom instruction and documented in the student's IEP/504 Plan. Accommodations not approved by ACT will result in an invalid attempt with no score.

For more information visit:

- ACT Accommodations
- ACT Accommodations vs. State Testing Accessibility Supports
- Oklahoma ACT Website
- OSTP Accommodations, Section IV
- The District Test Coordinator at your local school district

Assessment accommodations must correspond to the instructional accommodations described and provided to the student per the student's IEP/504 Plan and be in accordance with best practices for student testing.

ACT Accommodation(s) Request Process

IEP/504 Team determines accommodations.

Conduct detailed conversations during IEP/504 Team meeting concerning the ACT accommodations approval process and utilize the ACT accommodation guidance to direct conversations.

Be very thorough and detailed when completing the ACT Request.

ACT will only approve accommodations that are regularly used in a classroom setting.

District/School submits accommodation request to ACT.

ACT Accommodations

If approved

Student takes ACT with approved accommodations.

Scores ARE valid and college-reportable.

If NOT approved

Student takes the ACT with **NO** accommodations.

Scores ARE valid and college-reportable.

Assessment accommodations must correspond to the instructional accommodations provided to the student per the student's IEP/504 Plan and be in accordance with best practice for student testing. Accommodations not approved by ACT will result in an invalid attempt with no score.

Definition of Standard and Nonstandard OSTP Accommodations

For the purposes of the OSTP, a **standard accommodation** is defined as a change in the routine conditions under which students take OSTP tests that does not alter what the test is intended to measure. Standard accommodations are grouped into the following four categories:

- Setting: for example, administering the test in a small group or a separate setting
- Timing or scheduling of the test: for example, administering the test in short intervals or at a specific time of day
- Presentation: for example, using a large-print or Braille edition of the test
- Response: for example, dictating responses to a scribe

For the purposes of the OSTP, a **nonstandard accommodation** is defined as an accommodation that is needed for the student to access the assessment but not included on the allowable list of accommodations and requires OSDE approval for use on OSTP assessments.

General Requirements for the Use of Standard and Nonstandard Accommodations

All accommodations require adherence to test security protocols, including the presence of both a Test Administrator and a Test Proctor during periods requiring access to secure testing materials (e.g., human read- aloud). IEP/504 teams determine annually which accommodations will be needed and update the IEP/504 Plan accordingly. If the IEP/504 team believes that an OSTP accommodation listed in the student's IEP/504 Plan should be removed because it is no longer necessary or appropriate for the student, the team must amend the IEP/504 Plan accordingly prior to testing.

If a **nonstandard accommodation** will be provided, the student must meet all of the eligibility criteria for that accommodation, and a Nonstandard Accommodation Application must have been:

1) submitted by the DTC through the Nonstandard Accommodation Application on the Single Sign-On website,
2) approved by the OSDE before the accommodation may be used.

The use of accommodations is based on the individual needs of a student with a disability and may only be provided when **ALL** of the following conditions have been met:

1) The student's IEP/504 Plan accurately reflects accessibility needs related to the student's medical or health diagnosis/diagnoses or, in the case of an IEP, areas of need in specific academic content area(s).

2) The student uses the accommodation routinely (with rare exceptions) during classroom instruction and assessment in the subject, both before and after the OSTP assessment is administered.

However, use of a nonstandard accommodation during instruction does not necessarily qualify a student to receive the same nonstandard accommodation during OSTP testing; the student must meet additional eligibility requirements to receive a nonstandard accommodation on an OSTP assessment.

3) The accommodation is documented on both the State/District Accommodation and Class/Activity Accommodation sections of the student's current IEP/504 Plan.

4) The student requires the accommodation in order to participate in OSTP testing.

5) The accommodation is listed as a current accommodation in this appendix (or, prior to testing, the district or school has consulted with the OSDE and received permission to use a unique accommodation not included in this appendix).

Accommodations **may not:**

1) Alter, explain, simplify paraphrase, or eliminate any test question, reading passage, writing prompt, or multiple-choice answer option;

2) Provide verbal or other clues or suggestions that hint at or give away the correct response to the student;

3) Contradict test administration requirements or result in the violation of test security; for example,

- Test questions may not be modified, reordered, or reformatted in any way for any student;
- Tests may not be photocopied, enlarged, altered, or duplicated;
- English-language dictionaries are not allowed for any student on any test.

If the above five conditions have been met and the IEP/504 team determines an accommodation is necessary, then it must be provided to the student during OSTP testing. If an accommodation is provided that does not meet the conditions stated above, the student's test score may be invalidated.

Test Formatting Options	Paper	Online
Grade 3-8, OSTP ELA & Math Grades 5 & 8, OSTP Science Grade 11, CCRA: Science & U.S. History Content	X*	X
Braille Tests	X*	
Large Print tests may be provided in paper format for Online tests.	X*	

*These test formats are only available for students with an accommodation that has been appropriately documented in their IEP/504 Plan.

Oklahoma Accommodations Guide

IEP/504 teams can refer to the Oklahoma Accommodations Guide for examples of accommodations broken down by student characteristics if teams need extra guidance.

Paper & Pencil Test Formats

IEP/504 teams should include rationale or evidence in the Present Levels of Performance that states why paper and pencil testing is best for the student.

If the team decides that paper-based testing is appropriate, a student can take the paper and pencil assessment for all subject areas. However, teams may also decide based on the needs of the student that they may only need the paper and pencil version for one subject area. Please note that all sections in a subject area must be taken using the same format (paper/pencil or computer-based).

OSTP Accommodations (See Section IV for ACT ELA & Math)

I. Setting/Timing/Schedule	Procedures & Guidelines
S1. Individual Testing	This accommodation is required for many presentation or response accommodations and is intended to reduce student distractions. Students must be actively monitored to maintain test security.
S2. Small group testing **Best practice is no more than 5 students, but the absolute maximum is 10 students.**	This accommodation is intended to reduce student distractions and may be required for certain accommodations. Students must be actively monitored and may use a testing carrel or test in a special education resource room or other location that maintains test security. Students in the group will have matching accommodations and/or similar testing needs. **Students should be tested with their non-disabled peers to the greatest extent possible.**
S3. Preferential Seating	Students may need this accommodation for various reasons, including but not limited to, allow the student to see or hear more easily, have access to more physical space, or have access to special equipment.
S4. Separate location	A separate location would be appropriate if this is needed to meet the needs of the tester. The separate location should be a different testing location, or a different testing time as compared to the majority of students in that grade/subject area.
S5. Provide special lighting	Specify type (e.g., 75-Watt incandescent, light box, etc.).
S6. Provide adaptive or special furniture	Students may need accommodations to provide better access to test materials (e.g., slant board, stander, etc.).

I. Setting/Timing/Schedule Continued	Procedures & Guidelines
T1. Flexible schedule same day **Student test book(s) must be secured between sessions.**	Students are scheduled to allow for the best conditions/timing for their performance, and/or may be allowed to take the test during more than one sitting during a single day. Students are not allowed to study for or discuss tests between sessions. This is not intended for lunch or recess breaks. **(S4)** must be selected for this accommodation. **Students with this accommodation selected must finish the session in the same school day.**
T2. Administer test over several sessions or "chunking" (except writing tasks/sections) **Student test book(s) must be secured between sessions.**	The test may be separated into smaller sections and administered over several days within the state testing window. Students may only work in one separated section at a time and may not go to previous sections or work ahead. **(S4)** must be selected for this accommodation. It is best practice to determine the number of questions a student will answer before the testing session begins. For example, the student will only work on questions 1-10 in the first chunk of time. Once they end that session, they will not be able to go back to the questions from that session. The Test Administrator will need to enter the proctor password to allow the student to continue the test during their next session. This is not exclusive to paper/pencil testing. This accommodation can be provided in the online testing platform through the use of a proctor password. Please note that a student may not go back and visit previously viewed items once they exit the testing platform.

I. Setting/Timing/Schedule Continued	Procedures & Guidelines
T3. Allow frequent breaks during one test session (**maximum 10-15 minute duration**) **Student test book(s) must be secured during the breaks.**	Students must be monitored during breaks and may not have access to instructional materials or any electronic devices. Students may not view/change previously answered questions after a break. Students are allowed to take short breaks as requested or at predetermined intervals. Breaks of more than 20 minutes will prevent the student from returning to items already answered by the student. The Test Administrator will need to use the proctor password to allow the student access to the test but all items the student has seen will be locked. **(S1, S2, or S4) may be selected if frequent breaks will disrupt the general education testing environment. This accommodation is not intended for lunch or recess breaks—students must complete a section before being dismissed.**

II. Presentation	Procedures & Guidelines
P1. Alternate Formats a. Large-Print Version (Instructions provided within kit.) This can be administered in small groups or large groups as long as the student is marking their answers in the test booklet and the Test Administrator transcribes the answers after the test session. The directions from the Test Administration Manual must match the type of test the student is taking. b. Contracted Braille Version (Instructions provided within kits) c. Large-print through Online Testing Client (Screen Zoom)	Large print documents will be printed in a minimum of 18-point type. Check with the assessment vendor for exact specifications. The Test Administrator must transcribe student answers verbatim into the standard answer document/test book that was provided in the large- print (paper/pencil) or Braille kit. Braille test formats will be provided on paper using contracted Braille and Nemeth code for numbers and formulas. Large print formats may be configured in the online testing client for certain assessments.
P2. Color Contrast	Students who have a visual impairment may require this to access the computer screen. If a student needs this accommodation, we highly encourage the student to view the practice test. The Test Administrator can note which color contrast the student needs.
P3. Use of aids or assistive technology (AT) devices or supports (e.g., color overlays, magnifier, pencil grips, auditory amplification devices, noise buffers, wedge for positioning, fraction tiles, and multiplication table/chart, hundreds chart). If you are marking this accommodation, please also include it under Supplementary aids on the IEP.	The specific device or support should be specified in the IEP/504 Plan, be routinely used by the student, and not alter the construct being measured. If a student needs this accommodation, we highly encourage the student to view the practice test. The Test Administrator can note which color contrast the student needs. **(S1, S2, or S4)** may be appropriate for this accommodation as some AT devices or mathematics manipulatives may be distracting to other students.

II. Presentation Continued	Procedures & Guidelines
P4. Text-to-Speech, Human Reader, or Sign Language Interpretation ***P4 applies to all Math, Science, and U.S. History test sections and Grades 5 & 8 ELA writing/extended constructed response sections only** a. Text-to-Speech is built into the online testing client, requires the use of earphones, and may be administered in individual, small group, or general education classroom setting. (All Math, Science, U.S. History tests, and Grades 5 & 8 ELA Section 3 only.) b. Human Reader reads test directions, test items, and answer choices. This is limited to small group or individualized testing. c. Sign Language Interpretation may be accomplished by using a separate test booklet in a separate location. For additional information, please refer to the Protocol for Human Readers.	Online tests have built in Text-to-Speech functionality. Earphones are required. Students may test with nondisabled peers. **Please note: A student should be familiar with the accommodation prior to testing and if they do not use it for benchmark or other online testing platforms throughout the year it may not be appropriate.** For online tests, if a Human Reader is required for a student, then the test must be read from the computer screen verbatim. **(S1 or S2)** is required when utilizing a Human Reader for Online tests. For paper tests, tests **(test forms must be the same)** are read by a Human Reader. Test Administrator uses separate test booklet or reads over a student's shoulder. Small group testing **(S1 or S2: 8-10 maximum)** is required and test forms must be the same. **Students may request items be read more than once.**
P5. Use of a Secure Braille Note-taker (students with a visual impairment)	An electronic note-taker, which may have a Braille or QWERTY-type keyboard, is an adaptive device similar to a PDA. This device may have built-in speech output and/or a refreshable Braille display. **(S1 or S2)** must be selected for this accommodation.
P6. Simplification/repetition/signage of directions	Students may ask for clarification, simplification, signage of directions. This does not include test questions or answer choices. Students may have directions reread for each page of questions.
P7. Turn off Universal Tools/Accessibility Features	Disable any tools that may be distracting to a student, tools a student does not need to use, or tools a student may be unable to use.

II. Presentation Continued	Procedures & Guidelines
P8. Use of an abacus	Students who have a visual impairment/blindness or access mathematical calculations tactilely may use an abacus.
P9. Use of a calculator on Grades 3-5 Mathematics *For additional information, please refer to the OSTP Calculator Policy.*	Only basic four-function calculators with square root and percent are allowed. Calculators must be provided to students and are not integrated within the online testing interface.
P10. Provide cues (arrows, stop signs) on answer form	This applies to Paper Only tests. Cues may not clue a student to a correct or incorrect answer.
P11. Use masking or templates to reduce the amount of visible print	Masking involves blocking off content that is distracting to the student. Students are able to focus their attention on a specific part of a test item by masking. This feature is built into the online testing client.
P12. Secure paper to work area with tape or magnets	This applies to Paper Only tests. Please be cautious when adhering tape to the test booklet or answer document by avoiding the tracking marks (black bars) for the scoring process.
P13. Student may read the test aloud or sign the test to himself or herself.	This requires individual testing (even if student is reading aloud quietly). **(S1) must be selected for this accommodation.**
P14. Placeholders, templates, or markers to maintain place	This applies to Paper Only tests.
P15. Audio Calculator	This requires earphones for group testing. A non- embedded calculator for students needing a special calculator, such as a Braille calculator or a talking calculator, is currently unavailable within the online assessment platform. **(S1, S2, or S4)** may be appropriate for this accommodation.
P16. Paper & Pencil Test	Students unable to access an OSTP computer-based test must also receive classroom assessments, benchmark assessments, and districtwide assessments in this manner. A student on an IEP/504 Plan does not automatically receive a paper & pencil test format.

III. Response	Procedures & Guidelines
R1. Student marks answers in test book and not on an answer document, for later transfer by a Test Administrator to an answer document.	The Test Administrator, with the Test Proctor present, must transcribe answers verbatim into the standard answer document. **Does not apply to Grade 3 tests.** This accommodation applies to Paper Only tests.
R2. Human Scribe ELA, Mathematics, Science, U.S. History: a. Student dictates response to a scribe who records responses on an answer document or through the Online Testing Client by Test Administrator or Proctor. b. Student signs response to a scribe who records responses on an answer document or through the Online Testing Client by Test Administrator or Proctor. c. Student tapes or records response for a writing portion of the test for verbatim transcription by Test Administrator or Proctor. *For additional information, please refer to the Procedures for Scribing Student Responses section of this manual.*	A scribe is a Test Administrator or Proctor who writes down what a student dictates by speech, or through an assistive technology communication device. Students who have documented significant motor or processing difficulties that make it difficult to produce responses may need to dictate their responses to a human, who then records the students’ responses verbatim. The use of this support may result in the student needing additional overall time to complete the assessment. **The guiding principle in scribing is to assist the student in accessing the test and responding to it. (S1)** must be selected for this accommodation.
R3. Use computer or other assistive technology device to respond. a. Student utilizes an electronic input device without the “help” features, such as spell check, an electronic dictionary, a thesaurus, or access to the Internet. *For additional information, please refer to the Procedures for Scribing Student Responses section of this manual.*	Students may use an external device to respond such as a computer, typewriter, or other assistive technology device to respond. This may include software dictation or dictation devices the student uses during routine instruction. Extended written responses must be printed off for transcription. Return the original typed student response for secure materials submission. The Test Administrator must transcribe words verbatim into an answer document/test book or Online Testing Client. The electronic responses or recordings must be destroyed or erased by District Test Coordinator. **(S1 or S2)** must be selected for this accommodation.

III. Response Continued	Procedures & Guidelines
R4. Test Administrator monitors placement of student responses on the answer document or the online testing client.	Test Administrator may redirect students. Students may not be directed to correct or incorrect answers in any way.
R5. Brailler/Secure, Braille Note-taker/Abacus (students with a visual impairment)	The Test Administrator must transcribe answers verbatim into the standard answer document/test book that was provided in the large-print (paper/pencil) or Braille kit. **(S1, S2, or S4)** must be selected for this accommodation. We have Braille practice tests available on request. Please contact the Office of Assessments (assessments@sde.ok.gov) to request this.

IV. ACT ELA & Math

The ACT accommodations provided below represent typical or common accommodation(s) requests that are appropriate to produce valid, college-reportable scores. Please utilize this list as a starting point as ACT considers requests for utilization of accommodations on a case-by-case basis. **For more information, please see the following link: ACT Accommodations**

ACT (ELA/Math)

Timing/Setting

- Extra time
- Breaks
- Multiple Days
- Food or Medication
- Special Seating/Grouping
- Location for Movement
- Individual Administration
- Administration at Optimum Time of Day
- Administration from Home or Care Facility
- Audio Amplification
- Special Lighting
- Adaptive Equipment or Furniture
- Wheelchair Accessible Room
- Personalized Auditory/Visual Notification of Remaining Time

Presentation

- Text-to-Speech (screen reader, text-to- speech on Reading assessment, etc.)
- Read Aloud
- Unified English Braille (UEB)
- Large Print
- Browser Zoom Magnification or Magnification
- Line Reader
- Talking Calculator
- Color Contrast (Online or Overlay)
- Abacus

Response

- Respond in Test Booklet or on Separate Paper
- Large Block Answer Sheet
- Dictate Response
- Computer for Writing Essays and Constructed Responses
- Speech-to-text

Requirements for the Use of Nonstandard Accommodations

IEP and 504 teams may request the use of one or more of the following OSTP nonstandard accommodations (ELA Read-Aloud or Unique Accommodation) only when all of the criteria are met, as described within OSTP Nonstandard Accommodations table. For a **nonstandard accommodation** to be provided, the student must meet all of the eligibility criteria for that accommodation, and a Nonstandard Accommodation Application must have been:

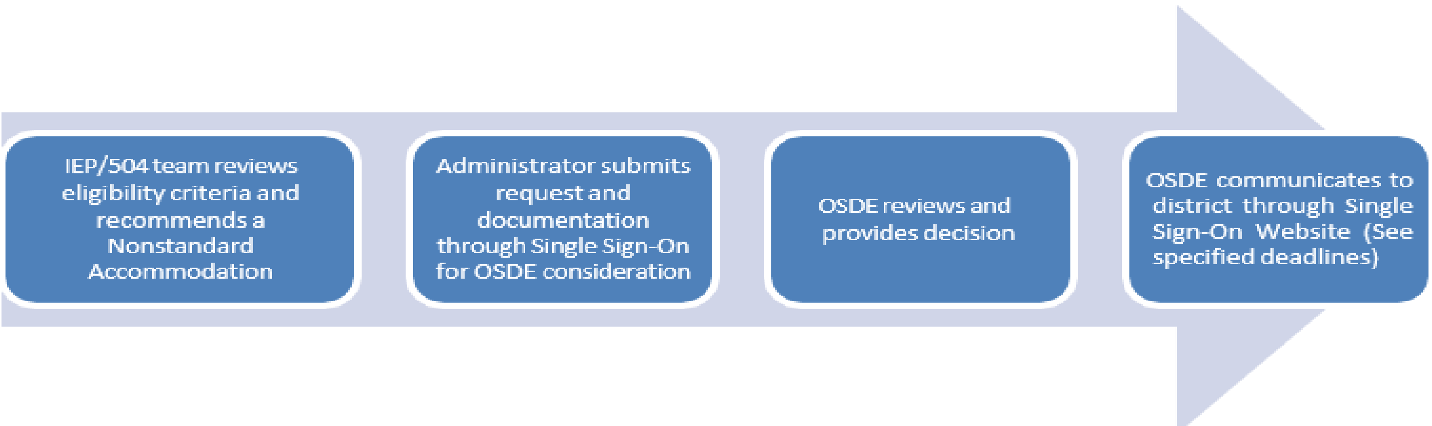
1) submitted by the DTC through the Nonstandard Accommodation Application on the Single Sign-On website,
2) approved by the OSDE before the accommodation may be used.

The decision to use a nonstandard accommodation is recommended by the IEP/504 team based on the nonstandard accommodation eligibility criteria. Nonstandard accommodations for use on OSTP assessments must be approved annually by the OSDE. The nonstandard accommodation can only be provided to a student with a disability on an OSTP assessments when it is documented in student's IEP/504 Plan under both the State/District Accommodations and Class/Activity Accommodation sections. The use of a nonstandard accommodation during instruction does not necessarily qualify a student to receive the same nonstandard accommodation on an OSTP assessment.

The **ELA Test Read-Aloud accommodation (NS1)** request for grades 3-8 may only be submitted when all three prongs of the eligibility requirements are met as described on within the OSTP Nonstandard Accommodations table. The OSTP ELA Test Read-Aloud Protocol will be used by the IEP/504 team to document all three prongs, including submission of any documents or evaluations to the OSDE. The protocol must be submitted through the Nonstandard Accommodation Application on the Single Sign-On website for consideration by the OSDE.

A **Unique Accommodation (NS2)** is an accommodation that requires changes or alterations to the test materials/booklet or media presentation. The unique accommodation must be one that is regularly used by the student for classroom instruction, must be on the student's IEP/504 Plan, and must not alter the underlying content of the assessment. The unique accommodation request must be submitted through the Nonstandard Accommodation Application on the Single Sign-On website for consideration by the OSDE. Please refer to NS2 section of the OSTP Nonstandard Accommodations table, Form U, and the Overview: Non-Standard Accommodations webpage for specific requirements.

IEP and 504 teams are encouraged to make consistent, defensible, and appropriate decisions for each student, and to amend the IEPs and 504 Plans of students who do not meet the nonstandard accommodation eligibility criteria. The OSDE will continue to review the number of students with disabilities who receive nonstandard accommodations in each district. Nonstandard accommodation requests must be approved by the OSDE before a student may use the accommodation on a state assessment. The use of a nonstandard accommodation on the OSTP without OSDE approval may result in a testing invalidation. Please do not submit a request if the student does not meet the specific eligibility criteria listed within the OSTP Nonstandard Accommodations table.



OSTP Nonstandard Accommodations

<table>
<tr><th>Nonstandard Accommodation</th><th>Eligibility Requirements</th></tr>
<tr><td>NS1. ELA Read-Aloud (Grades 3-8)
Text-to-Speech, Human Reader, or Sign Language Interpretation Accommodation for the OSTP English Language Arts Assessments.

a. Text-to-Speech is built into the online testing client, requires the use of earphones, and may be administered in individual, small group, or general education classroom setting for Grades 3, 4, 6, & 7.
b. Text-to-Speech is available on the Writing Section only of ELA Grades 5 & 8. Students requiring the Read-Aloud Accommodation for all sections of ELA Grades 5 & 8 must have a Human Reader for Sections 1 & 2.
c. A Human Reader reads test directions, test items, and answer choices. This is limited to small group or individualized testing.
d. Sign Language Interpretation may be accomplished by using a separate test booklet.

Test directions, test items, and answer choices must be read verbatim. Students may request items be read more than once.

<u>Due Date for Requests:</u>
Requests must be submitted to the OSDE through the Nonstandard Accommodation Application on the Single Sign-On website by February 1st for the Spring testing window and responses will be provided on a case-by-case basis no later than March 15th.</td><td>This accommodation must be determined by the following 3-pronged approach:

1. The student has a specific disability that severely limits or prevents him/her from decoding printed text at any level of difficulty, even after varied and repeated attempts to teach the student to do so (i.e., the student is a non-reader, not simply reading below grade level); <u>and</u>

2. The student can only access printed materials through a screen reader (assistive technology) or Human Reader, and/or is provided with spoken text on audiotape, CD, video, or other electronic format during routine instruction (includes Sign Language Interpretation), except while the student is actually being taught to decode; <u>and</u>

3. The IEP/504 team will utilize and provide the required documentation from the OSTP ELA Test Read-Aloud Protocol, which includes the use of the Protocol for Accommodations in Reading (PAR) or the AEM Navigator for deaf or blind students. This documentation must be uploaded into the Nonstandard Accommodation Application in the Single Sign-On website for consideration by the OSDE.

<u>Paper tests</u> are read by a Human Reader. (S1 or S2) is required, and test forms must be the same.
<u>Online tests:</u> If a Human Reader is utilized, they must read the assessment verbatim from the computer screen. (S1, S2, or S4) is required.

The request will be submitted annually through the Nonstandard Accommodation Application in the Single Sign-On website.</td></tr>
</table>

NS2. Unique Accommodations (Grades 3-8 ELA/Math/Science and Grade 11 Science & US History) **Students with disabilities who have IEPs/504 plans are eligible for consideration for unique accommodations on state assessments (e.g., allow projection of test for students receiving the Sign Language Interpretation accommodation in small groups, manipulatives, special devices, etc.).** **A unique accommodation is an accommodation that requires changes or alterations to the test materials/ booklet or media presentation.** **The unique accommodation must be one that is regularly used by the student for classroom instruction, must be on the student's IEP, and must not alter the underlying content of the assessment.**	A request may be made (pursuant to the IEP/504 team's determination) for a unique accommodation utilizing Form U for a student with a disability on any specified subject area(s) of the OSTP. The Form U must be submitted: • Due to the student's need for an accommodation that would enable the student to access the state assessment. • Through the Nonstandard Accommodation Application in the Single Sign-on Website. • With completed student information and any other requested information. • Form U is required when students have an electronic glucose monitor that will need to be with the student in the testing session.
If a student would benefit from the use of a fidget the team would need to submit a Form U for OSDE approval. **Tactile Fidget: A student uses a fidget for self- regulation to help with focus, attention, calming, and active listening. Examples include: squish ball, focus cube, or pencil topper. The tool must be free of anything that may give an advantage during testing or reveal any test content.**	**The requested accommodation must not impact the reliability or validity of the test, and the request may not exempt a student from taking any portion of the OSTP test(s).**

Calculator Policy

The items on the Grades 6-8 Math, Grade 8 Science, and Grade 11 CCRA: Science Content assessments are designed so that all tasks can be solved without the use of a calculator. However, certain tasks are more difficult if a calculator is not available. More information regarding calculator use can be found in the OSTP Calculator Policy. For ACT calculator requirements, please see the ACT Calculator Policy.

Before the first day of the test, students using a calculator for any Math and Science assessment should be familiar with the use of the specific calculator that can be utilized. Students should be consistently instructed throughout the school year in the use of calculators; otherwise, it may hinder students' performance on the assessment.

Protocol for Human Readers

A Test Administrator (Human Reader) who provides the verbatim reading accommodation to a student must comply with the following procedures when working with a student in a testing situation:

- Human Reader: A state-certified educator who reads orally to a student.
- All Human Readers must receive Test Administrator training by the local district, and the district must retain documentation, which may be requested by the OSDE at any time.
- **A test proctor who is employed by the school district is required**. Small group (8-10 maximum) or individual testing required.
- Human Readers must sign the Test Administrator Test Security Form.
- Human Readers must read from the computer screen for online test formats or from a separate test booklet or over the student's shoulder for paper/pencil formats (log test booklet serial number on NDA)
- Only students receiving the Human Reader accommodation and taking the same grade-level subject area test may be tested together in the same location.
- If students are taking a paper test, the students grouped together must have the same paper test form.

Verbatim Read-Aloud Procedures for Human Reader Accommodators

To ensure uniformity in presentation of standardized tests in Oklahoma, **built-in Text-to-Speech software on the secure online testing client** should be used whenever possible. If students are taking online tests, the students can be grouped together using the "Read Aloud" form. This form is enabled in the testing portal by configuring Text-to-Speech.

Human Readers must follow the procedures outlined below:

1. Human Readers must read, verbatim (word-for-word), only the words in the test book or on the computer screen, without changing or adding words, or otherwise assisting the test-taker in any way to influence the test taker's selection of a response.
2. Human Readers must speak in a clear and consistent voice throughout the test administration, using correct pronunciation.
3. Human Readers may not clarify, elaborate, or provide assistance to students.
4. Human Readers must give special emphasis only to words printed in **boldface**, *italics*, or CAPITALS and tell the test-taker that the words are printed in that way. No other emphasis or special vocal inflection is permissible. Readers should use even inflection so that the student does not receive any cues by the way the information is read.
5. Human Readers must be patient and understand that the test-taker may need to have test items repeated several times.
6. Human Readers must not attempt to solve problems or determine the correct answer to an item while reading as this may result in an unconscious pause or change in inflection which could be misleading to the test-taker.

7. Human Readers must maintain a neutral facial expression and must not smile or frown which may be interpreted by the test-taker as approval or disapproval of the student’s answers.
8. Human Readers must recognize that test-takers who are blind or who have low vision may also have additional special tools or equipment (e.g., abacus, brailler, slate, stylus) that have been approved for use during the test.
9. Human Readers must be familiar with the student’s IEP/504 Plan and know in advance the exact type of verbatim reading accommodation required by the student. The test-taker may require all or portions of the test to be read aloud, depending on his or her particular set of accommodations.
10. If a Human Reader finds an unfamiliar word or one that he or she is not sure how to pronounce, advise the test-taker of the uncertainty about the word and spell the word.
11. When reading a word that is pronounced like another word with a different spelling, if there is any doubt about which word is intended, readers must spell the word after pronouncing it.
12. Human Readers must spell any words requested by the test-taker.
13. When reading passages, readers must be alert to all punctuation marks. Human Readers may read the passage through once so that the test-taker can grasp the content of the passage. Some test-takers may ask for the passage to be read through a second time with punctuation marks indicated. When required or asked to read with punctuation, read the specific lines within a passage and indicate all punctuation found within those lines.
14. When test items refer to particular lines of a passage, reread the lines before reading the question-and-answer choices. For example, a Human Reader might say, “*Question X* refers to the following lines…” Reading the lines referred to would then be followed by reading *question X* and its response options.
15. When reading selected response items, readers must be particularly careful to give equal stress to each response option and to read all of them before waiting for a response. The test-taker will record the answer or provide the answer to the test scribe, who will record it for the test-taker.
16. If a Human Reader is also serving as a scribe, and if the test-taker designates a response choice by letter only (“D,” for example), the Human Reader must ask the test-taker if he/she would like the complete response to be reread before the answer is recorded.
17. If the test-taker chooses an answer before the reader has read all the answer choices, the Human Reader must ask if the test-taker wants the other response options to be read.

18. After a Human Reader finishes reading a test item, the Human Reader must allow the test-taker to pause before responding. However, if the test-taker pauses for a considerable time following the reading of the answer choices, say: "Do you want me to read the question again . . . or any part of it?" In rereading questions, readers must be careful to avoid any special emphasis on words not emphasized in the printed copy by italics or capital letters.

NOTE: For ACT, please refer to the ACT Accommodations section on page 4.

Special Guidelines for Reading, Mathematics, and Science Content

Mathematical expressions and science vocabulary must be read precisely and carefully to avoid misrepresentation. For mathematics items involving algebraic expressions or other mathematical notation, it may be preferable for the reader to silently read the entire question before reading it aloud to the test-taker. Use technically correct yet simple terms and be consistent in the treatment of similar expressions.

Sign Language Interpreters

Test-takers who are deaf or hard of hearing may require the services of an interpreter. The interpreter typically provides support to the student in understanding test instructions that would otherwise be read aloud to all students.

- Discussions with the interpreter on testing procedures should be conducted with the test-taker present before (and not during) the test session.
- Before the session, the interpreter must become familiar with the test instructions and the terminology used in the test that he or she will be interpreting.
- An interpreter always lags a few words or phrases behind the person who is speaking. Allow short pauses for the test-taker to respond or to ask questions.
- As the test administrator, remember to speak directly to the test-taker even when an interpreter is present.
- Courtesy requires that test examiners not say things to the interpreter that they do not want repeated to the test taker. (For example, do not ask the interpreter's opinion about the test taker or the situation.)
- An interpreter may also provide a verbatim read-aloud accommodation for students who require this accommodation, as listed in the student's IEP/504 Plan.

NOTE: For ACT, please refer to the ACT Accommodations section on page 4.

Procedures for Scribing Student Responses

Overview

A scribe is a Test Administrator or Proctor who writes down what a student dictates by speech, or through an assistive technology communication device. The guiding principle in scribing is to assist the student in accessing the test and responding to it. **Alterations or changes to OSTP tests are not allowed and will result in test invalidation.** Any variation in the assessment environment or process that fundamentally alters what the test measures or affects the comparability of scores is considered a modification. For ACT, please refer to the *ACT Accommodations section on page 4.*

A scribe must be a currently employed educator/paraprofessional, must be familiar with scribing, must have been trained as a Test Administrator or Proctor, and must have on file a signed Test Administrator/Proctor Security Form (See Test Preparation Manual). Individuals who serve as scribes need to be carefully prepared to ensure that they know the vocabulary involved and understand the boundaries of the assistance to be provided.

Scribes must be impartial and experienced in transcription. It is preferable for the scribe to be a familiar person, such as the teacher who is typically responsible for scribing during regular instruction. Scribes will review the test security procedures and will sign all statements required of Test Administrators/Proctors.

Scribes must fulfill the following duties:

- Sign a test security form acknowledging that they will ensure that the content of the written responses directly represents the independent work of the student.
- Sign a Test Administrator/Test Proctor Test Security Form.
- List the names and enrollment grades of the students whose responses were transcribed and send the form to the Building Test Coordinator (BTC) upon completion.
- Demonstrate proficiency in signing (ASL and/or signed English) if serving as both the interpreter and scribe.
- Test in a location where examinees are not able to hear or see other students' responses.
- Remain silent while students are dictating or signing.
- When needed, ask students to repeat a word or phrase for understanding.
- Indicate when they are unable to understand the student's oral or signed response.
- Record the interpreter's response.

Produce legible text so that the written portion of the test can be scored.

- When transcribing from a handwritten or word-processed response, record punctuation, capitalization, and spelling as provided by the student.

Refrain from:

- Communicating verbally or nonverbally whether the response is correct or incorrect.
- Prompting the student in any way that would result in a better response or essay.
- Influencing the student’s response in any way.
- Editing student work or completing a student’s incomplete essay.
- Discussing the student’s essay with the student or any other person.

Scribing Multiple-Choice Questions

The scribe should confirm the student's response before recording the student’s answer on the answer document or entering the student’s response into the secure online testing platform. If the scribe cannot understand a student's pattern of speech, or it is barely audible, large cards, each indicating one of the response options (e.g., A-D), can be used. The student can then choose the card that indicates the student’s desired response to the multiple-choice question. For ACT, please refer to the *ACT Accommodations section on page 4.*

Scribing Constructed/Extended-Response Questions (Writing Tasks)

The scribe should determine the preferred mode of recording the student’s response ***before*** the date of the test. At testing time, the student may then dictate the constructed/extended response directly to a scribe. A student with disabilities must be given the same opportunity as other students to plan, draft, and revise the constructed/extended response. The scribe’s responsibility is to be both accurate and fair, neither diminishing the fluency of the student’s response nor helping to improve or alter what the student asks to be recorded. This means that the scribe may write an outline or other plan as directed by the student. For online/computer-based tests, transcribing involves the transfer of a student’s written response into the secure testing platform. For ACT, please refer to the *ACT Accommodations section on page 4.*

The student does not have to specify repeatedly spelling and language conventions once the student has demonstrated knowledge and skills in the use of these spelling and language conventions. The scribe may apply these conventions automatically. Examples include the following:

- Once a student has demonstrated the knowledge of indicating the beginning of sentences with a capital letter, the student does not need to specify this throughout the remainder of the constructed/extended response. That is, scribes can automatically capitalize the first letter in the beginning of a sentence if the student has indicated punctuation ending the previous sentence. If the student has not indicated punctuation ending the previous sentence and says, “The dog ran. The dog jumped,” the scribe would write “the dog ran the dog jumped.”

- Homonyms and often-confused words should be spelled by the student each time they are used. For example:
    - "to," "two," and "too,"
    - "there," "their," and, "they're"
    - “than” and “then”

Scribing Procedures

To maintain the student’s fluency of thought and to allow the student to demonstrate the requisite knowledge and skill in English Language Arts conventions, the scribe should adhere to the following process:

1. The student dictates the response without interruption directly to the scribe or electronic recording device.
    a. Students may punctuate as they dictate. For example, when stating the sentence “The cat ran.”, the student may say, “The cat ran period.”
    b. Students may dictate more than one sentence at a time and add punctuation after the fact, when given the scribed sentences to proofread.
    c. The scribe transcribes a draft of the student’s response exactly as dictated without including any conventions other than spelling. Probing or clarifying questions are not allowed except in the case of classifiers for students using American Sign Language (ASL). Scribes may not question or correct student choices. Scribes may draw a diagram, or a picture described by the student if the student is unable to draw the diagram or picture. The student may not yet view this written transcription.
2. The scribe reads the draft to the student without vocal inflection that would indicate punctuation or alert the student to possible mistakes.
3. The student then provides letter-by-letter spelling for each word in the response that the scribe has determined must be spelled by the student. The scribe edits the draft of the constructed/extended response as spelled by the student.
4. The student views the draft and/or listens to the scribe as the scribe reads the draft of the constructed/extended response (i.e., written transcription). Students MUST be given the opportunity to review their responses in the way that the student prefers:

a. Scribes may read back the dictation for proofreading to the student; or

b. Students may review the written or typed response on paper or on the computer screen after having indicated word-for-word spelling according to these guidelines.

5. The student indicates additional edits to the scribe, including but not limited to paragraph structure, capitalization (for proper nouns, acronyms, and so forth), wording, spelling, and punctuation. The scribe will make those changes exactly as dictated by the student, even if incorrect.

6. The scribe records the final written response. Scribes may handwrite (there is no penalty for cross-outs and insertions), type, or use a laptop to record the student's work. If the scribe types and prints out the student's responses, the responses need to be transcribed into the response booklet for paper-based tests or typed directly into the secure testing client for online tests. The transcriber must copy the student's marks or responses exactly as he/she has written—including all errors in grammar, mechanics, spelling, etc.

If necessary, proofread the student essay with another scribe before word processing the student response.

- ✓ If the student is using a tape recorder or videotape for later transcription by a scribe, it is required to have two people listen or view as a reliability check for accuracy.
- ✓ For an accuracy check, scribes may record the session on audio or videotape for playback.
- ✓ Corrections of exclusively Braille errors will be at the discretion of the scribe. Braille errors are those errors that occur specifically to that population due to recording medium. An example could be the result of the physical typing on a Braille machine, such as typing an 'f' as opposed to the intended 'd' due to finger misplacement. The transcriber has the option to verify student response with another examiner trained in Braille.
- ✓ To increase accuracy, it is advisable to have one person read the student's responses as another transcribes them into the test booklet. The people then switch roles to check the transcription. Transcriptions must take place in a secure environment and, whenever possible, under the direction of the BTC. Please note that all test material—including the test booklet the student originally used—must be returned to the testing vendor.
- ✓ Collect scratch paper, rough drafts, and login information immediately at the end of the testing session. These items are considered secure material and must be collected and shredded by the BTC at the end of the testing session.

NOTE: For ACT, please refer to the ACT Accommodations section on page 4.

Oklahoma Alternate Assessment Program (OAAP)

The OAAP is a component of the OSTP and is designed for students with the most significant cognitive disabilities and adaptive behavior deficits. The OAAP mirrors the general assessment system in regard to grade levels and subjects assessed and utilizes the Dynamic Learning Maps (DLM) Alternate Assessment System. The academic achievement of students participating in the OAAP is based on alternate academic achievement standards, which differ in complexity from the Oklahoma Academic Standards (OAS) of the general state assessments.

In order to participate in the OAAP, students must require alternate achievement standards in all content areas and must have an IEP containing rigorous, measurable goals that include short-term benchmarks/objectives. In addition, students must meet the criteria identified in *The Criteria Checklist for Assessing Students with Disabilities on Alternate Assessments,* and the IEP team must determine an alternate assessment is appropriate for the student. The Every Student Succeeds Act (ESSA) mandates that no more than 1% of all tested students may participate in an alternate assessment. IEP teams should discuss the accommodations needed for students to participate in the general assessment prior to considering eligibility in the alternate assessment. For additional information on the OAAP, visit https://sde.ok.gov/assessment or contact the Special Education Office at (405) 521-3351 or Office of Assessments at (405) 522-1677.

Protocol for Emergency Accommodations on State Assessments

If, prior to or during testing, the school principal (or designee) determines that a student requires an emergency accommodation (e.g., broken hand), **Form EA** must be completed and submitted to the District Test Coordinator (DTC) for approval. A copy of this form must be filed in the testing archives, and a copy must be retained by the DTC at the central office.

Student Refusal of Accommodations during testing

If a student refuses to use an accommodation listed in his or her plan during testing, the school should document in writing that the student refused the accommodation and keep the documentation on file at the school. The student should be told that the accommodation will remain available during testing should they need it. The student should *not* be asked to sign an agreement acknowledging that they have refused an accommodation, nor should they be asked to waive their right to receive an accommodation that is listed in their IEP or 504 plan. A sample form for documenting a student's refusal of an accommodation is available in the Supporting Documents listed below.

If a student refuses an accommodation, and the IEP team agrees that the listed accommodation is no longer needed by the student, the accommodation should be removed from the plan at the next scheduled meeting (or listed in the plan "as requested by the student"). Written approval must be obtained from the parent/guardian (or student over 18 years of age) for new or amended IEPs before a change in accommodations can go into effect.

Similarly, 504 plans must reflect only those accommodations that are required by the student as determined by the educators familiar with the student.

Supporting Documents

ACT Accommodations Request Form

Form EA (Emergency Accommodation)

Form U (Unique Accommodation)

OSTP Calculator Policy

OSTP ELA/Reading Test Read-Aloud Protocol

Student Accommodation Refusal Form

APPENDIX F
PARTICIPATION RATES

Table F-1. Summary of Participation by Demographic Category—OSTP ELA

Description	Tested	
	Number	Percent
All Students	298,482	100.00
Female	145,530	48.76
Male	152,744	51.17
Black/African American	23,449	7.86
American Indian/Alaskan Native	33,691	11.29
Hispanic/Latino	59,872	20.06
Asian	7,041	2.36
Pacific Islander	1,379	0.46
White/Caucasian	134,240	44.97
Two or More Races	38,673	12.96
Economically Disadvantaged	182,737	61.22
Individual Education Program (IEP)	54,214	18.16
Plan 504	9,631	3.23
English Language Learner (ELL)	33,522	11.23

Table F-2. Summary of Participation by Demographic Category—OSTP Mathematics

Description	Tested	
	Number	Percent
All Students	298,138	100.00
Female	145,343	48.75
Male	152,587	51.18
Black/African American	23,424	7.86
American Indian/Alaskan Native	33,660	11.29
Hispanic/Latino	59,779	20.05
Asian	7,035	2.36
Pacific Islander	1,380	0.46
White/Caucasian	134,091	44.98
Two or More Races	38,631	12.96
Economically Disadvantaged	182,458	61.20
Individual Education Program (IEP)	54,124	18.15
Plan 504	9,613	3.22
English Language Learner (ELL)	33,480	11.23

Table F-3. Summary of Participation by Demographic Category—OSTP Science

Description	Tested	
	Number	Percent
All Students	99,998	100.00
Female	48,713	48.71
Male	51,154	51.16
Black/African American	8,040	8.04
American Indian/Alaskan Native	11,571	11.57
Hispanic/Latino	20,015	20.02
Asian	2,326	2.33
Pacific Islander	460	0.46
White/Caucasian	44,914	44.91
Two or More Races	12,564	12.56
Economically Disadvantaged	60,552	60.55
Individual Education Program (IEP)	17,228	17.23
Plan 504	3,392	3.39
English Language Learner (ELL)	10,314	10.31

Table F-4. Summary of Participation by Demographic Category—CCRA Science

Description	Tested	
	Number	Percent
All Students	48,989	100.00
Female	24,521	50.05
Male	24,422	49.85
Black/African American	3,901	7.96
American Indian/Alaskan Native	5,687	11.61
Hispanic/Latino	9,621	19.64
Asian	1,095	2.24
Pacific Islander	212	0.43
White/Caucasian	22,919	46.78
Two or More Races	5,535	11.30
Economically Disadvantaged	26,059	53.19
Individual Education Program (IEP)	7,010	14.31
Plan 504	1,947	3.97
English Language Learner (ELL)	3,136	6.40

Table F-5. Summary of Participation by Demographic Category—CCRA U.S. History

Description	Tested	
	Number	Percent
All Students	49,014	100.00
Female	24,546	50.08
Male	24,420	49.82
Black/African American	3,905	7.97
American Indian/Alaskan Native	5,690	11.61
Hispanic/Latino	9,601	19.59
Asian	1,093	2.23
Pacific Islander	212	0.43
White/Caucasian	22,944	46.81
Two or More Races	5,547	11.32
Economically Disadvantaged	26,041	53.13
Individual Education Program (IEP)	6,997	14.28
Plan 504	1,947	3.97
English Language Learner (ELL)	3,116	6.36

APPENDIX G

ONLINE TESTING ACCOMMODATION FREQUENCIES

Table G-1. Numbers of Students Tested with Accommodations by Accommodation Type and Grade—ELA

Accommodation Code	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
AccomBraille	4	4	1	2	1	1
AccomColorContrast	130	139	118	124	89	94
AccomGeneralMasking	147	150	125	74	70	67
AccomMagnification	155	167	145	114	99	108
AccomModeTesting	12	6	13	39	35	41
AccomReadAloudELA	66	66	6,651	18	11	4,959
AccomTurnoffUniversal	137	71	91	56	14	19
TestELL	3,138	2,886	2,132	932	1,207	1,097
TestIEP	6,308	6,863	6,845	6,658	6,475	6,489
TestPlan504	684	845	949	1,004	1,004	945

Table G-2. Numbers of Students Tested with Accommodations by Accommodation Type and Grade—Mathematics

Accommodation Code	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
AccomBraille	3	4	--	--	1	1
AccomColorContrast	133	139	118	123	88	94
AccomGeneralMasking	147	150	125	74	70	67
AccomMagnification	157	167	145	115	100	108
AccomModeTesting	12	6	13	38	31	39
AccomReadAloudMAT	8,331	8,767	8,241	7,386	7,012	6,827
AccomTurnoffUniversal	137	71	91	55	14	19
Spanish	104	122	128	132	169	151
TestELL	3,309	3,067	2,104	1,379	1,530	1,192
TestIEP	6,324	6,973	6,944	6,883	6,696	6,623
TestPlan504	680	843	953	1,004	1,000	937

Table G-3. Numbers of Students Tested with Accommodations by Accommodation Type and Grade—Science

Accommodation Code	Grade 5	Grade 8	Grade 11
AccomBraille	--	--	2
AccomColorContrast	117	94	88
AccomGeneralMasking	125	67	60
AccomMagnification	145	108	100
AccomModeTesting	13	39	16
AccomReadAloudSCI	7,901	6,368	2,570
AccomTurnoffUniversal	91	19	7
Spanish	146	130	93
TestELL	1,875	1,113	984
TestIEP	6,387	5,962	3,807
TestPlan504	863	864	661

Table G-4. Numbers of Students Tested with Accommodations by Accommodation Type and Grade—U.S. History

Accommodation Code	Grade 11
AccomColorContrast	88
AccomGeneralMasking	60
AccomMagnification	100
AccomModeTesting	15
AccomReadAloudUSH	2,542
AccomTurnoffUniversal	7
Spanish	129
TestELL	982
TestIEP	3,771
TestPlan504	661

APPENDIX H
STATISTICAL DETECTION REPORT FOR THE SPRING 2023 ADMINISTRATION

Oklahoma School Testing Program
Test Security Analysis

Statistical Detection Report for the Spring 2023 Administration

Prepared by Dr. Sandra Sweeney
October 2023

Oklahoma State
Department of Education

Table of Contents

Introduction

Cognia’s test security policies and practices are designed to protect examinee data privacy, test data security, and the security of test content. We organize our planning and execution of test security measures around a framework for comprehensive test security systems: *Prevention, Detection, Investigation, and Resolution* (PDIR; Ferrara, 2017). We rely on collaboration with our clients to protect test security and data integrity, working together with them to encourage and support rigorous, professional investigations if security issues should arise and to resolve any issues to the degree possible following such investigations.

In this report, we provide statistical detection findings from two techniques for detecting possible test security violations: inordinate response similarity analyses and inordinate score gain analyses. **Statistical detection findings** provide initial indication of whether additional follow-up may be required to determine if a test security violation may have occurred. **Inordinate response similarity analyses** enable us to detect evidence, in the form of inordinately similar item response patterns, of possible security threats from prior exposure of test items to educators and examinees, educators supplying answers to test items to examinees during administration, educators changing examinee answers after test administration, or examinees copying answers to test items from one another. **Response change analyses** enable us to detect evidence of inordinate numbers of response changes in an examinee group’s test performance.

The highest probability threats to the security of OSTP and CCRA are the exposure of test items and stimulus material (e.g., reading passages) before test administration, helping students respond to test items during test administration, and changing student responses after test administration.

We use the statistical results to flag possible evidence of a test security violation or other testing irregularity that may require follow-up. Statistical evidence by itself does not indicate that a test security violation has occurred; however, it signals the need for additional consideration to determine if a violation is likely and whether additional investigation is necessary. When one of the two statistical flags indicate the need for additional follow-up, this process could include examining results from the other statistical analysis, examining reports of test administration irregularities, and conducting informal conversations with people who may have firsthand knowledge of a situation. When initial evidence indicates the need for more formal follow-up investigations, these may include professional investigative interviews, requests for relevant documents, the examination of examinee online log files, and scannable answer documents. Cognia can provide advice and other support for investigations after delivery of the statistical detection report.

Statistical Detection Methods

Data Sources

The inordinate response similarity analysis required the examinee's response option selections (i.e., a, b, c, or d—not 0 or 1), along with the correct answer key for each item. Those response options were accompanied with the examinee's school ID to identify all possible pairs of examinees in a grade and content area, and to assign examinees to examinee groups for group-level analysis after the individual-level analysis. Similarly, inordinate response change analysis required the response option selections for examinees accompanied with the examinee's school ID to identify school and district assignment for group-level analysis. We planned all the data handling in advance with clear specifications and dealt with small data issues when they arose.

Procedures

Both the inordinate response similarity analysis that produced the ω-index and the inordinate response change analysis using independent two-samples t-test were done on the corresponding individual level data first. It's important to note that by the nature of the analysis and the structure of the data, the analysis units of the inordinate response similarity on the individual level are all possible pairs of examinees in an examinee group (i.e., grade and content area in a school), while the analysis units of the inordinate response change analysis on the individual level are all the individual examinees in an examinee group. The output result of the first analysis is the list of flagged pairs of examinees or the list of examinees. Those flagged individuals were used to calculate the proportions of flagged pairs or examinees in a grade and content area within a school in the group-level analysis. In the case of inordinate response change, students were grouped by school and then all individuals in each group were used to compare to the entire state (excluding the group in question). The result of the group-level analysis illustrates the list of all examined schools with details on whether such groups with inordinately high proportions of flagged examinee pairs or groups were marked for further investigation.

Inordinate Response Similarity Analysis: Examinee Pairs

Inordinate response similarity analysis focuses on the agreement between two examinees' response patterns by taking their ability into account. Inordinately high response similarity suggests a violation of independent test-taking behavior. Non-independent test-taking could be caused by many factors, such as the prior exposure of test items, examinees copying answers from each other, test administrators supplying answers during test administration, or test administrators changing answers after test administration.

Inordinate response similarity analysis is implemented by calculating the ω-index (Wollack, 1997) for every pair of examinees within an examinee group on their responses to multiple-choice items. The ω-index is a commonly used statistic in the literature of inordinate response similarity detection. Previous research (Wollack, 1997, 2003; Wollack & Cohen, 1998; Sotaridona, & Meijer, 2002) suggests that it performs just as well as or better than other statistics and the statistical properties of ω are not much affected by examinee sample size or error in item parameter estimates. The ω-index is based on the total number of matched responses, M_{CS}, between a pair of examinees, *C* (potential copier) and *S* (potential source). To determine whether M_{CS} is large enough to be considered suspicious, the expected value of M_{CS} is calculated under the null hypothesis that examinees *C* and *S* worked independently. With examinee *S'*s responses treated as fixed, the expected value of M_{CS} is equal to

$$E(M_{CS}|\theta_C, U_S) = \sum_i P(U_{iC} = u_{is}|\theta_C, U_S)$$

where θ_C is the latent ability of examinee *C*, U_S is the response pattern of examinee *S*, *i* is the index for item *i*, U_{iC} and u_{is} are the response on items *i* by examinee *C* and *S* respectively. $P(U_{iC} = u_{is}|\theta_C, U_S)$ represents the probability that examinee *C* chooses the same response as examinee *S,* given *C's* ability. The variance of M_{CS} is equal to

$$Var(M_{CS}|\theta_C, U_S) = \sum_i P(U_{iC} = u_{is}|\theta_C, U_S)(1 - P(U_{iC} = u_{is}|\theta_C, U_S))$$

The ω-index is calculated by taking the standardized form of M_{CS}:

$$\omega = \frac{M_{CS} - E(M_{CS}|\theta_C, U_S)}{\sqrt{Var(M_{CS}|\theta_C, U_S)}}$$

The ω-index follows a standard, normal distribution as the number of items becomes infinitely large (Wollack, 1997), and large positive values lead to the rejection of independent test-taking behavior.

Calculation of the ω-index requires estimating the probability that *C* chooses a particular response option. This probability is usually estimated by fitting a nominal response model to the data. However, based on our experience, the estimation of the nominal response model is sometimes unstable; the estimation either does not reach a converged solution after a large number of iterations or gives unreasonably large parameter estimates for low-discriminating items. Even if stable estimation is obtained, the fit of a nominal response model to some datasets may be unsatisfactory. To overcome these problems, we used nonparametric item response models to calculate the response probabilities. Nonparametric estimation provides a more flexible modeling tool, as it does not assume a parametric form for the item characteristic curves (ICC). Douglas (1997) has demonstrated that, under mild assumptions, the curved smoothed "ICC estimates and ordinal ability estimates simultaneously converge to their true values" (p. 19). Specifically, kernel smoothing is used as the nonparametric estimation technique, due to its computational simplicity and wide use in nonparametric regression, and examinee ability *θ* is estimated using the same procedure as described in Douglas (1997).

The ω-index was initially developed to identify potential copiers given a known source. However, the source is unknown in our analysis, as in most situations, and the calculation typically yields different results depending on which examinee in a pair is treated as a source. In our analysis, the examinee with a higher raw score is treated as the source in each examinee pair, so that there is only one value of ω for each pair of examinees.

A pair of examinees is flagged if the right tailed *p*-value of the ω statistic is smaller than the nominal level for these analyses, 0.01. The nominal level is the *p*-value threshold for rejecting the null hypothesis. The use of 0.01 in a right-tailed test ensures that we flag only largely positive and statistically significant ω values, which is part of our effort to minimize false positive flagging errors.

Inordinate response change analysis is only conducted at the group and state levels.

Group Level (School) Response Similarity and Response Change Analyses

The focus of these statistical detection analyses is to identify grade-level examinee groups within a school with inordinately high numbers of examinees with inordinately (a) similar response patterns, and (b) inordinately great numbers of WTR response changes.[1] To evaluate whether a grade-level examinee group within a school should be flagged for additional consideration, the response similarity individual pair-level results are aggregated to the school level. As hypothesis testing is conducted for each examinee pair or each examinee, the Type I error at the school level may be inflated due to the multiple comparisons in a school. To control for the inflated Type I error rate (or false positive error rate) at the school level in the response similarity analysis, a three-step procedure is used for school-level detection:

a. Calculate each statistic for all pairs of examinees or all individual examinees in each school and flag a pair or an examinee if the statistic falls into the rejection region, which is done in the individual level analyses.
b. Calculate the total number of flagged pairs or examinees (n_F) in each grade within a school.
c. Compare n_F to the Binomial distribution, *Binom*(*N*, α), where *N* is total number of pairs or examinees in a grade within a school and α is the nominal level used in step.
d. If the right tailed *p*-value associated with the $\mathrm{n_F}$ under the Binomial distribution is smaller than 0.01, a school is flagged.

Inordinate response change analysis focuses on the number of items where a respondent erased or deleted an incorrect response and replaced that response with one which was scored as correct. The proportion of wrong-to-right answer changes [WTR] is calculated at the school level and then each school is compared to the entire state (excluding the school in question) using independent two-sample hypothesis testing. This approach is commonly used in erasure and response change analysis (e.g., Wollack & Fremer, 2013), testing the null hypothesis that the population means related to two independent, random samples from an approximately normal distribution are equal.

The formula for pooled variance s^2 and statistic t for detecting inordinate response change are calculated as:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{s^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$s^2 = \frac{\sum_{i=1}^{n_1}(x_i - \bar{x}_1)^2 + \sum_{j=1}^{n_2}\left(x_j - \bar{x}_2\right)^2}{n_1 + n_2 - 2}$$

where $\bar{x}_1$ and $\bar{x}_2$ are the sample means, s^2 is the pooled sample variance, n_1 and n_2 are the sample sizes.

Schools are considered for flagging if the right tailed p-value of the t statistic is smaller than the nominal level for these analyses, 0.01. The nominal level is the p-value threshold for rejecting the null hypothesis. Any schools meeting those criteria would be ranked using Cohen's d as an indicator of effect size, and those schools with $d \geq$ .3 flagged for potential further investigation.

[1] *The preferred level of analysis is testing group rather than all students within a grade level with a school. Testing group assignment is not available in these data.*

Results

In this section of the report, we summarize the numbers of schools flagged in the inordinate response similarity and response change analyses. The summary tables list numbers and percentages of schools flagged in each analysis and count flagged schools according to numbers of examinees in different-size grade level examinee groups.

Full results from pair and individual analyses and school analyses are provided in a separate excel file. Descriptions of the tables provided in the excel file are appended at the end of this report.

Inordinate Response Similarity

Table 1 lists the numbers of schools within grade levels that are flagged for inordinately similar responses to the 2023 OSTP and CCRA test items and the percentage of the total number of schools within a grade level.

Table 1. Inordinate Response Similarity Analysis Results For 2023: Numbers of Flagged Schools by Examinee Group Size

Grade	No. of Schools Flagged (% of Total Schools)	No. of Examinees in the School				
		1–5	6–10	11–20	21–30	Greater Than 30
English Language Arts						
3	19 (2.3)	0	0	3	1	15
4	8 (1.0)	0	0	0	1	7
5	5 (0.6)	0	2	0	0	3
6	6 (1.0)	0	0	0	0	6
7	24 (4.1)	0	1	1	4	18
8	18 (3.1)	0	0	1	2	15
Mathematics						
3	13 (1.5)	0	0	1	3	9
4	24 (2.9)	0	2	1	4	17
5	33 (4.1)	0	2	1	3	27
6	39 (6.3)	0	0	3	5	31
7	163 (27.9)	0	4	19	12	128
8	164 (28.0)	0	6	13	20	125
Science						
5	19 (2.4)	0	1	4	3	11
8	16 (2.7)	0	2	0	4	10
11	131 (28.4)	0	0	9	11	111
US History						
11	55 (11.9)	0	0	8	3	44

As Table 1 indicates, in the inordinate response similarity analyses:

- Higher percentages of schools are flagged in Mathematics than in ELA, Science or US History.
- In ELA, as few as 0.6% of schools (grade 5) and as many as 4.1% of schools (grade 7) were flagged. These data represent a slight decrease on the lower end, and a slight increase on the higher end of the flagging percentages when compared to the previous year. In Mathematics, there were also decreases in group flagging percentages compared to the previous year. The range of percentages for Mathematics is 1.5% (grade 3) to 28% (grade 8). In science the range is

2.4% (grade 5) to 28.4% (grade 11). The findings within science show a slight decrease for grades 5 and 8, and a minor increase for grade 11 when compared to the previous year. In US History, 11.9% of schools were flagged which is a 0.9% increase compared to the previous year.

- Higher numbers of schools are flagged in testing groups with more than 30 examinees.
- Few schools are flagged for smaller examinee group sizes.

Inordinate Response Change

Table 2 lists the numbers and percentages of schools within grade levels that are flagged for inordinately high response changes in 2023 and the percentage of the total number of schools within a grade level.

Table 2. Inordinate Response Change Analysis Results For 2023: Numbers of Flagged Schools by Examinee Group Size

Grade	No. of Schools Flagged (% of Total Schools)	No. of Examinees in the School				
		12-20 *	21-30	31–40	41–50	Greater Than 50
			English Language Arts			
3	50 (5.9)	7	6	7	9	21
4	18 (2.2)	2	4	1	0	11
5	19 (2.4)	5	4	3	3	4
6	10 (1.6)	2	1	3	2	2
7	10 (1.7)	3	4	1	1	1
8	8 (1.4)	4	1	0	1	2
			Mathematics			
3	14 (1.7)	7	2	2	1	2
4	15 (1.8)	5	1	5	3	1
5	11 (1.4)	0	0	2	2	7
6	15 (2.4)	3	3	1	6	2
7	4 (0.7)	0	1	1	1	1
8	7 (1.2)	4	0	1	0	2
			Science			
5	27 (3.4)	3	6	7	5	6
8	13 (2.2)	1	1	3	4	4
11	18 (3.9)	7	2	4	1	4
			US History			
11	9 (1.9)	2	1	3	2	1

** Schools with examinees <12 are not subject to flagging for inordinate response change*

As Table 2 indicates, in the inordinate response change analyses:

- Slightly greater percentages of schools are flagged in science than in Mathematics, ELA and US History.
- Most flagged schools are in testing groups with fewer than 51 examinees.
- Slightly more schools are flagged among those with smaller examinee group sizes.

- In ELA the flagging percentages range from 1.4% in grade 8 to a maximum of 5.4% in grade 3. In Mathematics, the flagging percentages range from 0.7% in grade 7 to 2.4% in grade 6. In Science, the flagging percentages range from 2.2% in grade 8 to 3.9% in grade 11. In US History, 1.9% of schools were flagged.

Discussion and Recommendations

In this report, we have summarized statistical detection findings from analyses of inordinate response similarities and inordinate answer changes. We selected these analyses from a range of other statistical detection techniques because they focus on the highest probability threats to the security of OSTP and CCRA: exposure of test items and stimulus material (e.g., reading passages) before test administration, helping students respond to test items during test administration, and changing student responses after test administration.

We use the statistical results to flag possible evidence of a test security violation or other testing irregularity that may require follow-up. We emphasize that statistical evidence by itself does not indicate that a test security violation has occurred. It signals the need for additional consideration to determine if a violation is likely and whether additional investigation is necessary.

When one of the two statistical flags indicate the potential need for further analyses, initial follow-up investigations could include examining results from another statistical analysis, examining reports of test administration irregularities, and conducting informal conversations with people who may have firsthand knowledge of the administration. When initial evidence indicates the need for more formal follow-up investigations, these may include professional investigative interviews, requests for relevant documents, and examination of examinee online log files and scannable answer documents. Cognia can provide advice and other support for investigations after delivery of the statistical detection report.

The results show slight decreases in all grades of Math and most grades of ELA for group flagging percentages due to inordinate response similarity over 2022. Cognia would continue to urge caution in interpretation of these decreases given the confounding effects of changes to instruction and learning since 2019. Cognia recommends, in cases where other evidence suggests violations of test security, that investigators do not solely rely on group (school) detection flagging for additional evidence. In these cases, examining clusters of flagged examinee pairs where an overlap of respondents is indicated, within a school, may be a more powerful indicator of testing issues. These raw data details are provided along with this report. Additionally, Cognia would be able to provide more granular analysis if particular clusters or groups require additional investigation.

The 2023 administration represents the fourth time inordinate response change has been analyzed. Because of the gap in testing between 2019 and 2021, the above-mentioned confounding effects of changes to instruction and learning, the differences in 2019 test mode for some grades (paper vs. computer), and the relative lack of longitudinal data, year over year comparison of this analysis may not be appropriate or interpretable.

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Appendix A—Description of the Tables in the Output Files

A-1. Inordinate Response Similarity Analysis Output

Response Similarity – Student

- All possible pairs were constructed within the school unit for the purpose of the analysis.
- Only the flagged pairs of examinees are listed in the output.

Subject.Grade

- Specific subject and grade combination associated with the current examine pair (e.g., ELA03)

ID.District

- Identification number of the district where the school and the pair of examinees belong

ID.School

- Identification number of the school where the pair of examinees belongs

DistrictName

- Name of the district where the school and the pair of examinees belong

SchoolName

- Name of the school where the pair of examinees belongs

ID.Examinee.1

- Identification number of the first examinee

ID.Examinee.2

- Identification number of the second examinee

Score.Examinee.1

- Raw score of the first examinee

Score.Examinee.2

- Raw score of the second examinee

Observed.Matching

- Number of matching response options between two examinees (missing responses were not included in the analysis.)

Omega

- Answer similarity index

p.value

- Probability of getting the omega index at or above the observed value under the null hypothesis

Flag.at.0.01

- Whether a pair is flagged at the nominal level of 0.01: 1 indicates flagged, and 0 indicates not flagged.

School.Flag.at.0.01

- Whether the school where the pair of examinees belongs is flagged at the nominal level of 0.01: 1 indicates flagged, and 0 indicates not flagged.

Response Similarity – School

- All available districts and schools are listed.

Subject.Grade

- Specific subject and grade combination associated with the current examinees pair (e.g., ELA03)

ID.District

- Identification number of the district where the school belongs

ID.School

- Identification number of the school

DistrictName

- Name of the district where the school belongs

SchoolName

- Name of the school

Number.Examinees

- Number of examinees in the school

Proportion.Flag.at.0.01

- Proportion of examinees flagged in the school at the nominal level of 0.01

p.value.0.01

- Probability of getting the proportion at or above the observed value under the null hypothesis

Flag.at.0.01

- Whether the school is flagged at the nominal level of 0.01: 1 indicates flagged, and 0 indicates not flagged.

A-2. Inordinate Response Change Analysis Output

Response Change – Glossary of Terms

Wrong-to-Right [WTR], Right-to-Wrong [RTW] and Wrong-to-Wrong [WTW]

- There is an indication that the examinee changed their response from an incorrect answer to the correct answer [WTR], from the correct answer to an incorrect answer [RTW] or from an incorrect answer to a different incorrect answer [WTW]

Response Change – Student

- Examinees are not flagged for inordinate response changes at the student level. All analyzed examinees are listed for each flagged school, and descriptive information provided regarding examinee response changes. For computer-based administrations, process data has been collected indicating an answer was changed prior to the final recorded entry.

Subject.Grade

- Grade and subject for the listed examinee analysis.

ID.District

- Identification number of the district where the examinee belongs

ID.School

- Identification number of the school where the examinee belongs

DistrictName

- Name of the district where the school is located.

SchoolName

- Name of the school identified by ID. School.

Booklet.Number

- Identification number of the booklet taken by the examinee

ID.Examinee

- Identification number of the examinee

N.Answered

- Number of multiple-choice items where the examinee indicated a scored response.

N.Erasure

- Number of answered items indicating a response change has been made.

Avg. Erasures

- The ratio (in decimal form) of erasures made to items answered.

SD. Erasures

- The standard deviation of N. Erasure.

N. Erasure Type (WTR, RTW, WTW)

- Number of answered items indicating a response change of the type detailed above.

Avg. Erasure Type (WTR, RTW, WTW)

- The ratio (in decimal form) of the indicated erasure type to items answered.

Erasure Type Ratio

- The ratio (in decimal form) of the indicated erasure type to response changes.

Response Change – School

- All available districts and schools are listed. Schools with analyzed examinees < 12 are not examined for aberrative response change using statistical methods, however all other descriptive statistics are still shown.

Subject.Grade

- Specific subject and grade combination associated with the listed analysis (e.g., ELA03)

ID.School

- Identification number of the school

DistrictName

- Name of the district where the listed school is located.

SchoolName

- Name of the school analyzed.

N

- Number of current year examinees analyzed for the listed school.

Descriptive Statistics

- Averages of examinee-level statistics aggregated at school-level (Answered, Erasures, WTR, RTW, WTW)

Cohen's D

- A measure of effect size. Significant comparisons between WTW response changes at the school and state level are flagged based on effect size.

p.value

- Probability of getting the proportion at or above the observed value under the null hypothesis

Flag

- Whether the school is flagged for inordinate response change behavior: 1 indicates flagged and 0 indicates not flagged.

APPENDIX I
SCORE REPORTS

Table I-1. Double Blind Report—Grade 3 Reading CRs

Scorer ID	Total Scored	Total # of DB	% DB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22105	4,615	717	15.5	577	80.5	140	19.5	0	0
21572	4,082	796	19.5	686	86.2	110	13.8	0	0
22912	1,113	678	60.9	548	80.8	127	18.7	3	0.4
22603	523	103	19.7	85	82.5	18	17.5	0	0
22392	8,347	1,475	17.7	1162	78.8	313	21.2	0	0
22551	1,238	328	26.5	274	83.5	54	16.5	0	0
80548	225	136	60.4	122	89.7	14	10.3	0	0
22157	498	326	65.5	270	82.8	55	16.9	1	0.3
21963	4,701	791	16.8	644	81.4	147	18.6	0	0
21899	290	47	16.2	37	78.7	10	21.3	0	0
22258	1,713	343	20	286	83.4	57	16.6	0	0
22063	1,280	622	48.6	513	82.5	109	17.5	0	0
21774	666	156	23.4	123	78.8	33	21.2	0	0
22448	1,888	339	18	262	77.3	77	22.7	0	0
22269	13,941	2,148	15.4	1857	86.5	291	13.5	0	0
27494	3,465	514	14.8	426	82.9	88	17.1	0	0
23048	1,366	765	56	660	86.3	103	13.5	2	0.3
21305	7,452	1,786	24	1486	83.2	300	16.8	0	0
21800	2,827	576	20.4	481	83.5	94	16.3	1	0.2
18912	8,886	1,873	21.1	1564	83.5	309	16.5	0	0
22171	3,120	1,424	45.6	1202	84.4	217	15.2	5	0.4
21966	1,080	232	21.5	213	91.8	19	8.2	0	0
15262	3,799	1,079	28.4	906	84	173	16	0	0
63717	6,454	1,119	17.3	901	80.5	218	19.5	0	0
22280	1,530	250	16.3	212	84.8	38	15.2	0	0
22117	3,804	1,236	32.5	1046	84.6	185	15	5	0.4
22595	1,164	604	51.9	513	84.9	88	14.6	3	0.5
21635	8,220	1,842	22.4	1597	86.7	245	13.3	0	0
21639	628	106	16.9	97	91.5	9	8.5	0	0
22749	3,058	1,075	35.2	901	83.8	173	16.1	1	0.1
21806	2,130	353	16.6	295	83.6	58	16.4	0	0
21898	369	191	51.8	171	89.5	20	10.5	0	0
22875	689	119	17.3	105	88.2	14	11.8	0	0
21606	846	120	14.2	97	80.8	23	19.2	0	0
22766	538	85	15.8	73	85.9	12	14.1	0	0
27492	11,158	2,104	18.9	1744	82.9	360	17.1	0	0
15904	3,203	1,041	32.5	847	81.4	194	18.6	0	0
22621	355	60	16.9	49	81.7	11	18.3	0	0
22193	10,376	1,652	15.9	1369	82.9	283	17.1	0	0
32028	314	73	23.2	60	82.2	13	17.8	0	0
27493	4,136	785	19	640	81.5	145	18.5	0	0
22071	7,165	2,056	28.7	1744	84.8	312	15.2	0	0
22913	900	151	16.8	125	82.8	26	17.2	0	0
22531	1,866	392	21	315	80.4	77	19.6	0	0
22744	2,949	400	13.6	335	83.8	65	16.3	0	0
22303	686	196	28.6	163	83.2	33	16.8	0	0
22304	748	168	22.5	140	83.3	28	16.7	0	0
22788	1,510	281	18.6	247	87.9	34	12.1	0	0
Total	**15,1911***	**33,713**	**22.2**	**28170**	**83.6**	**5522**	**16.4**	**21**	**0.1**

**Does not include responses that received a condition code.*

Table I-2. Read Behind Report—Grade 3 Reading CRs

Scorer ID	Total Scored	Total # of RB	% RB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22105	4,615	251	5.4	217	86.5	34	13.5	0	0
21572	4,082	232	5.7	208	89.7	24	10.3	0	0
22912	1,113	61	5.5	56	91.8	5	8.2	0	0
22603	523	19	3.6	16	84.2	3	15.8	0	0
22392	8,347	415	5	356	85.8	58	14	1	0.2
22551	1,238	27	2.2	25	92.6	2	7.4	0	0
80548	225	5	2.2	5	100	0	0	0	0
22157	498	24	4.8	22	91.7	2	8.3	0	0
21963	4,701	328	7	291	88.7	37	11.3	0	0
21899	290	21	7.2	19	90.5	2	9.5	0	0
22258	1,713	142	8.3	120	84.5	22	15.5	0	0
22063	1,280	66	5.2	60	90.9	6	9.1	0	0
21498	341	13	3.8	13	100	0	0	0	0
21774	666	25	3.8	23	92	2	8	0	0
22448	1,888	123	6.5	108	87.8	15	12.2	0	0
22269	13,941	873	6.3	778	89.1	95	10.9	0	0
27494	3,465	178	5.1	154	86.5	24	13.5	0	0
23048	1,366	76	5.6	70	92.1	6	7.9	0	0
21305	7,452	410	5.5	409	99.8	1	0.2	0	0
21800	2,827	193	6.8	171	88.6	22	11.4	0	0
18912	8,886	465	5.2	402	86.5	63	13.5	0	0
22171	3,120	173	5.5	157	90.8	16	9.2	0	0
21966	1,080	58	5.4	57	98.3	1	1.7	0	0
15262	3,799	160	4.2	160	100	0	0	0	0
63717	6,454	336	5.2	292	86.9	43	12.8	1	0.3
22280	1,530	110	7.2	93	84.5	17	15.5	0	0
22117	3,804	199	5.2	183	92	16	8	0	0
22595	1,164	84	7.2	74	88.1	10	11.9	0	0
21635	8,220	390	4.7	337	86.4	53	13.6	0	0
21639	628	39	6.2	36	92.3	3	7.7	0	0
22749	3,058	167	5.5	153	91.6	14	8.4	0	0
21806	2,130	150	7	127	84.7	23	15.3	0	0
21898	369	16	4.3	16	100	0	0	0	0
22875	689	56	8.1	45	80.4	11	19.6	0	0
21606	846	131	15.5	109	83.2	22	16.8	0	0
22766	538	34	6.3	29	85.3	5	14.7	0	0
27492	11,158	520	4.7	457	87.9	63	12.1	0	0
15904	3,203	213	6.7	208	97.7	5	2.3	0	0
22621	355	19	5.4	19	100	0	0	0	0
22193	10,376	488	4.7	430	88.1	58	11.9	0	0
32028	314	20	6.4	16	80	4	20	0	0
27493	4,136	233	5.6	214	91.8	19	8.2	0	0
22071	7,165	419	5.8	415	99	4	1	0	0
22913	900	81	9	68	84	13	16	0	0
22531	1,866	146	7.8	129	88.4	17	11.6	0	0
22744	2,949	203	6.9	189	93.1	14	6.9	0	0
22303	686	43	6.3	40	93	3	7	0	0
22304	748	32	4.3	29	90.6	3	9.4	0	0
22788	1,510	59	3.9	55	93.2	4	6.8	0	0
Total	**152,252**	**8,526**	**5.6**	**7660**	**89.8**	**864**	**10.1**	**2**	**0**

**Does not include responses that received a condition code.*

Table I-3. Double Blind Report—Grade 4 Reading CRs

Scorer ID	Total Scored	Total # of DB	% DB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22884	704	21	3	14	66.7	7	33.3	0	0
22889	3,404	114	3.3	80	70.2	34	29.8	0	0
22911	3,186	131	4.1	108	82.4	23	17.6	0	0
22105	2,241	159	7.1	126	79.2	33	20.8	0	0
21572	2,279	171	7.5	132	77.2	39	22.8	0	0
21643	1,958	149	7.6	110	73.8	38	25.5	1	0.7
22912	3,281	102	3.1	81	79.4	21	20.6	0	0
22603	1,169	112	9.6	79	70.5	33	29.5	0	0
22392	3,486	327	9.4	257	78.6	70	21.4	0	0
22551	3,287	418	12.7	326	78	92	22	0	0
22040	36	24	66.7	19	79.2	5	20.8	0	0
21899	2,203	167	7.6	129	77.2	38	22.8	0	0
22258	892	59	6.6	50	84.7	9	15.3	0	0
21774	2,216	258	11.6	175	67.8	83	32.2	0	0
22448	533	38	7.1	27	71.1	11	28.9	0	0
22028	557	251	45.1	200	79.7	46	18.3	5	2
21800	7,031	752	10.7	584	77.7	167	22.2	1	0.1
22780	236	22	9.3	13	59.1	9	40.9	0	0
18912	3,054	189	6.2	150	79.4	39	20.6	0	0
20219	3,929	206	5.2	153	74.3	53	25.7	0	0
21966	3,651	291	8	231	79.4	60	20.6	0	0
63717	2,716	192	7.1	146	76	46	24	0	0
22916	3,846	272	7.1	191	70.2	81	29.8	0	0
21635	3,085	281	9.1	234	83.3	47	16.7	0	0
21639	1,645	122	7.4	100	82	22	18	0	0
22914	2,841	150	5.3	104	69.3	46	30.7	0	0
22900	4,132	296	7.2	209	70.6	87	29.4	0	0
22845	5,339	617	11.6	516	83.6	95	15.4	6	1
22875	1,385	103	7.4	86	83.5	17	16.5	0	0
21606	799	51	6.4	42	82.4	9	17.6	0	0
22766	1,617	117	7.2	89	76.1	28	23.9	0	0
27492	3,727	245	6.6	189	77.1	56	22.9	0	0
22981	1,290	717	55.6	608	84.8	103	14.4	6	0.8
15904	458	154	33.6	122	79.2	32	20.8	0	0
22621	1,597	117	7.3	87	74.4	30	25.6	0	0
80651	1,498	794	53	652	82.1	136	17.1	6	0.8
21905	175	109	62.3	86	78.9	22	20.2	1	0.9
22193	2,663	1,173	44	973	82.9	188	16	12	1
22879	1,084	618	57	514	83.2	102	16.5	2	0.3
32028	899	61	6.8	50	82	11	18	0	0
27493	939	41	4.4	33	80.5	8	19.5	0	0
22071	391	79	20.2	68	86.1	11	13.9	0	0
22906	1,605	42	2.6	32	76.2	10	23.8	0	0
22913	3,381	131	3.9	110	84	21	16	0	0
22856	574	75	13.1	63	84	12	16	0	0
22531	1,196	130	10.9	89	68.5	41	31.5	0	0
22744	1,258	63	5	50	79.4	13	20.6	0	0
22303	1,976	221	11.2	154	69.7	67	30.3	0	0
22915	4,061	727	17.9	595	81.8	127	17.5	5	0.7
22304	3,154	252	8	204	81	48	19	0	0
21960	1,431	661	46.2	558	84.4	96	14.5	7	1.1
22788	7,828	785	10	617	78.6	167	21.3	1	0.1
22471	1,695	892	52.6	776	87	109	12.2	7	0.8
22390	2,941	1,029	35	863	83.9	144	14	22	2.1
Total	**122559***	**15,278**	**12.5**	**12254**	**80.2**	**2942**	**19.3**	**82**	**0.5**

**Does not include responses that received a condition code.*

Table I-4. Read Behind Report—Grade 4 Reading CRs

Scorer ID	Total Scored	Total # of RB	% RB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22884	704	93	13.2	86	92.5	6	6.5	1	1.1
22889	3,404	290	8.5	278	95.9	11	3.8	1	0.3
22911	3,186	191	6	165	86.4	26	13.6	0	0
22105	2,241	115	5.1	100	87	15	13	0	0
21572	2,279	134	5.9	123	91.8	11	8.2	0	0
21643	1,958	183	9.3	164	89.6	18	9.8	1	0.5
22912	3,281	174	5.3	157	90.2	17	9.8	0	0
22603	1,169	60	5.1	50	83.3	10	16.7	0	0
22392	3,486	179	5.1	155	86.6	23	12.8	1	0.6
22551	3,287	151	4.6	133	88.1	18	11.9	0	0
22040	36	11	30.6	9	81.8	2	18.2	0	0
21899	2,203	123	5.6	111	90.2	12	9.8	0	0
22258	892	62	7	56	90.3	6	9.7	0	0
21774	2,216	108	4.9	92	85.2	16	14.8	0	0
22448	533	46	8.6	44	95.7	2	4.3	0	0
22269	1,316	97	7.4	90	92.8	6	6.2	1	1
22028	557	35	6.3	30	85.7	5	14.3	0	0
21800	7,031	356	5.1	320	89.9	36	10.1	0	0
22780	236	11	4.7	9	81.8	2	18.2	0	0
18912	3,054	175	5.7	161	92	13	7.4	1	0.6
20219	3,929	282	7.2	246	87.2	34	12.1	2	0.7
21966	3,651	209	5.7	193	92.3	16	7.7	0	0
15262	93	12	12.9	12	100	0	0	0	0
63717	2,716	163	6	149	91.4	13	8	1	0.6
22916	3,846	237	6.2	204	86.1	32	13.5	1	0.4
22280	71	6	8.5	6	100	0	0	0	0
21635	3,085	151	4.9	130	86.1	21	13.9	0	0
21639	1,645	139	8.4	130	93.5	8	5.8	1	0.7
22914	2,841	151	5.3	133	88.1	18	11.9	0	0
22900	4,132	253	6.1	221	87.4	31	12.3	1	0.4
22845	5,339	329	6.2	299	90.9	28	8.5	2	0.6
22875	1,385	95	6.9	91	95.8	4	4.2	0	0
21606	799	138	17.3	126	91.3	12	8.7	0	0
22766	1,617	98	6.1	90	91.8	8	8.2	0	0
27492	3,727	211	5.7	187	88.6	23	10.9	1	0.5
22981	1,290	146	11.3	134	91.8	10	6.8	2	1.4
15904	458	38	8.3	38	100	0	0	0	0
22621	1,597	129	8.1	116	89.9	12	9.3	1	0.8
80651	1,498	134	8.9	124	92.5	9	6.7	1	0.7
21905	175	76	43.4	71	93.4	4	5.3	1	1.3
22193	2,663	138	5.2	129	93.5	9	6.5	0	0
22879	1,084	92	8.5	87	94.6	4	4.3	1	1.1
32028	899	55	6.1	50	90.9	5	9.1	0	0
27493	939	56	6	50	89.3	6	10.7	0	0
22071	391	49	12.5	48	98	1	2	0	0
22906	1,605	155	9.7	133	85.8	21	13.5	1	0.6
22913	3,381	224	6.6	201	89.7	22	9.8	1	0.4
22856	574	40	7	34	85	6	15	0	0
22531	1,196	64	5.4	54	84.4	10	15.6	0	0
22744	1,258	91	7.2	88	96.7	3	3.3	0	0
22303	1,976	125	6.3	110	88	14	11.2	1	0.8
22915	4,061	277	6.8	255	92.1	20	7.2	2	0.7
22304	3,154	152	4.8	136	89.5	15	9.9	1	0.7
21960	1,431	78	5.5	69	88.5	9	11.5	0	0

continued

Scorer ID	Total Scored	Total # of RB	% RB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22788	7,828	416	5.3	368	88.5	48	11.5	0	0
22471	1,695	90	5.3	88	97.8	2	2.2	0	0
22390	2,941	191	6.5	178	93.2	12	6.3	1	0.5
Total	**124,039**	**7,884**	**6.4**	**7111**	**90.2**	**745**	**9.4**	**28**	**0.4**

**Does not include responses that received a condition code.*

Table I-5. Double Blind Report—Grade 5 Writing ERs

Scorer ID	Total Scored	Total # of DB	% DB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22347	1,363	19	1.4	16	84.2	3	15.8	0	0
22883	3,091	24	0.8	23	95.8	1	4.2	0	0
22630	685	1	0.1	1	100	0	0	0	0
22885	2,266	11	0.5	10	90.9	1	9.1	0	0
22887	3,240	26	0.8	24	92.3	2	7.7	0	0
22607	4,820	35	0.7	33	94.3	2	5.7	0	0
22800	2,146	13	0.6	12	92.3	1	7.7	0	0
22891	1,975	17	0.9	13	76.5	4	23.5	0	0
75857	6,077	51	0.8	47	92.2	3	5.9	1	2
22892	2,103	23	1.1	21	91.3	2	8.7	0	0
22893	1,641	13	0.8	12	92.3	1	7.7	0	0
22895	3,191	36	1.1	35	97.2	1	2.8	0	0
22896	2,415	22	0.9	20	90.9	2	9.1	0	0
22897	2,488	28	1.1	24	85.7	4	14.3	0	0
22909	1,736	10	0.6	9	90	1	10	0	0
22898	3,843	25	0.7	20	80	5	20	0	0
54508	61	59	96.7	46	78	12	20.3	1	1.7
22495	2,581	20	0.8	18	90	2	10	0	0
22907	1,761	44	2.5	42	95.5	2	4.5	0	0
22908	1,627	8	0.5	7	87.5	1	12.5	0	0
Total	**49110***	**485**	**1**	**433**	**89.3**	**50**	**10.3**	**2**	**0.4**

**Does not include responses that received a condition code.*

Table I-6. Read Behind Report—Grade 5 Writing ERs

Scorer ID	Total Scored	Total # of RB	% RB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22347	1,363	75	5.5	72	96	3	4	0	0
22883	3,091	135	4.4	120	88.9	15	11.1	0	0
22630	685	101	14.7	82	81.2	17	16.8	2	2
22885	2,266	107	4.7	92	86	15	14	0	0
22887	3,240	162	5	140	86.4	22	13.6	0	0
22888	359	37	10.3	29	78.4	7	18.9	1	2.7
22607	4,820	190	3.9	163	85.8	27	14.2	0	0
22800	2,146	122	5.7	111	91	11	9	0	0
22891	1,975	127	6.4	98	77.2	26	20.5	3	2.4
75857	6,077	239	3.9	219	91.6	19	7.9	1	0.4
22892	2,103	154	7.3	121	78.6	29	18.8	4	2.6
22893	1,641	105	6.4	85	81	19	18.1	1	1
22895	3,191	150	4.7	135	90	15	10	0	0
22896	2,415	101	4.2	89	88.1	11	10.9	1	1
22897	2,488	127	5.1	116	91.3	11	8.7	0	0
22909	1,736	88	5.1	77	87.5	11	12.5	0	0
22898	3,843	145	3.8	125	86.2	19	13.1	1	0.7

continued

Scorer ID	Total Scored	Total # of RB	% RB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22495	2,581	149	5.8	121	81.2	26	17.4	2	1.3
22907	1,761	100	5.7	82	82	18	18	0	0
22908	1,627	107	6.6	83	77.6	23	21.5	1	0.9
Total	**49,408**	**2,521**	**5.1**	**2160**	**85.7**	**344**	**13.6**	**17**	**0.7**

**Includes responses that received a condition code.*

Table I-7. Double Blind Report—Grade 6 Reading CRs

Scorer ID	Total Scored	Total # of DB	% DB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22911	1,223	105	8.6	95	90.5	10	9.5	0	0
59897	2	1	50	1	100	0	0	0	0
22105	2,406	180	7.5	166	92.2	14	7.8	0	0
21572	2,468	191	7.7	171	89.5	20	10.5	0	0
21643	1,099	109	9.9	100	91.7	9	8.3	0	0
22912	4,933	1,020	20.7	785	77	230	22.5	5	0.5
22603	1,985	113	5.7	96	85	17	15	0	0
22392	2,847	263	9.2	217	82.5	46	17.5	0	0
22551	3,704	538	14.5	494	91.8	44	8.2	0	0
22408	1,750	182	10.4	170	93.4	12	6.6	0	0
80548	508	317	62.4	239	75.4	76	24	2	0.6
22040	2	1	50	1	100	0	0	0	0
22355	233	7	3	7	100	0	0	0	0
22157	566	353	62.4	285	80.7	66	18.7	2	0.6
21899	1,559	146	9.4	129	88.4	17	11.6	0	0
22258	1,040	70	6.7	63	90	7	10	0	0
55164	821	42	5.1	41	97.6	1	2.4	0	0
22516	343	33	9.6	33	100	0	0	0	0
22063	1,064	545	51.2	410	75.2	124	22.8	11	2
21774	2,018	278	13.8	254	91.4	24	8.6	0	0
22448	1,416	109	7.7	102	93.6	7	6.4	0	0
22941	1,117	149	13.3	118	79.2	31	20.8	0	0
23048	1,390	823	59.2	645	78.4	173	21	5	0.6
22618	1,284	120	9.3	114	95	6	5	0	0
21800	5,507	699	12.7	634	90.7	64	9.2	1	0.1
22780	1,504	134	8.9	122	91	12	9	0	0
18912	3,041	338	11.1	304	89.9	34	10.1	0	0
20627	1,622	185	11.4	179	96.8	6	3.2	0	0
20219	2,235	155	6.9	143	92.3	12	7.7	0	0
22171	2,038	1,128	55.3	859	76.2	262	23.2	7	0.6
22718	965	67	6.9	64	95.5	3	4.5	0	0
22701	695	53	7.6	52	98.1	1	1.9	0	0
21966	3,789	377	9.9	347	92	30	8	0	0
15262	1,542	243	15.8	222	91.4	21	8.6	0	0
63717	2,017	209	10.4	190	90.9	19	9.1	0	0
22916	2,876	298	10.4	276	92.6	22	7.4	0	0
19828	1,180	114	9.7	113	99.1	1	0.9	0	0
22373	1,875	81	4.3	76	93.8	5	6.2	0	0
22117	4,729	1,373	29	1032	75.2	335	24.4	6	0.4
22510	3,065	268	8.7	259	96.6	9	3.4	0	0
22595	1,313	767	58.4	537	70	226	29.5	4	0.5
21635	2,717	357	13.1	326	91.3	31	8.7	0	0
21639	2,078	149	7.2	137	91.9	12	8.1	0	0
22749	2,430	1,073	44.2	793	73.9	265	24.7	15	1.4
22914	1,850	262	14.2	237	90.5	25	9.5	0	0
22900	77	6	7.8	5	83.3	1	16.7	0	0

continued

Scorer ID	Total Scored	Total # of DB	% DB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22461	1,225	64	5.2	60	93.8	4	6.3	0	0
21806	1,064	74	7	69	93.2	5	6.8	0	0
21898	781	372	47.6	251	67.5	118	31.7	3	0.8
22845	3,809	365	9.6	339	92.9	25	6.8	1	0.3
22932	2,096	207	9.9	200	96.6	7	3.4	0	0
22875	1,222	78	6.4	72	92.3	6	7.7	0	0
21606	1,168	99	8.5	94	94.9	5	5.1	0	0
22766	1,395	142	10.2	131	92.3	11	7.7	0	0
27492	3,510	496	14.1	458	92.3	37	7.5	1	0.2
15904	344	162	47.1	141	87	20	12.3	1	0.6
22621	1,010	98	9.7	87	88.8	11	11.2	0	0
32028	758	74	9.8	64	86.5	10	13.5	0	0
22691	244	13	5.3	13	100	0	0	0	0
22071	1,205	133	11	126	94.7	7	5.3	0	0
22906	1,181	118	10	100	84.7	18	15.3	0	0
22913	3,906	430	11	403	93.7	27	6.3	0	0
22856	3,599	415	11.5	376	90.6	39	9.4	0	0
22531	1,583	189	11.9	160	84.7	29	15.3	0	0
22744	1,767	116	6.6	110	94.8	6	5.2	0	0
22303	1,499	205	13.7	188	91.7	17	8.3	0	0
22915	2,345	291	12.4	263	90.4	28	9.6	0	0
22940	1,998	290	14.5	278	95.9	12	4.1	0	0
22937	2,140	145	6.8	140	96.6	5	3.4	0	0
Total	**127754***	**19,093**	**14.9**	**16192**	**84.8**	**2836**	**14.9**	**65**	**0.3**

**Does not include responses that received a condition code.*

Table I-8. Read Behind Report—Grade 6 Reading CRs

Scorer ID	Total Scored	Total # of RB	% RB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22911	1,223	240	19.6	203	84.6	36	15	1	0.4
22105	2,406	203	8.4	177	87.2	25	12.3	1	0.5
21572	2,468	157	6.4	144	91.7	12	7.6	1	0.6
21643	1,099	140	12.7	116	82.9	24	17.1	0	0
22912	4,933	316	6.4	287	90.8	28	8.9	1	0.3
22603	1,985	99	5	83	83.8	16	16.2	0	0
22392	2,847	432	15.2	352	81.5	77	17.8	3	0.7
22551	3,704	315	8.5	261	82.9	53	16.8	1	0.3
22408	1,750	272	15.5	223	82	47	17.3	2	0.7
80548	508	69	13.6	64	92.8	4	5.8	1	1.4
22355	233	47	20.2	38	80.9	9	19.1	0	0
66051	77	10	13	8	80	2	20	0	0
22157	566	40	7.1	39	97.5	1	2.5	0	0
21899	1,559	89	5.7	77	86.5	12	13.5	0	0
22258	1,040	63	6.1	54	85.7	9	14.3	0	0
55164	821	95	11.6	90	94.7	4	4.2	1	1.1
22516	343	62	18.1	52	83.9	10	16.1	0	0
22063	1,064	69	6.5	62	89.9	7	10.1	0	0
21774	2,018	123	6.1	106	86.2	17	13.8	0	0
22448	1,416	78	5.5	66	84.6	12	15.4	0	0
22941	1,117	65	5.8	56	86.2	9	13.8	0	0
23048	1,390	98	7.1	86	87.8	11	11.2	1	1
22618	1,284	83	6.5	69	83.1	14	16.9	0	0
21800	5,507	260	4.7	212	81.5	48	18.5	0	0
22780	1,504	122	8.1	112	91.8	9	7.4	1	0.8

continued

Scorer ID	Total Scored	Total # of RB	% RB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
18912	3,041	154	5.1	138	89.6	16	10.4	0	0
20627	1,622	225	13.9	183	81.3	42	18.7	0	0
20219	2,235	113	5.1	97	85.8	16	14.2	0	0
22171	2,038	124	6.1	100	80.6	24	19.4	0	0
22718	965	134	13.9	124	92.5	8	6	2	1.5
22701	695	83	11.9	71	85.5	12	14.5	0	0
21966	3,789	220	5.8	204	92.7	16	7.3	0	0
15262	1,542	80	5.2	79	98.8	1	1.3	0	0
63717	2,017	106	5.3	92	86.8	14	13.2	0	0
22916	2,876	141	4.9	121	85.8	20	14.2	0	0
19828	1,180	114	9.7	96	84.2	17	14.9	1	0.9
22373	1,875	145	7.7	118	81.4	27	18.6	0	0
22117	4,729	236	5	196	83.1	40	16.9	0	0
22510	3,065	186	6.1	155	83.3	30	16.1	1	0.5
22595	1,313	73	5.6	64	87.7	9	12.3	0	0
21635	2,717	138	5.1	123	89.1	15	10.9	0	0
21639	2,078	95	4.6	85	89.5	10	10.5	0	0
22749	2,430	163	6.7	133	81.6	29	17.8	1	0.6
22914	1,850	100	5.4	84	84	16	16	0	0
22900	77	23	29.9	19	82.6	4	17.4	0	0
22461	1,225	202	16.5	180	89.1	22	10.9	0	0
21806	1,064	176	16.5	153	86.9	21	11.9	2	1.1
21898	781	60	7.7	52	86.7	8	13.3	0	0
22845	3,809	223	5.9	195	87.4	28	12.6	0	0
22932	2,096	76	3.6	64	84.2	12	15.8	0	0
22875	1,222	215	17.6	177	82.3	38	17.7	0	0
21606	1,168	111	9.5	98	88.3	12	10.8	1	0.9
22766	1,395	93	6.7	87	93.5	6	6.5	0	0
27492	3,510	177	5	154	87	23	13	0	0
15904	344	28	8.1	28	100	0	0	0	0
22621	1,010	65	6.4	57	87.7	8	12.3	0	0
32028	758	132	17.4	109	82.6	23	17.4	0	0
22691	244	66	27	55	83.3	11	16.7	0	0
22071	1,205	65	5.4	65	100	0	0	0	0
22906	1,181	91	7.7	82	90.1	9	9.9	0	0
22913	3,906	382	9.8	324	84.8	57	14.9	1	0.3
22856	3,599	217	6	194	89.4	23	10.6	0	0
22531	1,583	81	5.1	70	86.4	11	13.6	0	0
22744	1,767	103	5.8	94	91.3	9	8.7	0	0
22303	1,499	81	5.4	68	84	13	16	0	0
22915	2,345	121	5.2	105	86.8	16	13.2	0	0
22304	2,982	200	6.7	173	86.5	27	13.5	0	0
22940	1,998	135	6.8	115	85.2	20	14.8	0	0
22937	2,140	107	5	92	86	15	14	0	0
Total	**127,827**	**9,407**	**7.4**	**8110**	**86.2**	**1274**	**13.5**	**23**	**0.2**

**Includes responses that received a condition code.*

Table I-9. Double Blind Report—Grade 7 Reading CRs

Scorer ID	Total Scored	Total # of DB	% DB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
21825	211	7	3.3	7	100	0	0	0	0
22347	733	51	7	51	100	0	0	0	0
22911	400	34	8.5	31	91.2	3	8.8	0	0
22794	1,981	150	7.6	147	98	3	2	0	0
22689	1,695	92	5.4	90	97.8	2	2.2	0	0
22105	947	70	7.4	60	85.7	10	14.3	0	0
22630	83	3	3.6	3	100	0	0	0	0
22795	611	29	4.7	28	96.6	1	3.4	0	0
22857	203	8	3.9	8	100	0	0	0	0
21572	1,035	69	6.7	58	84.1	11	15.9	0	0
21643	930	44	4.7	37	84.1	7	15.9	0	0
22602	1,966	91	4.6	88	96.7	3	3.3	0	0
22912	1,497	67	4.5	65	97	2	3	0	0
22392	1,188	156	13.1	102	65.4	54	34.6	0	0
21992	292	15	5.1	14	93.3	1	6.7	0	0
22551	1,768	169	9.6	149	88.2	20	11.8	0	0
22408	536	52	9.7	49	94.2	3	5.8	0	0
21749	631	55	8.7	52	94.5	3	5.5	0	0
22797	1,008	38	3.8	37	97.4	1	2.6	0	0
22410	514	63	12.3	61	96.8	2	3.2	0	0
22355	1,027	140	13.6	114	81.4	26	18.6	0	0
21899	1,312	114	8.7	103	90.4	11	9.6	0	0
22258	458	28	6.1	27	96.4	1	3.6	0	0
55164	609	67	11	60	89.6	7	10.4	0	0
22516	183	14	7.7	12	85.7	2	14.3	0	0
22607	271	2	0.7	2	100	0	0	0	0
22688	822	45	5.5	43	95.6	2	4.4	0	0
21774	1,574	117	7.4	108	92.3	9	7.7	0	0
22800	29	2	6.9	2	100	0	0	0	0
22714	223	2	0.9	1	50	1	50	0	0
22821	2,331	82	3.5	79	96.3	3	3.7	0	0
22448	880	99	11.3	84	84.8	15	15.2	0	0
22801	1,941	81	4.2	80	98.8	1	1.2	0	0
22863	421	37	8.8	34	91.9	3	8.1	0	0
22941	677	45	6.6	34	75.6	11	24.4	0	0
22064	211	76	36	64	84.2	12	15.8	0	0
22417	1,512	61	4	57	93.4	4	6.6	0	0
22618	836	59	7.1	51	86.4	8	13.6	0	0
22891	57	8	14	8	100	0	0	0	0
75857	473	13	2.7	13	100	0	0	0	0
67131	42	8	19	8	100	0	0	0	0
21800	2,643	190	7.2	167	87.9	23	12.1	0	0
22780	731	45	6.2	38	84.4	7	15.6	0	0
22893	301	9	3	9	100	0	0	0	0
20075	242	4	1.7	4	100	0	0	0	0
18912	1,561	115	7.4	96	83.5	19	16.5	0	0
20627	1,501	174	11.6	146	83.9	28	16.1	0	0
62329	159	39	24.5	38	97.4	1	2.6	0	0
20219	137	11	8	9	81.8	2	18.2	0	0
21953	230	39	17	33	84.6	6	15.4	0	0
22718	791	109	13.8	99	90.8	10	9.2	0	0
22367	2,153	70	3.3	67	95.7	3	4.3	0	0
22701	996	72	7.2	62	86.1	10	13.9	0	0
21966	1,626	120	7.4	109	90.8	11	9.2	0	0

continued

Scorer ID	Total Scored	Total # of DB	% DB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22784	165	6	3.6	6	100	0	0	0	0
63717	1,344	149	11.1	128	85.9	21	14.1	0	0
22916	1,453	94	6.5	77	81.9	17	18.1	0	0
19828	1,203	133	11.1	123	92.5	10	7.5	0	0
22669	2,149	134	6.2	129	96.3	5	3.7	0	0
22895	407	12	2.9	12	100	0	0	0	0
22373	1,202	80	6.7	78	97.5	2	2.5	0	0
22510	902	165	18.3	134	81.2	31	18.8	0	0
22896	292	30	10.3	30	100	0	0	0	0
64133	25	14	56	14	100	0	0	0	0
21635	1,154	140	12.1	130	92.9	10	7.1	0	0
21639	994	52	5.2	49	94.2	3	5.8	0	0
22507	1,195	21	1.8	20	95.2	1	4.8	0	0
22909	322	6	1.9	6	100	0	0	0	0
22898	548	25	4.6	25	100	0	0	0	0
22914	788	108	13.7	98	90.7	10	9.3	0	0
22933	295	8	2.7	8	100	0	0	0	0
22175	521	6	1.2	6	100	0	0	0	0
22461	680	50	7.4	47	94	3	6	0	0
21806	862	70	8.1	60	85.7	10	14.3	0	0
22610	277	7	2.5	7	100	0	0	0	0
22845	2,346	716	30.5	603	84.2	108	15.1	5	0.7
22805	1,524	55	3.6	52	94.5	3	5.5	0	0
61175	1,373	48	3.5	45	93.8	3	6.3	0	0
22932	1,994	204	10.2	172	84.3	32	15.7	0	0
67026	4,429	288	6.5	277	96.2	11	3.8	0	0
22785	71	1	1.4	1	100	0	0	0	0
21974	171	14	8.2	10	71.4	4	28.6	0	0
21802	3,328	198	5.9	195	98.5	3	1.5	0	0
21606	331	22	6.6	18	81.8	4	18.2	0	0
22766	880	55	6.3	51	92.7	4	7.3	0	0
27492	1,535	134	8.7	117	87.3	17	12.7	0	0
22981	1,134	599	52.8	505	84.3	88	14.7	6	1
15904	165	47	28.5	45	95.7	2	4.3	0	0
22806	622	27	4.3	25	92.6	2	7.4	0	0
80651	1,734	942	54.3	771	81.8	161	17.1	10	1.1
22807	1,735	54	3.1	54	100	0	0	0	0
22931	225	2	0.9	2	100	0	0	0	0
22193	3,618	1,190	32.9	999	83.9	185	15.5	6	0.5
67942	136	41	30.1	33	80.5	8	19.5	0	0
22683	178	11	6.2	9	81.8	2	18.2	0	0
22879	1,052	565	53.7	498	88.1	66	11.7	1	0.2
32028	265	28	10.6	27	96.4	1	3.6	0	0
21843	1,588	54	3.4	52	96.3	2	3.7	0	0
22808	4,058	188	4.6	178	94.7	10	5.3	0	0
22692	1,703	79	4.6	75	94.9	4	5.1	0	0
22600	3,218	136	4.2	130	95.6	6	4.4	0	0
22071	53	4	7.5	4	100	0	0	0	0
67042	1,720	108	6.3	103	95.4	5	4.6	0	0
18468	227	45	19.8	40	88.9	5	11.1	0	0
22906	820	53	6.5	43	81.1	10	18.9	0	0
22907	66	4	6.1	4	100	0	0	0	0
22742	1,549	81	5.2	77	95.1	4	4.9	0	0
22934	696	9	1.3	9	100	0	0	0	0
22913	1,479	88	5.9	76	86.4	12	13.6	0	0
22856	1,246	139	11.2	119	85.6	20	14.4	0	0

continued

Scorer ID	Total Scored	Total # of DB	% DB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22531	760	108	14.2	99	91.7	9	8.3	0	0
22302	60	13	21.7	12	92.3	1	7.7	0	0
22744	825	52	6.3	43	82.7	9	17.3	0	0
22303	1,235	216	17.5	195	90.3	21	9.7	0	0
22915	2,282	603	26.4	497	82.4	104	17.2	2	0.3
22304	1,081	155	14.3	133	85.8	22	14.2	0	0
21960	1,596	748	46.9	618	82.6	126	16.8	4	0.5
22471	1,393	747	53.6	647	86.6	98	13.1	2	0.3
22940	1,331	175	13.1	148	84.6	27	15.4	0	0
22937	1,121	82	7.3	70	85.4	12	14.6	0	0
22390	3,334	1,321	39.6	1109	84	198	15	14	1.1
Total	126254*	15,119	12	13175	87.1	1894	12.5	50	0.3
21825	211	7	3.3	7	100	0	0	0	0
22347	733	51	7	51	100	0	0	0	0

**Does not include responses that received a condition code.*

Table I-10. Read Behind Report—Grade 7 Reading CRs

Scorer ID	Total Scored	Total # of RB	% RB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
21825	211	31	14.7	27	87.1	4	12.9	0	0
22347	733	29	4	24	82.8	5	17.2	0	0
22792	8	1	12.5	1	100	0	0	0	0
22911	400	67	16.8	61	91	6	9	0	0
22794	1,981	172	8.7	154	89.5	18	10.5	0	0
22689	1,695	122	7.2	100	82	22	18	0	0
22105	947	71	7.5	65	91.5	6	8.5	0	0
22630	83	6	7.2	6	100	0	0	0	0
22795	611	82	13.4	72	87.8	10	12.2	0	0
22857	203	14	6.9	12	85.7	2	14.3	0	0
21572	1,035	81	7.8	71	87.7	9	11.1	1	1.2
21643	930	70	7.5	61	87.1	9	12.9	0	0
22602	1,966	157	8	135	86	22	14	0	0
22912	1,497	87	5.8	80	92	7	8	0	0
22392	1,188	61	5.1	50	82	11	18	0	0
21992	292	45	15.4	38	84.4	7	15.6	0	0
22551	1,768	152	8.6	136	89.5	15	9.9	1	0.7
22408	536	35	6.5	30	85.7	5	14.3	0	0
21749	631	102	16.2	81	79.4	21	20.6	0	0
22797	1,008	85	8.4	77	90.6	8	9.4	0	0
22410	514	59	11.5	51	86.4	8	13.6	0	0
22355	1,027	53	5.2	48	90.6	5	9.4	0	0
21899	1,312	66	5	57	86.4	9	13.6	0	0
22258	458	31	6.8	26	83.9	5	16.1	0	0
55164	609	42	6.9	39	92.9	3	7.1	0	0
22516	183	49	26.8	39	79.6	10	20.4	0	0
22607	271	10	3.7	8	80	2	20	0	0
22688	822	45	5.5	40	88.9	5	11.1	0	0
21774	1,574	90	5.7	79	87.8	11	12.2	0	0
22800	29	9	31	7	77.8	2	22.2	0	0
22714	223	11	4.9	10	90.9	1	9.1	0	0
22821	2,331	159	6.8	143	89.9	16	10.1	0	0
22448	880	42	4.8	35	83.3	7	16.7	0	0
22801	1,941	129	6.6	114	88.4	15	11.6	0	0

continued

Scorer ID	Total Scored	Total # of RB	% RB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22863	421	37	8.8	30	81.1	7	18.9	0	0
22941	677	55	8.1	49	89.1	6	10.9	0	0
22064	211	10	4.7	9	90	1	10	0	0
22417	1,512	143	9.5	127	88.8	16	11.2	0	0
22618	836	61	7.3	51	83.6	10	16.4	0	0
22891	57	12	21.1	10	83.3	2	16.7	0	0
75857	473	8	1.7	8	100	0	0	0	0
22892	235	9	3.8	8	88.9	1	11.1	0	0
67131	42	8	19	8	100	0	0	0	0
21800	2,643	133	5	109	82	24	18	0	0
22780	731	44	6	40	90.9	4	9.1	0	0
22893	301	12	4	10	83.3	2	16.7	0	0
20075	242	34	14	29	85.3	5	14.7	0	0
18912	1,561	89	5.7	80	89.9	9	10.1	0	0
20627	1,501	69	4.6	60	87	9	13	0	0
62329	159	5	3.1	5	100	0	0	0	0
20219	137	20	14.6	16	80	4	20	0	0
21953	230	18	7.8	17	94.4	1	5.6	0	0
22718	791	65	8.2	57	87.7	8	12.3	0	0
22367	2,153	150	7	140	93.3	10	6.7	0	0
22701	996	91	9.1	77	84.6	14	15.4	0	0
21966	1,626	82	5	74	90.2	8	9.8	0	0
22784	165	10	6.1	10	100	0	0	0	0
63717	1,344	64	4.8	53	82.8	11	17.2	0	0
22916	1,453	78	5.4	67	85.9	11	14.1	0	0
19828	1,203	78	6.5	65	83.3	13	16.7	0	0
22669	2,149	195	9.1	179	91.8	15	7.7	1	0.5
22895	407	5	1.2	5	100	0	0	0	0
22373	1,202	72	6	63	87.5	9	12.5	0	0
22510	902	106	11.8	87	82.1	19	17.9	0	0
22896	292	11	3.8	9	81.8	2	18.2	0	0
64133	25	4	16	4	100	0	0	0	0
21635	1,154	64	5.5	55	85.9	9	14.1	0	0
21639	994	48	4.8	40	83.3	8	16.7	0	0
22507	1,195	92	7.7	75	81.5	17	18.5	0	0
22909	322	11	3.4	10	90.9	1	9.1	0	0
22898	548	12	2.2	11	91.7	1	8.3	0	0
22914	788	47	6	41	87.2	6	12.8	0	0
22933	295	31	10.5	31	100	0	0	0	0
22175	521	78	15	68	87.2	10	12.8	0	0
22461	680	137	20.1	129	94.2	8	5.8	0	0
21806	862	117	13.6	106	90.6	11	9.4	0	0
22610	277	20	7.2	19	95	1	5	0	0
22845	2,346	162	6.9	147	90.7	15	9.3	0	0
22805	1,524	103	6.8	94	91.3	9	8.7	0	0
61175	1,373	80	5.8	72	90	8	10	0	0
22932	1,994	97	4.9	82	84.5	15	15.5	0	0
67026	4,429	234	5.3	212	90.6	22	9.4	0	0
22785	71	27	38	22	81.5	5	18.5	0	0
21974	171	8	4.7	7	87.5	1	12.5	0	0
21802	3,328	264	7.9	236	89.4	27	10.2	1	0.4
21606	331	24	7.3	20	83.3	4	16.7	0	0
22766	880	42	4.8	36	85.7	6	14.3	0	0
27492	1,535	83	5.4	72	86.7	11	13.3	0	0
22981	1,134	83	7.3	74	89.2	9	10.8	0	0
15904	165	18	10.9	18	100	0	0	0	0

continued

Scorer ID	Total Scored	Total # of RB	% RB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22806	622	58	9.3	50	86.2	8	13.8	0	0
80651	1,734	106	6.1	92	86.8	14	13.2	0	0
22807	1,735	198	11.4	171	86.4	27	13.6	0	0
22931	225	33	14.7	27	81.8	6	18.2	0	0
22193	3,618	194	5.4	182	93.8	12	6.2	0	0
67942	136	8	5.9	7	87.5	1	12.5	0	0
22683	178	11	6.2	11	100	0	0	0	0
22879	1,052	68	6.5	65	95.6	3	4.4	0	0
32028	265	43	16.2	35	81.4	8	18.6	0	0
21843	1,588	91	5.7	79	86.8	12	13.2	0	0
22808	4,058	280	6.9	249	88.9	31	11.1	0	0
22692	1,703	195	11.5	171	87.7	23	11.8	1	0.5
22600	3,218	287	8.9	244	85	43	15	0	0
22071	53	10	18.9	10	100	0	0	0	0
67042	1,720	133	7.7	119	89.5	14	10.5	0	0
18468	227	16	7	16	100	0	0	0	0
22906	820	46	5.6	41	89.1	5	10.9	0	0
22907	66	5	7.6	5	100	0	0	0	0
22742	1,549	119	7.7	106	89.1	13	10.9	0	0
22934	696	47	6.8	41	87.2	6	12.8	0	0
22913	1,479	203	13.7	182	89.7	20	9.9	1	0.5
22856	1,246	78	6.3	65	83.3	13	16.7	0	0
22531	760	44	5.8	38	86.4	6	13.6	0	0
22302	60	8	13.3	7	87.5	1	12.5	0	0
22744	825	39	4.7	35	89.7	4	10.3	0	0
22303	1,235	54	4.4	49	90.7	5	9.3	0	0
22915	2,282	140	6.1	130	92.9	10	7.1	0	0
22304	1,081	55	5.1	48	87.3	7	12.7	0	0
21960	1,596	121	7.6	109	90.1	12	9.9	0	0
22471	1,393	94	6.7	89	94.7	5	5.3	0	0
22940	1,331	85	6.4	76	89.4	9	10.6	0	0
22937	1,121	80	7.1	71	88.8	9	11.3	0	0
22390	3,334	209	6.3	193	92.3	15	7.2	1	0.5
Total	**126,497**	**9,083**	**7.2**	**8023**	**88.3**	**1053**	**11.6**	**7**	**0.1**

**Includes responses that received a condition code.*

Table I-11. Double Blind Report—Grade 8 Writing ERs

Scorer ID	Total Scored	Total # of DB	% DB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
22792	1,176	3	0.3	2	66.7	1	33.3	0	0
22885	171	2	1.2	2	100	0	0	0	0
22398	3,257	12	0.4	11	91.7	1	8.3	0	0
22778	1,205	4	0.3	4	100	0	0	0	0
22607	524	1	0.2	1	100	0	0	0	0
22265	876	1	0.1	1	100	0	0	0	0
22714	300	2	0.7	2	100	0	0	0	0
22863	637	5	0.8	4	80	1	20	0	0
22864	774	5	0.6	5	100	0	0	0	0
22064	593	1	0.2	1	100	0	0	0	0
22775	438	5	1.1	4	80	1	20	0	0
75857	469	4	0.9	3	75	1	25	0	0
67131	932	1	0.1	1	100	0	0	0	0
22893	199	1	0.5	1	100	0	0	0	0
20075	852	6	0.7	5	83.3	1	16.7	0	0

continued

Scorer ID	Total Scored	Total # of DB	% DB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
62329	1,288	1	0.1	0	0	0	0	1	100
22867	1,037	4	0.4	2	50	2	50	0	0
21850	927	2	0.2	2	100	0	0	0	0
22784	423	1	0.2	1	100	0	0	0	0
22109	450	3	0.7	2	66.7	1	33.3	0	0
64133	1,447	7	0.5	6	85.7	1	14.3	0	0
22909	234	2	0.9	2	100	0	0	0	0
16742	26	8	30.8	8	100	0	0	0	0
22933	592	5	0.8	5	100	0	0	0	0
61296	1,564	2	0.1	2	100	0	0	0	0
22729	1,951	4	0.2	4	100	0	0	0	0
20051	3,414	7	0.2	6	85.7	1	14.3	0	0
22901	1,769	4	0.2	2	50	2	50	0	0
22785	386	1	0.3	0	0	1	100	0	0
67942	715	2	0.3	1	50	1	50	0	0
22903	3,992	10	0.3	10	100	0	0	0	0
22905	3,703	9	0.2	8	88.9	0	0	1	11.1
22495	158	1	0.6	1	100	0	0	0	0
18468	1,820	15	0.8	13	86.7	2	13.3	0	0
21556	27	16	59.3	13	81.3	3	18.8	0	0
22934	981	2	0.2	2	100	0	0	0	0
22704	652	5	0.8	5	100	0	0	0	0
22302	2,476	6	0.2	6	100	0	0	0	0
Total	**42,435**	**170**	**0.4**	**148**	**87.1**	**20**	**11.8**	**2**	**1.2**

**Does not include responses that received a condition code.*

Table I-12. Read Behind Report—Grade 8 Writing ERs

Scorer ID	Total Scored	Total # of RB	% RB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
21825	592	29	4.9	23	79.3	6	20.7	0	0
22792	1,176	84	7.1	71	84.5	12	14.3	1	1.2
22180	413	28	6.8	25	89.3	3	10.7	0	0
22630	205	10	4.9	8	80	2	20	0	0
22857	129	18	14	12	66.7	5	27.8	1	5.6
22885	171	9	5.3	8	88.9	1	11.1	0	0
21749	462	25	5.4	21	84	4	16	0	0
22886	0	4	0	3	75	1	25	0	0
22398	3,257	262	8	183	69.8	78	29.8	1	0.4
22778	1,205	61	5.1	54	88.5	6	9.8	1	1.6
22887	113	11	9.7	10	90.9	1	9.1	0	0
22607	524	21	4	19	90.5	2	9.5	0	0
22265	876	67	7.6	58	86.6	9	13.4	0	0
22800	103	12	11.7	12	100	0	0	0	0
22714	300	18	6	15	83.3	3	16.7	0	0
22863	637	38	6	30	78.9	8	21.1	0	0
22864	774	73	9.4	68	93.2	5	6.8	0	0
22064	593	29	4.9	26	89.7	2	6.9	1	3.4
22754	66	4	6.1	3	75	1	25	0	0
22775	438	66	15.1	49	74.2	17	25.8	0	0
22943	41	2	4.9	2	100	0	0	0	0
75857	469	27	5.8	24	88.9	3	11.1	0	0
22892	475	23	4.8	21	91.3	2	8.7	0	0
67131	932	132	14.2	101	76.5	30	22.7	1	0.8
22893	199	14	7	13	92.9	1	7.1	0	0

continued

Scorer ID	Total Scored	Total # of RB	% RB	# Exact	% Exact	# Adjacent	% Adjacent	# Discrepant	% Discrepant
20075	852	53	6.2	39	73.6	12	22.6	2	3.8
62329	1,288	81	6.3	69	85.2	11	13.6	1	1.2
21953	1,091	84	7.7	74	88.1	10	11.9	0	0
22867	1,037	57	5.5	41	71.9	15	26.3	1	1.8
21850	927	71	7.7	69	97.2	2	2.8	0	0
22784	423	46	10.9	43	93.5	3	6.5	0	0
22109	450	34	7.6	26	76.5	8	23.5	0	0
22895	152	10	6.6	8	80	2	20	0	0
22896	170	12	7.1	11	91.7	1	8.3	0	0
64133	1,447	187	12.9	149	79.7	37	19.8	1	0.5
22897	140	7	5	7	100	0	0	0	0
22909	234	18	7.7	16	88.9	2	11.1	0	0
22829	432	39	9	34	87.2	5	12.8	0	0
22898	267	14	5.2	14	100	0	0	0	0
22933	592	57	9.6	41	71.9	16	28.1	0	0
61296	1,564	135	8.6	111	82.2	21	15.6	3	2.2
22729	1,951	124	6.4	102	82.3	21	16.9	1	0.8
22690	698	51	7.3	41	80.4	10	19.6	0	0
20051	3,414	307	9	245	79.8	57	18.6	5	1.6
22610	1,631	88	5.4	72	81.8	15	17	1	1.1
22901	1,769	162	9.2	118	72.8	41	25.3	3	1.9
22785	386	21	5.4	16	76.2	5	23.8	0	0
21974	609	38	6.2	32	84.2	5	13.2	1	2.6
22931	413	27	6.5	21	77.8	6	22.2	0	0
67942	715	56	7.8	41	73.2	15	26.8	0	0
22879	578	44	7.6	34	77.3	8	18.2	2	4.5
22903	3,992	324	8.1	251	77.5	71	21.9	2	0.6
22905	3,703	299	8.1	234	78.3	63	21.1	2	0.7
22495	158	15	9.5	14	93.3	1	6.7	0	0
18468	1,820	170	9.3	141	82.9	29	17.1	0	0
22907	257	14	5.4	13	92.9	1	7.1	0	0
22934	981	103	10.5	74	71.8	29	28.2	0	0
22704	652	49	7.5	41	83.7	6	12.2	2	4.1
22302	2,476	149	6	130	87.2	19	12.8	0	0
22908	110	11	10	10	90.9	1	9.1	0	0
Total	**51,529**	**4,024**	**7.8**	**3241**	**80.5**	**750**	**18.6**	**33**	**0.8**

**Includes responses that received a condition code.*

APPENDIX J

ITEM-LEVEL CLASSICAL STATISTICS

Table J-1. Item-Level Classical Test Theory Statistics—ELA Grade 3

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
147341A	MC	0.76	0.49	0.10
147348A	MC	0.68	0.55	0.12
155274A	MC	0.74	0.56	0.20
155277A	MC	0.51	0.37	0.23
155278A	MC	0.67	0.40	0.23
155279A	MC	0.63	0.51	0.09
155282A	MC	0.59	0.33	0.39
155283A	MC	0.68	0.49	0.17
156120A	MC	0.68	0.59	0.54
156121A	MC	0.61	0.49	0.27
156123A	MC	0.46	0.42	0.80
156124A	MC	0.75	0.47	0.30
156126A	MC	0.46	0.48	0.40
482316	MC	0.63	0.22	0.05
482318	MC	0.54	0.38	0.10
482867	MC	0.39	0.41	0.05
484541	MC	0.76	0.59	0.07
484543	MC	0.27	0.26	0.11
484569	MC	0.60	0.44	0.25
484571	MC	0.31	0.13	0.38
484575	MC	0.57	0.43	1.22
484577	MC	0.40	0.30	0.13
484579	MC	0.45	0.43	1.11
484581	MC	0.38	0.21	0.88

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
628643	MC	0.43	0.27	0.13
628709	MC	0.72	0.59	0.08
628734	MC	0.60	0.45	0.13
701185	MC	0.62	0.43	0.15
701219	MC	0.30	0.14	0.17
701289	MC	0.36	0.22	0.15
705924	MC	0.69	0.56	0.22
715595	MC	0.60	0.49	0.17
758779	MC	0.63	0.50	0.14
759133	MC	0.56	0.39	0.15
759149	MC	0.50	0.39	0.19
759159	MC	0.60	0.35	0.15
765883	MC	0.56	0.46	0.14
799386	MC	0.62	0.41	0.08
799388	MC	0.49	0.52	0.05
799392	MC	0.51	0.35	0.07
799395	MC	0.39	0.42	0.08
799397	MC	0.83	0.42	0.08
802056	MC	0.41	0.41	0.10
802069	MC	0.69	0.57	0.11
802248	MC	0.69	0.59	0.08
802262	MC	0.55	0.45	0.12
802414	MC	0.37	0.43	0.09
802422	MC	0.45	0.38	0.10

Table J-2. Item-Level Classical Test Theory Statistics—ELA Grade 4

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
146887A	MC	0.54	0.46	0.09
148685A	MC	0.44	0.48	0.16
148686A	MC	0.48	0.31	0.17
148719A	MC	0.46	0.21	0.16
148754A	MC	0.69	0.44	0.17
148938A	MC	0.81	0.55	0.10
149114A	MC	0.75	0.54	0.17
149115A	MC	0.44	0.37	0.15
155473A	MC	0.49	0.41	0.13
155490A	MC	0.52	0.47	0.07
155569A	MC	0.58	0.42	0.29
155571A	MC	0.70	0.45	0.24
155572A	MC	0.76	0.44	0.23
155580A	MC	0.70	0.58	0.40
158587A	MC	0.57	0.53	0.15
158589A	MC	0.68	0.58	0.27
158602A	MC	0.52	0.36	0.07
158604A	MC	0.73	0.37	0.07
158611A	MC	0.62	0.39	0.08
158691A	MC	0.84	0.49	0.09
158692A	MC	0.49	0.37	0.06
186016A	MC	0.68	0.34	0.14
186018A	MC	0.25	0.11	0.23
483086	MC	0.58	0.38	0.11
484626	MC	0.65	0.46	0.12
484628	MC	0.75	0.53	0.11
484632	MC	0.60	0.51	0.13
484636	MC	0.60	0.31	0.14
484638	MC	0.63	0.55	0.09
484640	MC	0.43	0.45	0.02
484648	MC	0.49	0.37	0.09
484650	MC	0.58	0.50	0.02
484722	MC	0.67	0.57	0.06
485159	MC	0.67	0.49	0.05
485165	MC	0.48	0.40	0.19
485172	MC	0.64	0.55	0.06
635510	MC	0.71	0.42	0.12
635527	MC	0.63	0.40	0.02
635530	MC	0.67	0.38	0.03
635757	MC	0.91	0.35	0.01
702458	MC	0.66	0.55	0.05
702895	MC	0.32	0.16	0.05
702920	MC	0.62	0.47	0.06
702924	MC	0.80	0.53	0.05
799478	MC	0.70	0.53	0.05
799480	MC	0.45	0.33	0.06
799483	MC	0.87	0.51	0.05
799497	MC	0.48	0.29	0.05

Table J-3. Item-Level Classical Test Theory Statistics—ELA Grade 5

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
147920A	MC	0.83	0.44	0.05
147921A	MC	0.68	0.50	0.08
147923A	MC	0.67	0.44	0.05
147924A	MC	0.72	0.43	0.05
147926A	MC	0.57	0.38	0.06
147969A	MC	0.81	0.52	0.07
148893A	MC	0.68	0.39	0.02
148900A	MC	0.65	0.50	0.02
148906A	MC	0.89	0.47	0.01
148961A	MC	0.72	0.47	0.11
148963A	MC	0.78	0.51	0.12
148967A	MC	0.79	0.62	0.11
148971A	MC	0.65	0.43	0.06
149152A	MC	0.86	0.47	0.10
149158A	MC	0.53	0.33	0.10
149196A	MC	0.69	0.41	0.25
149318A	MC	0.65	0.50	0.15
149321A	MC	0.62	0.31	0.13
149330A	MC	0.78	0.46	0.06
149339A	MC	0.61	0.33	0.19
158749A	MC	0.59	0.43	0.11
159151A	MC	0.61	0.47	0.04
159165A	MC	0.61	0.39	0.04
159368A	MC	0.55	0.35	0.04
159475A	MC	0.70	0.46	0.04

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
159592A	MC	0.67	0.43	0.09
159600A	MC	0.89	0.42	0.04
160682A	MC	0.64	0.39	0.02
186469A	MC	0.37	0.43	0.27
186471A	MC	0.89	0.47	0.20
186474A	MC	0.56	0.36	0.21
186476A	MC	0.58	0.43	0.22
483144	MC	0.84	0.44	0.05
483150	MC	0.66	0.40	0.00
483162	MC	0.95	0.37	0.02
483170	MC	0.91	0.43	0.05
630607	MC	0.31	0.19	0.01
630655	MC	0.66	0.56	0.06
631955	MC	0.81	0.49	0.04
631981	MC	0.59	0.51	0.05
631995	MC	0.50	0.45	0.01
632263	MC	0.87	0.42	0.03
632323	MC	0.55	0.43	0.06
799549	MC	0.72	0.52	0.03
799562	MC	0.68	0.36	0.04
799574	MC	0.60	0.43	0.03
799579	MC	0.91	0.45	0.04
799588	MC	0.69	0.47	0.05
799592	MC	0.62	0.40	0.04
799594	MC	0.71	0.51	0.04

Table J-4. Item-Level Classical Test Theory Statistics—ELA Grade 6

Item					Item				
Number	Type	Difficulty	Discrimination	Percent Omitted	Number	Type	Difficulty	Discrimination	Percent Omitted
147260A	MC	0.47	0.26	0.08	181889A	MC	0.67	0.44	0.09
147261A	MC	0.76	0.47	0.09	181893A	MC	0.48	0.32	0.09
147283A	MC	0.69	0.49	0.06	181904A	MC	0.57	0.55	0.07
147289A	MC	0.67	0.34	0.06	485443	MC	0.38	0.40	0.17
147290A	MC	0.65	0.46	0.06	485688	MC	0.72	0.52	0.26
149570A	MC	0.61	0.48	0.20	485986	MC	0.27	0.25	0.07
149571A	MC	0.58	0.60	0.21	486369	MC	0.61	0.53	0.08
158723A	MC	0.79	0.50	0.16	486371	MC	0.60	0.45	0.08
158740A	MC	0.62	0.33	0.17	486376	MC	0.67	0.52	0.08
158747A	MC	0.67	0.49	0.21	629854	MC	0.28	0.29	0.07
158777A	MC	0.65	0.48	0.16	629856	MC	0.57	0.47	0.09
158780A	MC	0.47	0.44	0.07	629863	MC	0.62	0.45	0.04
158886A	MC	0.82	0.46	0.16	629867	MC	0.74	0.52	0.03
158935A	MC	0.61	0.40	0.04	629869	MC	0.52	0.38	0.05
158943A	MC	0.38	0.19	0.08	629885	MC	0.53	0.39	0.19
158947A	MC	0.60	0.40	0.07	629889	MC	0.34	0.26	0.19
159272A	MC	0.78	0.55	0.09	629891	MC	0.44	0.32	0.13
159273A	MC	0.66	0.47	0.09	629895	MC	0.60	0.40	0.19
159451A	MC	0.76	0.42	0.15	629898	MC	0.34	0.34	0.14
159453A	MC	0.67	0.38	0.17	708956	MC	0.60	0.35	0.06
159454A	MC	0.35	0.35	0.16	709888	MC	0.65	0.41	0.07
159457A	MC	0.75	0.39	0.16	709904	MC	0.69	0.46	0.07
159458A	MC	0.65	0.40	0.17	710081	MC	0.53	0.45	0.07
181888A	MC	0.64	0.44	0.07	710109	MC	0.48	0.42	0.05

Table J-5. Item-Level Classical Test Theory Statistics—ELA Grade 7

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
148117A	MC	0.54	0.43	0.20
148759A	MC	0.57	0.46	0.19
148760A	MC	0.59	0.51	0.21
148762A	MC	0.68	0.39	0.24
148785A	MC	0.32	0.27	0.27
148823A	MC	0.67	0.45	0.02
148850A	MC	0.72	0.43	0.18
148859A	MC	0.81	0.47	0.18
148861A	MC	0.46	0.45	0.17
148866A	MC	0.64	0.41	0.15
154639A	MC	0.41	0.35	0.18
158719A	MC	0.46	0.40	0.17
158724A	MC	0.53	0.46	0.18
158765A	MC	0.62	0.46	0.15
158766A	MC	0.61	0.41	0.15
158768A	MC	0.81	0.48	0.09
159120A	MC	0.63	0.57	0.19
159122A	MC	0.44	0.33	0.19
159393A	MC	0.30	0.16	0.07
159394A	MC	0.50	0.29	0.10
159646A	MC	0.48	0.45	0.08
160475A	MC	0.45	0.40	0.03
160508A	MC	0.60	0.50	0.04
160511A	MC	0.58	0.38	0.02
160937A	MC	0.71	0.56	0.07
160940A	MC	0.78	0.52	0.09
161009A	MC	0.71	0.48	0.04
161013A	MC	0.65	0.58	0.05
161015A	MC	0.73	0.53	0.05
161017A	MC	0.50	0.41	0.04
486302	MC	0.45	0.39	0.09
486597	MC	0.52	0.47	0.05
486613	MC	0.66	0.37	0.05
486661	MC	0.65	0.48	0.05
486665	MC	0.42	0.21	0.06
634303	MC	0.41	0.36	0.07
634354	MC	0.45	0.24	0.17
634364	MC	0.54	0.39	0.17
634366	MC	0.52	0.25	0.16
634374	MC	0.40	0.25	0.18
634379	MC	0.52	0.49	0.18
634389	MC	0.56	0.36	0.17
711110	MC	0.60	0.47	0.05
711120	MC	0.70	0.38	0.04
711137	MC	0.55	0.42	0.06
711145	MC	0.68	0.50	0.05
711168	MC	0.61	0.47	0.04
711173	MC	0.53	0.41	0.05

Table J-6. Item-Level Classical Test Theory Statistics—ELA Grade 8

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
148177A	MC	0.72	0.48	0.15
148187A	MC	0.75	0.37	0.13
148189A	MC	0.54	0.36	0.13
149416A	MC	0.65	0.36	0.11
149431A	MC	0.77	0.51	0.13
149653A	MC	0.56	0.47	0.09
149654A	MC	0.34	0.23	0.10
149721A	MC	0.84	0.44	0.09
149731A	MC	0.26	0.24	0.11
149744A	MC	0.49	0.46	0.11
160467A	MC	0.72	0.33	0.13
160742A	MC	0.66	0.50	0.09
160745A	MC	0.74	0.44	0.07
160747A	MC	0.62	0.41	0.08
160770A	MC	0.93	0.44	0.06
160771A	MC	0.49	0.43	0.06
160775A	MC	0.63	0.53	0.05
160777A	MC	0.46	0.26	0.04
160784A	MC	0.91	0.44	0.04
160785A	MC	0.85	0.44	0.03
160787A	MC	0.54	0.43	0.04
160788A	MC	0.62	0.32	0.05
160789A	MC	0.43	0.36	0.05
160790A	MC	0.60	0.27	0.04
160791A	MC	0.79	0.49	0.11
160872A	MC	0.46	0.44	0.09
160873A	MC	0.50	0.40	0.09
160875A	MC	0.41	0.14	0.09
160877A	MC	0.40	0.39	0.09
160992A	MC	0.70	0.32	0.07
160993A	MC	0.51	0.29	0.08
485469	MC	0.41	0.35	0.09
485495	MC	0.58	0.41	0.11
485500	MC	0.58	0.48	0.10
485506	MC	0.22	0.11	0.12
486738	MC	0.47	0.23	0.05
486744	MC	0.54	0.35	0.05
486763	MC	0.81	0.28	0.05
487006	MC	0.81	0.41	0.06
626597	MC	0.58	0.23	0.06
626626	MC	0.40	0.45	0.16
626785	MC	0.73	0.54	0.14
626814	MC	0.41	0.16	0.13
627061	MC	0.80	0.53	0.14
760819	MC	0.50	0.36	0.03
760826	MC	0.42	0.30	0.05
760834	MC	0.45	0.40	0.03
760837	MC	0.90	0.41	0.03
760844	MC	0.63	0.39	0.04
760851	MC	0.89	0.37	0.03

Table J-7. Item-Level Classical Test Theory Statistics—Mathematics Grade 3

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
146917A	MC	0.80	0.51	0.05
146947A	MC	0.27	0.27	0.21
147044A	MC	0.68	0.46	0.39
147064A	MC	0.91	0.40	0.13
147073A	MC	0.69	0.52	0.08
147300A	MC	0.58	0.42	0.05
147330A	MC	0.86	0.54	0.46
147542A	MC	0.76	0.49	0.33
147708A	MC	0.57	0.55	0.07
147712A	MC	0.80	0.54	0.27
147728A	MC	0.62	0.41	0.38
147966A	MC	0.42	0.16	0.10
152031A	MC	0.78	0.55	0.04
152546A	MC	0.80	0.45	0.17
152598A	MC	0.47	0.52	0.28
152620A	MC	0.69	0.51	0.03
152739A	MC	0.79	0.43	0.07
152864A	MC	0.62	0.39	0.78
152884A	MC	0.47	0.43	0.02
153168A	MC	0.71	0.64	0.22
154329A	MC	0.85	0.45	0.55
154533A	MC	0.66	0.53	0.17
154758A	MC	0.65	0.60	0.30
154760A	MC	0.66	0.61	0.14
155260A	MC	0.84	0.58	0.19
155455A	MC	0.36	0.36	0.36
155525A	MC	0.73	0.62	0.06
161166A	MC	0.71	0.51	0.19
479111	MC	0.70	0.51	0.13
479113	MC	0.90	0.45	0.37
479117	MC	0.70	0.41	0.31
479125	MC	0.96	0.31	0.32
479138	MC	0.55	0.51	0.29
488998	MC	0.49	0.30	0.17
636391	MC	0.77	0.55	0.08
636410	MC	0.86	0.39	0.11
636412	MC	0.51	0.35	0.14
636421	MC	0.44	0.43	0.06
636429	MC	0.74	0.33	0.11
636439	MC	0.66	0.32	0.14
636443	MC	0.55	0.35	0.13
674356	MC	0.75	0.47	0.07
674364	MC	0.71	0.49	0.05
674370	MC	0.44	0.49	0.14
733123	MC	0.71	0.51	0.16
733127	MC	0.87	0.44	0.07
733131	MC	0.37	0.40	0.03
733134	MC	0.47	0.40	0.04
771992	MC	0.84	0.28	0.07

Table J-8. Item-Level Classical Test Theory Statistics—Mathematics Grade 4

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
146951A	MC	0.60	0.34	0.06
147525A	MC	0.71	0.51	0.14
148236A	MC	0.60	0.52	0.02
148654A	MC	0.42	0.48	0.22
148675A	MC	0.37	0.28	0.17
150642A	MC	0.48	0.40	0.03
150722A	MC	0.41	0.22	0.08
151278A	MC	0.56	0.38	0.17
151506A	MC	0.52	0.47	0.18
151519A	MC	0.87	0.50	0.23
151553A	MC	0.83	0.47	0.03
151556A	MC	0.74	0.54	0.32
152166A	MC	0.56	0.46	0.05
152197A	MC	0.77	0.33	0.19
152343A	MC	0.53	0.56	0.06
152353A	MC	0.70	0.51	0.10
152355A	MC	0.83	0.45	0.10
152518A	MC	0.79	0.47	0.09
152789A	MC	0.41	0.44	0.05
152874A	MC	0.40	0.44	0.16
152985A	MC	0.80	0.46	0.02
152988A	MC	0.67	0.54	0.33
153171A	MC	0.60	0.50	0.18
153189A	MC	0.53	0.55	0.22
153325A	MC	0.47	0.46	0.56
154024A	MC	0.57	0.55	0.06
154501A	MC	0.76	0.59	0.04
155121A	MC	0.33	0.33	0.15
155220A	MC	0.74	0.39	0.14
156019A	MC	0.59	0.52	0.10
184241A	MC	0.73	0.48	0.22
479500	MC	0.86	0.41	0.08
479502	MC	0.76	0.47	0.05
479507	MC	0.81	0.32	0.07
479930	MC	0.72	0.31	0.08
636619	MC	0.78	0.49	0.10
636627	MC	0.34	0.37	0.16
636649	MC	0.85	0.47	0.09
636655	MC	0.83	0.45	0.02
636657	MC	0.51	0.36	0.08
636666	MC	0.76	0.55	0.09
636668	MC	0.67	0.46	0.11
733078	MC	0.65	0.56	0.09
733086	MC	0.83	0.41	0.02
733088	MC	0.52	0.44	0.04
733092	MC	0.86	0.49	0.04
733094	MC	0.26	0.35	0.09
733096	MC	0.67	0.47	0.04
733100	MC	0.61	0.38	0.13

Table J-9. Item-Level Classical Test Theory Statistics—Mathematics Grade 5

Item Number	Type	Difficulty	Discrimination	Percent Omitted
146915A	MC	0.70	0.54	0.05
146959A	MC	0.61	0.42	0.17
147747A	MC	0.62	0.52	0.22
147990A	MC	0.43	0.53	0.09
148011A	MC	0.68	0.54	0.12
148173A	MC	0.48	0.44	0.17
148659A	MC	0.58	0.59	0.22
149230A	MC	0.56	0.57	0.06
149246A	MC	0.63	0.49	0.13
149261A	MC	0.45	0.51	0.16
149384A	MC	0.68	0.51	0.19
149559A	MC	0.37	0.36	0.01
149640A	MC	0.33	0.35	0.16
150273A	MC	0.51	0.42	0.06
150689A	MC	0.57	0.42	0.26
151248A	MC	0.80	0.34	0.08
152946A	MC	0.70	0.53	0.15
153107A	MC	0.58	0.46	0.18
153162A	MC	0.88	0.33	0.16
153165A	MC	0.57	0.50	0.23
153950A	MC	0.78	0.38	0.04
153972A	MC	0.67	0.45	0.28
155232A	MC	0.81	0.46	0.01
155234A	MC	0.21	0.44	0.17
155329A	MC	0.59	0.49	0.06

Item Number	Type	Difficulty	Discrimination	Percent Omitted
155426A	MC	0.88	0.36	0.07
155434A	MC	0.54	0.45	0.17
155474A	MC	0.67	0.52	0.16
155479A	MC	0.38	0.45	0.64
155489A	MC	0.51	0.47	0.07
161469A	MC	0.71	0.48	0.15
184261A	MC	0.57	0.38	0.25
484706	MC	0.66	0.42	0.18
489954	MC	0.89	0.35	0.02
636705	MC	0.92	0.23	0.03
636718	MC	0.83	0.42	0.01
636726	MC	0.56	0.56	0.18
636730	MC	0.31	0.47	0.01
636735	MC	0.76	0.34	0.05
636740	MC	0.50	0.44	0.16
636748	MC	0.51	0.37	0.17
674572	MC	0.81	0.46	0.06
674574	MC	0.88	0.41	0.16
733174	MC	0.55	0.49	0.04
733176	MC	0.57	0.49	0.06
733184	MC	0.78	0.51	0.15
733188	MC	0.82	0.44	0.02
733196	MC	0.55	0.38	0.14
773934	MC	0.69	0.28	0.02

Table J-10. Item-Level Classical Test Theory Statistics—Mathematics Grade 6

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
147326A	MC	0.65	0.50	0.08
148159A	MC	0.71	0.25	0.21
149234A	MC	0.77	0.48	0.19
149259A	MC	0.84	0.46	0.04
149350A	MC	0.55	0.44	0.10
150723A	MC	0.76	0.51	0.23
151145A	MC	0.63	0.38	0.31
151782A	MC	0.23	0.24	0.07
152379A	MC	0.48	0.60	0.11
152633A	MC	0.73	0.53	0.02
152754A	MC	0.35	0.34	0.22
152840A	MC	0.70	0.50	0.06
153512A	MC	0.56	0.50	0.24
153601A	MC	0.71	0.44	0.21
154011A	MC	0.67	0.39	0.19
155138A	MC	0.38	0.33	0.09
155184A	MC	0.62	0.41	0.14
155300A	MC	0.90	0.37	0.15
155465A	MC	0.79	0.46	0.02
181455A	MC	0.48	0.46	0.27
479039	MC	0.50	0.35	0.08
479041	MC	0.75	0.43	0.07
479043	MC	0.31	0.29	0.06
479047	MC	0.41	0.32	0.21

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
479049	MC	0.34	0.20	0.13
479051	MC	0.47	0.43	0.12
479057	MC	0.78	0.41	0.23
479069	MC	0.82	0.41	0.07
479077	MC	0.38	0.28	0.23
479081	MC	0.69	0.48	0.10
479083	MC	0.55	0.39	0.15
479087	MC	0.46	0.31	0.05
636459	MC	0.66	0.48	0.12
636463	MC	0.43	0.37	0.23
636465	MC	0.71	0.49	0.21
636479	MC	0.51	0.40	0.07
636483	MC	0.47	0.44	0.04
636485	MC	0.53	0.28	0.06
636493	MC	0.73	0.40	0.04
636499	MC	0.67	0.38	0.05
674628	MC	0.26	0.28	0.09
674630	MC	0.40	0.30	0.16
674634	MC	0.68	0.32	0.08
674638	MC	0.52	0.37	0.08
733232	MC	0.23	0.46	0.18
733240	MC	0.54	0.52	0.10
773992	MC	0.50	0.45	0.14

Table J-11. Item-Level Classical Test Theory Statistics—Mathematics Grade 7

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
148154A	MC	0.80	0.38	0.23
148171A	MC	0.46	0.50	0.11
148193A	MC	0.29	0.31	0.09
148478A	MC	0.30	0.33	0.29
148527A	MC	0.63	0.47	0.24
148530A	MC	0.52	0.38	0.26
148912A	MC	0.50	0.39	0.21
149064A	MC	0.61	0.43	0.06
149204A	MC	0.50	0.43	0.07
149247A	MC	0.65	0.52	0.03
150199A	MC	0.51	0.56	0.23
150232A	MC	0.21	0.44	0.14
150629A	MC	0.70	0.44	0.16
150891A	MC	0.33	0.25	0.19
151987A	MC	0.65	0.34	0.12
152009A	MC	0.38	0.41	0.21
152051A	MC	0.30	0.49	0.13
152056A	MC	0.51	0.54	0.08
153291A	MC	0.50	0.43	0.22
153299A	MC	0.32	0.47	0.16
153504A	MC	0.34	0.49	0.20
155126A	MC	0.26	0.36	0.14
155443A	MC	0.45	0.47	0.07
182015A	MC	0.33	0.39	0.16

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
182026A	MC	0.63	0.24	0.06
182027A	MC	0.47	0.30	0.07
480274	MC	0.35	0.31	0.05
480287	MC	0.44	0.41	0.13
480295	MC	0.33	0.29	0.32
480307	MC	0.25	0.15	0.14
480350	MC	0.46	0.47	0.17
489119	MC	0.30	0.35	0.29
489176	MC	0.50	0.37	0.16
490454	MC	0.30	0.20	0.32
636508	MC	0.50	0.42	0.19
636512	MC	0.32	0.40	0.25
636537	MC	0.50	0.36	0.17
636539	MC	0.32	0.31	0.11
636547	MC	0.43	0.52	0.09
636551	MC	0.55	0.38	0.06
636555	MC	0.29	0.31	0.07
674704	MC	0.50	0.50	0.04
674708	MC	0.52	0.47	0.05
674723	MC	0.55	0.41	0.13
733277	MC	0.66	0.47	0.17
733285	MC	0.77	0.43	0.06
774055	MC	0.43	0.56	0.10

Table J-12. Item-Level Classical Test Theory Statistics—Mathematics Grade 8

Item Number	Type	Difficulty	Discrimination	Percent Omitted
148061A	MC	0.36	0.52	0.05
148303A	MC	0.41	0.46	0.07
148327A	MC	0.46	0.55	0.26
148379A	MC	0.65	0.49	0.13
148531A	MC	0.72	0.41	0.06
148689A	MC	0.38	0.52	0.26
150198A	MC	0.36	0.53	0.26
150215A	MC	0.48	0.34	0.26
151253A	MC	0.42	0.48	0.29
151260A	MC	0.68	0.46	0.03
151283A	MC	0.49	0.48	0.05
152296A	MC	0.70	0.34	0.03
152944A	MC	0.50	0.55	0.04
153437A	MC	0.42	0.48	0.09
153448A	MC	0.54	0.51	0.08
164493A	MC	0.39	0.44	0.08
181901A	MC	0.33	0.35	0.02
181934A	MC	0.28	0.33	0.09
183795A	MC	0.34	0.36	0.25
484783	MC	0.20	0.25	0.07
484815	MC	0.34	0.29	0.03
484821	MC	0.58	0.47	0.10
484823	MC	0.68	0.45	0.05
484828	MC	0.63	0.37	0.26
484841	MC	0.22	0.19	0.28
484847	MC	0.65	0.34	0.08
484853	MC	0.54	0.55	0.31
484860	MC	0.35	0.29	0.13
484866	MC	0.31	0.40	0.04
484873	MC	0.34	0.28	0.25
484877	MC	0.66	0.39	0.25
484881	MC	0.65	0.28	0.24
484977	MC	0.43	0.36	0.13
490116	MC	0.55	0.36	0.26
636559	MC	0.44	0.43	0.12
636567	MC	0.46	0.31	0.17
636578	MC	0.42	0.55	0.15
636590	MC	0.25	0.40	0.03
636594	MC	0.56	0.33	0.05
636602	MC	0.21	0.28	0.28
636610	MC	0.66	0.41	0.08
674821	MC	0.46	0.32	0.04
674875	MC	0.33	0.34	0.14
674877	MC	0.53	0.60	0.14
733318	MC	0.31	0.30	0.14
733322	MC	0.55	0.41	0.05
774106	MC	0.29	0.32	0.03

Table J-13. Item-Level Classical Test Theory Statistics—Science Grade 5

Item Number	Type	Difficulty	Discrimination	Percent Omitted
184387A	MC	0.59	0.51	0.11
184423A	MC	0.49	0.36	0.09
185413A	MC	0.33	0.37	0.08
186483A	MC	0.53	0.22	0.02
186489A	MC	0.54	0.42	0.03
186490A	MC	0.47	0.33	0.03
186754A	MC	0.78	0.45	0.15
186756A	MC	0.80	0.42	0.14
186759A	MC	0.82	0.48	0.15
187503A	MC	0.52	0.33	0.08
187505A	MC	0.80	0.41	0.11
187510A	MC	0.86	0.45	0.09
188717A	MC	0.73	0.52	0.19
188718A	MC	0.85	0.48	0.21
188720A	MC	0.76	0.44	0.39
189235A	MC	0.73	0.41	0.20
189237A	MC	0.54	0.50	0.16
189238A	MC	0.46	0.30	0.14
189340A	MC	0.65	0.55	0.17
189341A	MC	0.56	0.38	0.27
189345A	MC	0.35	0.29	0.20
189356A	MC	0.44	0.44	0.15
189358A	MC	0.48	0.31	0.16
189361A	MC	0.77	0.50	0.15
437241	MC	0.48	0.47	0.09
437243	MC	0.41	0.35	0.11
437245	MC	0.40	0.40	0.09
437494	MC	0.46	0.40	0.05
437506	MC	0.38	0.34	0.05
465317	MC	0.70	0.50	0.05
638751	MC	0.43	0.26	0.04
638753	MC	0.47	0.33	0.04
638755	MC	0.47	0.29	0.05
638808	MC	0.46	0.40	0.12
638810	MC	0.47	0.50	0.13
638812	MC	0.40	0.37	0.13
701741	MC	0.44	0.40	0.07
701743	MC	0.39	0.29	0.06
701751	MC	0.68	0.35	0.06
760514	MC	0.74	0.36	0.03
760544	MC	0.63	0.39	0.02
760546	MC	0.86	0.39	0.02
760557	MC	0.54	0.47	0.02
760561	MC	0.41	0.30	0.02
760567	MC	0.47	0.34	0.02

Table J-14. Item-Level Classical Test Theory Statistics—Science Grade 8

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
186321A	MC	0.53	0.42	0.04
186325A	MC	0.76	0.38	0.04
186364A	MC	0.45	0.42	0.04
188312A	MC	0.33	0.28	0.19
188317A	MC	0.65	0.39	0.18
189061A	MC	0.39	0.43	0.08
189076A	MC	0.57	0.41	0.06
189080A	MC	0.55	0.38	0.06
189438A	MC	0.56	0.29	0.18
189440A	MC	0.65	0.32	0.16
189442A	MC	0.69	0.49	0.16
300061A	MC	0.50	0.39	0.07
300065A	MC	0.27	0.40	0.08
300066A	MC	0.45	0.49	0.08
638899	MC	0.57	0.46	0.09
638901	MC	0.60	0.50	0.10
701389	MC	0.47	0.41	0.13
701392	MC	0.50	0.48	0.13
701395	MC	0.25	0.38	0.15
763208	MC	0.55	0.37	0.09
763210	MC	0.35	0.35	0.09
763221	MC	0.32	0.19	0.08
788002	MC	0.68	0.42	0.05
788012	MC	0.39	0.27	0.05
788014	MC	0.54	0.30	0.05
788073	MC	0.74	0.46	0.04
788075	MC	0.70	0.39	0.03
788079	MC	0.76	0.48	0.03
788088	MC	0.37	0.23	0.04
788094	MC	0.51	0.31	0.04
788096	MC	0.32	0.26	0.05
788127	MC	0.53	0.42	0.06
788139	MC	0.39	0.50	0.10
788153	MC	0.31	0.39	0.09
788155	MC	0.48	0.20	0.10
788161	MC	0.55	0.45	0.08
788209	MC	0.44	0.40	0.07
788213	MC	0.56	0.45	0.08
788219	MC	0.52	0.40	0.07
803595	MC	0.59	0.40	0.06
803597	MC	0.54	0.34	0.06
803605	MC	0.31	0.39	0.06

Table J-15. Item-Level Classical Test Theory Statistics—Science Grade 11

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
186972A	MC	0.34	0.34	0.25
186989A	MC	0.51	0.47	0.27
186992A	MC	0.59	0.44	0.25
187933A	MC	0.70	0.47	0.16
187935A	MC	0.57	0.45	0.16
187938A	MC	0.62	0.37	0.16
187996A	MC	0.64	0.50	0.25
187999A	MC	0.39	0.39	0.25
188008A	MC	0.50	0.31	0.26
188454A	MC	0.51	0.26	0.10
188458A	MC	0.40	0.22	0.11
188459A	MC	0.43	0.40	0.10
188544A	MC	0.36	0.42	0.12
188545A	MC	0.47	0.35	0.12
188546A	MC	0.42	0.46	0.10
188657A	MC	0.47	0.28	0.18
188658A	MC	0.39	0.21	0.17
188659A	MC	0.43	0.30	0.17
189596A	MC	0.50	0.36	0.05
189597A	MC	0.28	0.21	0.04
300016A	MC	0.40	0.25	0.04
586027	MC	0.34	0.36	0.17
586029	MC	0.42	0.45	0.17
586031	MC	0.49	0.48	0.18
586051	MC	0.43	0.32	0.26
586069	MC	0.39	0.25	0.26
586106	MC	0.48	0.44	0.05
586108	MC	0.39	0.39	0.04
586110	MC	0.33	0.19	0.04
586218	MC	0.55	0.51	0.17
586649	MC	0.41	0.42	0.22
586655	MC	0.37	0.34	0.22
586701	MC	0.45	0.39	0.27
586709	MC	0.35	0.50	0.27
586711	MC	0.35	0.32	0.27
592069	MC	0.54	0.55	0.16
592071	MC	0.67	0.48	0.16
592073	MC	0.28	0.33	0.16
593424	MC	0.42	0.33	0.19
593426	MC	0.49	0.48	0.17
603684	MC	0.45	0.41	0.26
639009	MC	0.29	0.16	0.14
639014	MC	0.31	0.34	0.18
639018	MC	0.27	0.14	0.13
701417	MC	0.32	0.41	0.43
701425	MC	0.33	0.32	0.30
701601	MC	0.25	0.30	0.16
701612	MC	0.50	0.55	0.16
701624	MC	0.24	0.26	0.16
701635	MC	0.56	0.30	0.25
701641	MC	0.52	0.37	0.25
701654	MC	0.64	0.41	0.25
754205	MC	0.38	0.30	0.25
754209	MC	0.50	0.37	0.25
754213	MC	0.39	0.24	0.24
786847	MC	0.49	0.34	0.12
786849	MC	0.40	0.29	0.11
786851	MC	0.35	0.30	0.09

Table J-16. Item-Level Classical Test Theory Statistics—U.S. History Grade 11

Item Number	Item Type	Difficulty	Discrimination	Percent Omitted	Item Number	Item Type	Difficulty	Discrimination	Percent Omitted
140941A	MC	0.26	0.20	0.18	648623	MC	0.52	0.54	0.15
141113A	MC	0.41	0.40	0.13	648625	MC	0.52	0.15	0.14
143252A	MC	0.69	0.52	0.17	648627	MC	0.43	0.49	0.13
143254A	MC	0.41	0.32	0.16	652304	MC	0.69	0.40	0.15
143278A	MC	0.58	0.49	0.16	652307	MC	0.50	0.52	0.16
143286A	MC	0.45	0.44	0.18	652328	MC	0.61	0.28	0.16
143291A	MC	0.58	0.39	0.17	658018	MC	0.44	0.49	0.17
143295A	MC	0.59	0.28	0.12	658020	MC	0.39	0.33	0.13
143307A	MC	0.38	0.30	0.12	658029	MC	0.28	0.31	0.13
143326A	MC	0.33	0.34	0.23	658051	MC	0.50	0.45	0.12
143333A	MC	0.44	0.31	0.21	658053	MC	0.64	0.55	0.16
143337A	MC	0.75	0.50	0.13	658058	MC	0.45	0.33	0.11
143340A	MC	0.65	0.25	0.12	658060	MC	0.65	0.37	0.16
143361A	MC	0.40	0.42	0.13	658074	MC	0.28	0.33	0.15
143364A	MC	0.58	0.36	0.12	658076	MC	0.49	0.49	0.17
143365A	MC	0.43	0.52	0.18	658078	MC	0.44	0.50	0.06
143371A	MC	0.52	0.49	0.13	658082	MC	0.47	0.54	0.15
143377A	MC	0.62	0.36	0.17	700021	MC	0.53	0.49	0.10
143416A	MC	0.63	0.45	0.14	700082	MC	0.83	0.46	0.11
143447A	MC	0.59	0.42	0.16	700300	MC	0.49	0.39	0.18
648566	MC	0.48	0.39	0.12	700377	MC	0.77	0.42	0.16
648568	MC	0.44	0.49	0.12	700443	MC	0.55	0.53	0.04
648570	MC	0.56	0.31	0.12	700979	MC	0.59	0.56	0.03
648572	MC	0.50	0.30	0.13	755321	MC	0.40	0.39	0.03
648621	MC	0.48	0.49	0.12	755336	MC	0.34	0.35	0.07

Table J-17. Item-Level Non-MC Items—Across Grades & Content Areas

Content Area	Grade	PvMax	Item	Type	P0	P1	P2	P3	P4	P5	P6	P7
ELA	3	2	627921	CR	47.13	48.98	3.90	NULL	NULL	NULL	NULL	NULL
		2	628835	CR	45.89	51.13	2.97	NULL	NULL	NULL	NULL	NULL
	4	2	629160	CR	36.43	52.81	10.76	NULL	NULL	NULL	NULL	NULL
		2	799500	CR	29.67	62.80	7.53	NULL	NULL	NULL	NULL	NULL
	5	5	761740	WP	0.80	44.80	NULL	42.62	11.06	0.73	NULL	NULL
	6	2	630290	CR	49.77	42.82	7.41	NULL	NULL	NULL	NULL	NULL
		2	630430	CR	62.56	32.63	4.81	NULL	NULL	NULL	NULL	NULL
	7	2	630545	CR	47.09	48.84	4.07	NULL	NULL	NULL	NULL	NULL
		2	630649	CR	40.40	47.40	12.20	NULL	NULL	NULL	NULL	NULL
	8	7	762233	WP	1.06	NULL	28.30	NULL	39.24	29.82	NULL	1.58
Mathematics	3	1	771996	TE	60.26	39.74	NULL	NULL	NULL	NULL	NULL	NULL
	4	1	733102	TE	45.57	54.43	NULL	NULL	NULL	NULL	NULL	NULL
	5	1	674588	TE	78.31	21.69	NULL	NULL	NULL	NULL	NULL	NULL
	6	1	479095	TE	83.73	16.27	NULL	NULL	NULL	NULL	NULL	NULL
		1	479097	TE	65.42	34.58	NULL	NULL	NULL	NULL	NULL	NULL
		1	479148	TE	78.31	21.69	NULL	NULL	NULL	NULL	NULL	NULL
	7	1	480360	TE	84.41	15.59	NULL	NULL	NULL	NULL	NULL	NULL
		1	480373	TE	78.34	21.66	NULL	NULL	NULL	NULL	NULL	NULL
		1	480380	TE	84.56	15.44	NULL	NULL	NULL	NULL	NULL	NULL
	8	1	484750	TE	79.07	20.93	NULL	NULL	NULL	NULL	NULL	NULL
		1	484766	TE	42.40	57.60	NULL	NULL	NULL	NULL	NULL	NULL
		1	733332	TE	71.42	28.58	NULL	NULL	NULL	NULL	NULL	NULL
Science	8	2	494991	TE	16.11	24.23	59.65	NULL	NULL	NULL	NULL	NULL
		2	638903	TE	17.33	32.44	50.22	NULL	NULL	NULL	NULL	NULL
		2	788146	TE	9.58	36.11	54.31	NULL	NULL	NULL	NULL	NULL
	11	2	586659	TE	37.97	31.17	30.87	NULL	NULL	NULL	NULL	NULL
		2	701400	TE	65.96	22.68	11.36	NULL	NULL	NULL	NULL	NULL

APPENDIX K

DIFFERENTIAL ITEM FUNCTIONING RESULTS

Table K-1. Number of Items Classified as "Low Resolution" or "High Resolution" DIF Overall & by Grade & Group Favored—ELA: MC Items

Grade	Group: Reference	Group: Focal	Item Type	Number of Items	Number "Low Resolution": Total	Number "Low Resolution": Favoring Reference	Number "Low Resolution": Favoring Focal	Number "High Resolution": Total	Number "High Resolution": Favoring Reference	Number "High Resolution": Favoring Focal
3	Male	Female	MC	48	0	0	0	0	0	0
	White/Caucasian	Black / African American	MC	48	0	0	0	0	0	0
		Hispanic or Latino	MC	48	0	0	0	0	0	0
		American Indian / Alaskan Native	MC	48	1	1	0	0	0	0
		Asian	MC	48	7	5	2	1	1	0
		Pacific Islander	MC	48	8	5	3	3	2	1
		Two or More Races	MC	48	0	0	0	0	0	0
	Non-IEP	IEP	MC	48	0	0	0	0	0	0
	Non-EconDis	EconDis	MC	48	0	0	0	0	0	0
	Non-ELL	ELL	MC	48	2	2	0	0	0	0
4	Male	Female	MC	48	2	1	1	0	0	0
	White/Caucasian	Black / African American	MC	48	1	1	0	0	0	0
		Hispanic or Latino	MC	48	0	0	0	0	0	0
		American Indian / Alaskan Native	MC	48	1	1	0	0	0	0
		Asian	MC	48	4	2	2	0	0	0
		Pacific Islander	MC	48	9	5	4	1	1	0
		Two or More Races	MC	48	0	0	0	0	0	0
	Non-IEP	IEP	MC	48	0	0	0	0	0	0
	Non-EconDis	EconDis	MC	48	0	0	0	0	0	0
	Non-ELL	ELL	MC	48	3	3	0	0	0	0
5	Male	Female	MC	50	5	3	2	1	1	0
	White/Caucasian	Black / African American	MC	50	3	2	1	0	0	0
		Hispanic or Latino	MC	50	0	0	0	0	0	0
		American Indian / Alaskan Native	MC	50	3	3	0	0	0	0
		Asian	MC	50	5	2	3	1	1	0
		Pacific Islander	MC	50	11	7	4	3	2	1
		Two or More Races	MC	50	0	0	0	0	0	0
	Non-IEP	IEP	MC	50	0	0	0	0	0	0
	Non-EconDis	EconDis	MC	50	0	0	0	0	0	0
	Non-ELL	ELL	MC	50	4	3	1	1	1	0
6	Male	Female	MC	48	4	4	0	0	0	0
	White/Caucasian	Black / African American	MC	48	0	0	0	0	0	0
		Hispanic or Latino	MC	48	0	0	0	0	0	0

continued

Grade	Group Reference	Group Focal	Item Type	Number of Items	Number "Low Resolution" Total	Low Resolution Favoring Reference	Low Resolution Favoring Focal	Number "High Resolution" Total	High Resolution Favoring Reference	High Resolution Favoring Focal
6	White/Caucasian	American Indian / Alaskan Native	MC	48	1	0	1	0	0	0
		Asian	MC	48	8	6	2	0	0	0
		Pacific Islander	MC	48	9	4	5	2	2	0
		Two or More Races	MC	48	0	0	0	0	0	0
	Non-IEP	IEP	MC	48	0	0	0	0	0	0
	Non-EconDis	EconDis	MC	48	0	0	0	0	0	0
	Non-ELL	ELL	MC	48	2	1	1	0	0	0
7	Male	Female	MC	48	7	6	1	1	1	0
	White/Caucasian	Black / African American	MC	48	4	3	1	0	0	0
		Hispanic or Latino	MC	48	0	0	0	0	0	0
		American Indian / Alaskan Native	MC	48	1	1	0	0	0	0
		Asian	MC	48	5	3	2	1	1	0
		Pacific Islander	MC	48	11	6	5	2	2	0
		Two or More Races	MC	48	0	0	0	0	0	0
	Non-IEP	IEP	MC	48	1	1	0	0	0	0
	Non-EconDis	EconDis	MC	48	0	0	0	0	0	0
	Non-ELL	ELL	MC	48	2	2	0	1	1	0
8	Male	Female	MC	50	4	2	2	1	1	0
	White/Caucasian	Black / African American	MC	50	4	2	2	0	0	0
		Hispanic or Latino	MC	50	0	0	0	0	0	0
		American Indian / Alaskan Native	MC	50	2	2	0	0	0	0
		Asian	MC	50	5	0	5	2	2	0
		Pacific Islander	MC	50	0	0	0	0	0	0
		Two or More Races	MC	50	0	0	0	0	0	0
	Non-IEP	IEP	MC	50	0	0	0	0	0	0
	Non-EconDis	EconDis	MC	50	0	0	0	0	0	0
	Non-ELL	ELL	MC	50	2	2	0	0	0	0

Table K-2. Number of Items Classified as "Low Resolution" or "High Resolution" DIF Overall and by Grade and Group Favored—ELA: CR Items

Grade	Group: Reference	Group: Focal	Item Type	Number of Items	Number "Low Resolution": Total	Number "Low Resolution" Favoring: Reference	Number "Low Resolution" Favoring: Focal	Number "High Resolution": Total	Number "High Resolution" Favoring: Reference	Number "High Resolution" Favoring: Focal
3	Male	Female	CR	2	0	0	0	0	0	0
	White/Caucasian	Black / African American	CR	2	0	0	0	0	0	0
		Hispanic or Latino	CR	2	0	0	0	0	0	0
		American Indian / Alaskan Native	CR	2	0	0	0	0	0	0
		Asian	CR	2	0	0	0	0	0	0
		Pacific Islander	CR	2	0	0	0	0	0	0
		Two or More Races	CR	2	0	0	0	0	0	0
	Non-IEP	IEP	CR	2	0	0	0	0	0	0
	Non-EconDis	EconDis	CR	2	0	0	0	0	0	0
	Non-ELL	ELL	CR	2	0	0	0	0	0	0
4	Male	Female	CR	2	1	0	1	0	0	0
	White/Caucasian	Black / African American	CR	2	0	0	0	0	0	0
		Hispanic or Latino	CR	2	0	0	0	0	0	0
		American Indian / Alaskan Native	CR	2	0	0	0	0	0	0
		Asian	CR	2	0	0	0	0	0	0
		Pacific Islander	CR	2	1	0	1	0	0	0
		Two or More Races	CR	2	0	0	0	0	0	0
	Non-IEP	IEP	CR	2	0	0	0	0	0	0
	Non-EconDis	EconDis	CR	2	0	0	0	0	0	0
	Non-ELL	ELL	CR	2	0	0	0	0	0	0
5	Male	Female	CR	0	0	0	0	0	0	0
	White/Caucasian	Black / African American	CR	0	0	0	0	0	0	0
		Hispanic or Latino	CR	0	0	0	0	0	0	0
		American Indian / Alaskan Native	CR	0	0	0	0	0	0	0
		Asian	CR	0	0	0	0	0	0	0
		Pacific Islander	CR	0	0	0	0	0	0	0
		Two or More Races	CR	0	0	0	0	0	0	0

continued

Grade	Group: Reference	Group: Focal	Item Type	Number of Items	Number "Low Resolution": Total	Number "Low Resolution" Favoring: Reference	Number "Low Resolution" Favoring: Focal	Number "High Resolution": Total	Number "High Resolution" Favoring: Reference	Number "High Resolution" Favoring: Focal
5	Non-IEP	IEP	CR	0	0	0	0	0	0	0
	Non-EconDis	EconDis	CR	0	0	0	0	0	0	0
	Non-ELL	ELL	CR	0	0	0	0	0	0	0
6	Male	Female	CR	2	2	0	2	0	0	0
	White/Caucasian	Black / African American	CR	2	0	0	0	0	0	0
		Hispanic or Latino	CR	2	0	0	0	0	0	0
		American Indian / Alaskan Native	CR	2	0	0	0	0	0	0
		Asian	CR	2	2	0	2	0	0	0
		Pacific Islander	CR	2	0	0	0	0	0	0
		Two or More Races	CR	2	0	0	0	0	0	0
	Non-IEP	IEP	CR	2	0	0	0	0	0	0
	Non-EconDis	EconDis	CR	2	0	0	0	0	0	0
	Non-ELL	ELL	CR	2	0	0	0	0	0	0
7	Male	Female	CR	2	2	0	2	0	0	0
	White/Caucasian	Black / African American	CR	2	0	0	0	0	0	0
		Hispanic or Latino	CR	2	0	0	0	0	0	0
		American Indian / Alaskan Native	CR	2	0	0	0	0	0	0
		Asian	CR	2	1	0	1	0	0	0
		Pacific Islander	CR	2	0	0	0	0	0	0
		Two or More Races	CR	2	0	0	0	0	0	0
	Non-IEP	IEP	CR	2	0	0	0	0	0	0
	Non-EconDis	EconDis	CR	2	0	0	0	0	0	0
	Non-ELL	ELL	CR	2	0	0	0	0	0	0
8	Male	Female	CR	0	0	0	0	0	0	0
	White	Black / African American	CR	0	0	0	0	0	0	0
		Hispanic or Latino	CR	0	0	0	0	0	0	0
		American Indian / Alaskan Native	CR	0	0	0	0	0	0	0
		Asian	CR	0	0	0	0	0	0	0
		Pacific Islander	CR	0	0	0	0	0	0	0

continued

Grade	Group: Reference	Group: Focal	Item Type	Number of Items	Number "Low Resolution": Total	Number "Low Resolution": Favoring Reference	Number "Low Resolution": Favoring Focal	Number "High Resolution": Total	Number "High Resolution": Favoring Reference	Number "High Resolution": Favoring Focal
8	White	Two or More Races	CR	0	0	0	0	0	0	0
	Non-IEP	IEP	CR	0	0	0	0	0	0	0
	Non-EconDis	EconDis	CR	0	0	0	0	0	0	0
	Non-ELL	ELL	CR	0	0	0	0	0	0	0

Table K-3. Number of Items Classified as "Low Resolution" or "High Resolution" DIF Overall and by Grade and Group Favored—ELA: WP Items

Grade	Group: Reference	Group: Focal	Item Type	Number of Items	Number "Low Resolution": Total	Number "Low Resolution": Favoring Reference	Number "Low Resolution": Favoring Focal	Number "High Resolution": Total	Number "High Resolution": Favoring Reference	Number "High Resolution": Favoring Focal
5	Male	Female	WP	1	0	0	0	0	0	0
	White/Caucasian	Black / African American	WP	1	0	0	0	0	0	0
		Hispanic or Latino	WP	1	0	0	0	0	0	0
		American Indian / Alaskan Native	WP	1	0	0	0	0	0	0
		Asian	WP	1	0	0	0	0	0	0
		Pacific Islander	WP	1	0	0	0	0	0	0
		Two or More Races	WP	1	0	0	0	0	0	0
	Non-IEP	IEP	WP	1	0	0	0	0	0	0
	Non-EconDis	EconDis	WP	1	0	0	0	0	0	0
	Non-ELL	ELL	WP	1	0	0	0	0	0	0
8	Male	Female	WP	1	0	0	0	0	0	0
	White/Caucasian	Black / African American	WP	1	0	0	0	0	0	0
		Hispanic or Latino	WP	1	0	0	0	0	0	0
		American Indian / Alaskan Native	WP	1	0	0	0	0	0	0
		Asian	WP	1	0	0	0	0	0	0
		Pacific Islander	WP	1	0	0	0	0	0	0
		Two or More Races	WP	1	0	0	0	0	0	0
	Non-IEP	IEP	WP	1	0	0	0	0	0	0
	Non-EconDis	EconDis	WP	1	0	0	0	0	0	0
	Non-ELL	ELL	WP	1	0	0	0	0	0	0

Table K-4. Number of Items Classified as "Low Resolution" or "High Resolution" DIF Overall & by Grade & Group Favored—Mathematics: MC Items

Grade	Group: Reference	Group: Focal	Item Type	Number of Items	Number "Low Resolution": Total	Number "Low Resolution": Favoring Reference	Number "Low Resolution": Favoring Focal	Number "High Resolution": Total	Number "High Resolution": Favoring Reference	Number "High Resolution": Favoring Focal
3	Male	Female	MC	49	3	2	1	0	0	0
	White/Caucasian	Black / African American	MC	49	2	0	2	0	0	0
		Hispanic or Latino	MC	49	0	0	0	0	0	0
		American Indian / Alaskan Native	MC	49	0	0	0	0	0	0
		Asian	MC	49	5	2	3	0	0	0
		Pacific Islander	MC	49	0	0	0	0	0	0
		Two or More Races	MC	49	0	0	0	0	0	0
	Non-IEP	IEP	MC	49	0	0	0	0	0	0
	Non-EconDis	EconDis	MC	49	0	0	0	0	0	0
	Non-ELL	ELL	MC	49	0	0	0	0	0	0
4	Male	Female	MC	49	4	3	1	0	0	0
	White/Caucasian	Black / African American	MC	49	4	3	1	0	0	0
		Hispanic or Latino	MC	49	0	0	0	0	0	0
		American Indian / Alaskan Native	MC	49	2	2	0	0	0	0
		Asian	MC	49	2	1	1	1	1	0
		Pacific Islander	MC	49	0	0	0	0	0	0
		Two or More Races	MC	49	0	0	0	0	0	0
	Non-IEP	IEP	MC	49	0	0	0	0	0	0
	Non-EconDis	EconDis	MC	49	0	0	0	0	0	0
	Non-ELL	ELL	MC	49	1	1	0	1	1	0
5	Male	Female	MC	49	2	2	0	2	2	0
	White/Caucasian	Black / African American	MC	49	6	5	1	0	0	0
		Hispanic or Latino	MC	49	0	0	0	0	0	0
		American Indian / Alaskan Native	MC	49	0	0	0	0	0	0
		Asian	MC	49	9	4	5	0	0	0
		Pacific Islander	MC	49	6	2	4	1	1	0
		Two or More Races	MC	49	0	0	0	0	0	0
	Non-IEP	IEP	MC	49	0	0	0	0	0	0
	Non-EconDis	EconDis	MC	49	0	0	0	0	0	0
	Non-ELL	ELL	MC	49	1	1	0	0	0	0
6	Male	Female	MC	47	3	2	1	0	0	0
	White/Caucasian	Black / African American	MC	47	0	0	0	0	0	0
		Hispanic or Latino	MC	47	0	0	0	0	0	0
		American Indian / Alaskan Native	MC	47	1	1	0	0	0	0
		Asian	MC	47	4	3	1	1	1	0

continued

Grade	Group: Reference	Group: Focal	Item Type	Number of Items	Number "Low Resolution": Total	Number "Low Resolution": Favoring Reference	Number "Low Resolution": Favoring Focal	Number "High Resolution": Total	Number "High Resolution": Favoring Reference	Number "High Resolution": Favoring Focal
6	White/Caucasian	Pacific Islander	MC	47	11	7	4	5	2	3
		Two or More Races	MC	47	0	0	0	0	0	0
	Non-IEP	IEP	MC	47	0	0	0	0	0	0
	Non-EconDis	EconDis	MC	47	0	0	0	0	0	0
	Non-ELL	ELL	MC	47	2	2	0	0	0	0
7	Male	Female	MC	47	9	3	6	1	1	0
	White/Caucasian	Black / African American	MC	47	1	1	0	0	0	0
		Hispanic or Latino	MC	47	0	0	0	0	0	0
		American Indian / Alaskan Native	MC	47	0	0	0	0	0	0
		Asian	MC	47	6	2	4	0	0	0
		Pacific Islander	MC	47	3	2	1	2	1	1
		Two or More Races	MC	47	0	0	0	0	0	0
	Non-IEP	IEP	MC	47	1	1	0	0	0	0
	Non-EconDis	EconDis	MC	47	0	0	0	0	0	0
	Non-ELL	ELL	MC	47	0	0	0	0	0	0
8	Male	Female	MC	47	0	0	0	0	0	0
	White/Caucasian	Black / African American	MC	47	3	3	0	0	0	0
		Hispanic or Latino	MC	47	0	0	0	0	0	0
		American Indian / Alaskan Native	MC	47	0	0	0	0	0	0
		Asian	MC	47	2	0	2	0	0	0
		Pacific Islander	MC	47	0	0	0	0	0	0
		Two or More Races	MC	47	0	0	0	0	0	0
	Non-IEP	IEP	MC	47	1	1	0	0	0	0
	Non-EconDis	EconDis	MC	47	0	0	0	0	0	0
	Non-ELL	ELL	MC	47	4	4	0	0	0	0

Table K-5. Number of Items Classified as "Low Resolution" or "High Resolution" DIF Overall and by Grade and Group Favored—Mathematics: TEI Items

Grade	Group: Reference	Group: Focal	Item Type	Number of Items	Number "Low Resolution": Total	Number "Low Resolution": Favoring Reference	Number "Low Resolution": Favoring Focal	Number "High Resolution": Total	Number "High Resolution": Favoring Reference	Number "High Resolution": Favoring Focal
4	Male	Female	TE	1	0	0	0	0	0	0
	White/Caucasian	Black / African American	TE	1	0	0	0	0	0	0
		Hispanic or Latino	TE	1	0	0	0	0	0	0
		American Indian / Alaskan Native	TE	1	0	0	0	0	0	0
		Asian	TE	1	0	0	0	0	0	0
		Pacific Islander	TE	1	0	0	0	0	0	0
		Two or More Races	TE	1	0	0	0	0	0	0
	Non-IEP	IEP	TE	1	0	0	0	0	0	0
	Non-EconDis	EconDis	TE	1	0	0	0	0	0	0
	Non-ELL	ELL	TE	1	0	0	0	0	0	0
5	Male	Female	TE	1	0	0	0	0	0	0
	White/Caucasian	Black / African American	TE	1	0	0	0	0	0	0
		Hispanic or Latino	TE	1	0	0	0	0	0	0
		American Indian / Alaskan Native	TE	1	0	0	0	0	0	0
		Asian	TE	1	0	0	0	0	0	0
		Pacific Islander	TE	1	0	0	0	0	0	0
		Two or More Races	TE	1	0	0	0	0	0	0
	Non-IEP	IEP	TE	1	0	0	0	0	0	0
	Non-EconDis	EconDis	TE	1	0	0	0	0	0	0
	Non-ELL	ELL	TE	1	0	0	0	0	0	0
6	Male	Female	TE	1	0	0	0	0	0	0
	White/Caucasian	Black / African American	TE	1	0	0	0	0	0	0
		Hispanic or Latino	TE	1	0	0	0	0	0	0
		American Indian / Alaskan Native	TE	1	0	0	0	0	0	0
		Asian	TE	1	0	0	0	0	0	0
		Pacific Islander	TE	1	0	0	0	0	0	0
		Two or More Races	TE	1	0	0	0	0	0	0
	Non-IEP	IEP	TE	1	0	0	0	0	0	0
	Non-EconDis	EconDis	TE	1	0	0	0	0	0	0
	Non-ELL	ELL	TE	1	0	0	0	0	0	0

continued

Grade	Group: Reference	Group: Focal	Item Type	Number of Items	Number "Low Resolution": Total	Low Resolution Favoring: Reference	Low Resolution Favoring: Focal	Number "High Resolution": Total	High Resolution Favoring: Reference	High Resolution Favoring: Focal
7	Male	Female	TE	3	0	0	0	0	0	0
	White/Caucasian	Black / African American	TE	3	0	0	0	0	0	0
		Hispanic or Latino	TE	3	0	0	0	0	0	0
		American Indian / Alaskan Native	TE	3	0	0	0	0	0	0
		Asian	TE	3	0	0	0	0	0	0
		Pacific Islander	TE	3	0	0	0	0	0	0
		Two or More Races	TE	3	0	0	0	0	0	0
	Non-IEP	IEP	TE	3	0	0	0	0	0	0
	Non-EconDis	EconDis	TE	3	0	0	0	0	0	0
	Non-ELL	ELL	TE	3	0	0	0	0	0	0
8	Male	Female	TE	3	0	0	0	0	0	0
	White/Caucasian	Black / African American	TE	3	1	1	0	0	0	0
		Hispanic or Latino	TE	3	0	0	0	0	0	0
		American Indian / Alaskan Native	TE	3	0	0	0	0	0	0
		Asian	TE	3	1	0	1	0	0	0
		Pacific Islander	TE	3	0	0	0	0	0	0
		Two or More Races	TE	3	0	0	0	0	0	0
	Non-IEP	IEP	TE	3	0	0	0	0	0	0
	Non-EconDis	EconDis	TE	3	0	0	0	0	0	0
	Non-ELL	ELL	TE	3	0	0	0	0	0	0

Table K-6. Number of Items Classified as "Low Resolution" or "High Resolution" DIF Overall & by Grade & Group Favored—Science: MC Items

Grade	Group		Item Type	Number of Items	Number "Low Resolution"			Number "High Resolution"		
	Reference	Focal			Total	Favoring Reference	Favoring Focal	Total	Favoring Reference	Favoring Focal
5	Male	Female	MC	45	1	1	0	0	0	0
	White/Caucasian	Black / African American	MC	45	2	1	1	0	0	0
		Hispanic or Latino	MC	45	0	0	0	0	0	0
		American Indian / Alaskan Native	MC	45	0	0	0	0	0	0
		Asian	MC	45	3	2	1	0	0	0
		Pacific Islander	MC	45	7	4	3	1	1	0
		Two or More Races	MC	45	0	0	0	0	0	0
	Non-IEP	IEP	MC	45	0	0	0	0	0	0
	Non-EconDis	EconDis	MC	45	0	0	0	0	0	0
	Non-ELL	ELL	MC	45	1	1	0	0	0	0
8	Male	Female	MC	42	9	4	5	0	0	0
	White/Caucasian	Black / African American	MC	42	0	0	0	0	0	0
		Hispanic or Latino	MC	42	0	0	0	0	0	0
		American Indian / Alaskan Native	MC	42	0	0	0	0	0	0
		Asian	MC	42	3	2	1	0	0	0
		Pacific Islander	MC	42	0	0	0	0	0	0
		Two or More Races	MC	42	0	0	0	0	0	0
	Non-IEP	IEP	MC	42	1	1	0	0	0	0
	Non-EconDis	EconDis	MC	42	0	0	0	0	0	0
	Non-ELL	ELL	MC	42	2	2	0	0	0	0
11	Male	Female	MC	58	3	2	1	0	0	0
	White/Caucasian	Black / African American	MC	58	0	0	0	0	0	0
		Hispanic or Latino	MC	58	0	0	0	0	0	0
		American Indian / Alaskan Native	MC	58	0	0	0	0	0	0
		Asian	MC	58	2	1	1	0	0	0
		Pacific Islander	MC	58	5	4	1	1	0	1
		Two or More Races	MC	58	0	0	0	0	0	0
	Non-IEP	IEP	MC	58	1	1	0	0	0	0
	Non-EconDis	EconDis	MC	58	0	0	0	0	0	0
	Non-ELL	ELL	MC	58	1	1	0	0	0	0

Table K-7. Number of Items Classified as "Low Resolution" or "High Resolution" DIF Overall and by Grade and Group Favored—Science: TEI Items

Grade	Group		Item Type	Number of Items	Number "Low Resolution"			Number "High Resolution"		
	Reference	Focal			Total	Favoring		Total	Favoring	
						Reference	Focal		Reference	Focal
8	Male	Female	TE	3	1	1	0	0	0	0
	White/Caucasian	Black / African American	TE	3	0	0	0	0	0	0
		Hispanic or Latino	TE	3	0	0	0	0	0	0
		American Indian / Alaskan Native	TE	3	0	0	0	0	0	0
		Asian	TE	3	0	0	0	0	0	0
		Pacific Islander	TE	3	0	0	0	0	0	0
		Two or More Races	TE	3	0	0	0	0	0	0
	Non-IEP	IEP	TE	3	0	0	0	0	0	0
	Non-EconDis	EconDis	TE	3	0	0	0	0	0	0
	Non-ELL	ELL	TE	3	0	0	0	0	0	0
11	Male	Female	TE	2	0	0	0	0	0	0
	White/Caucasian	Black / African American	TE	2	0	0	0	0	0	0
		Hispanic or Latino	TE	2	0	0	0	0	0	0
		American Indian / Alaskan Native	TE	2	0	0	0	0	0	0
		Asian	TE	2	0	0	0	0	0	0
		Pacific Islander	TE	2	0	0	0	0	0	0
		Two or More Races	TE	2	0	0	0	0	0	0
	Non-IEP	IEP	TE	2	0	0	0	0	0	0
	Non-EconDis	EconDis	TE	2	0	0	0	0	0	0
	Non-ELL	ELL	TE	2	0	0	0	0	0	0

Table K-8. Number of Items Classified as "Low Resolution" or "High Resolution" DIF Overall and by Grade and Group Favored—U.S. History: MC Items

Grade	Group: Reference	Group: Focal	Item Type	Number of Items	Number "Low Resolution": Total	Number "Low Resolution" Favoring: Reference	Number "Low Resolution" Favoring: Focal	Number "High Resolution": Total	Number "High Resolution" Favoring: Reference	Number "High Resolution" Favoring: Focal
11	Male	Female	MC	50	10	5	5	1	1	0
	White/Caucasian	Black / African American	MC	50	2	2	0	1	0	1
		Hispanic or Latino	MC	50	0	0	0	0	0	0
		American Indian / Alaskan Native	MC	50	0	0	0	0	0	0
		Asian	MC	50	3	1	2	1	1	0
		Pacific Islander	MC	50	10	5	5	1	1	0
		Two or More Races	MC	50	0	0	0	0	0	0
	Non-IEP	IEP	MC	50	1	1	0	0	0	0
	Non-EconDis	EconDis	MC	50	0	0	0	0	0	0
	Non-ELL	ELL	MC	50	1	1	0	0	0	0

APPENDIX L
OSTP AND CCRA
22-23 EQUATING REPORTS

Oklahoma School Testing Program

2022–2023: EQUATING REPORT

2022–2023 Oklahoma School Testing Program

Equating Report

The purpose of this document is to summarize the equating results obtained from Cognia for OSTP. Presented in this report are various program summary statistics and specific results related to the equating study.

The results of this report are organized as follows:

1. Aggregate Results
    1. Percentage of Students by Performance Level Categories
    2. Theta Cuts and Scaling Constants
    3. Calibration Report
    4. Equating Item Summary Statistics
2. Grade Subject Results
    1. A/A, B/B, Delta, and Cumulative Scale Score Distribution Plots
    2. Cumulative Scale Score Distribution Tables
    3. Tabled Delta Analysis Results
    4. Tabled B/B Analysis Results
    5. Final Item Parameters
    6. Decision Accuracy and Consistency (DAC)
    7. Fit Plots of Watchlist Items

The final results of this equating will be included as part of the 2022–2023 OSTP Technical Manual.

Section 1.1

Percentage of Students by Performance Level Categories

Table 1.1.1
Percentage of Students by Performance Level Categories
English Language Arts

Grade	Year	Count	BB	B	P	A	P+A	Delta	Ave. SS
3	2023	49618	41	31	25	4	29	-0.1	281.9
	2022	49563	40	32	23	6	29	4.1	281.8
	2021	46090	44	32	21	4	25	-14.1	278.9
	2019	50832	31	30	29	10	39	5.7	289.2
	2018	52382	34	33	27	6	33	-5.6	286.6
	2017	52060	30	32	31	8	39		290.7
4	2023	49054	41	35	22	2	24	0.5	278.9
	2022	48326	43	33	21	2	24	1.3	276.5
	2021	45579	45	33	20	2	22	-8.0	276.1
	2019	51321	36	33	24	6	30	-5.5	284.0
	2018	50985	30	34	28	7	36	-1.3	287.9
	2017	50512	29	34	30	7	37		289.3
5	2023	41941	23	46	25	6	32	0.6	287.6
	2022	42835	26	43	23	8	31	3.6	287.0
	2021	45840	31	41	21	6	28	-7.7	281.6
	2019	51488	25	40	27	8	35	0.3	287.7
	2018	33277	23	42	22	13	35	-5.0	290.3
	2017	48449	21	39	28	12	40		291.4
6	2023	48748	32	42	23	3	26	0.1	281.3
	2022	49567	31	43	22	4	26	0.3	281.2
	2021	47197	31	44	21	4	26	-10.5	281.6
	2019	51337	22	42	28	8	36	-1.7	289.7
	2018	49226	22	40	29	9	38	-2.4	290.3
	2017	46499	18	41	31	9	40		292.7
7	2023	49849	44	34	17	4	21	-0.4	276.0
	2022	50993	44	34	16	5	22	2.4	274.9
	2021	47139	46	34	15	4	19	-9.7	273.0
	2019	49406	35	36	21	8	29	1.7	283.2
	2018	46675	32	41	20	8	27	0.9	284.7
	2017	48035	34	40	20	6	26		282.1
8	2023	46294	33	46	17	4	21	-6.4	278.3
	2022	46257	30	42	22	6	27	3.4	281.5
	2021	46743	33	43	18	6	24	-8.8	279.0
	2019	46983	25	43	24	9	33	0.2	285.1
	2018	48052	24	43	24	9	33	-2.0	286.3
	2017	47914	23	42	23	11	35		287.6

Table 1.1.2

Percentage of Students by Performance Level Categories

Mathematics

Grade	Year	Count	BB	B	P	A	P+A	Delta	Ave. SS
3	2023	41307	25	37	27	12	38	4.9	290.9
	2022	49530	33	33	22	11	34	4.2	285.6
	2021	46033	35	35	20	9	29	-13.6	283.2
	2019	50739	24	33	26	17	43	1.4	294.4
	2018	51842	24	35	26	15	42	-2.6	292.9
	2017	52518	21	35	27	17	44		295.3
4	2023	40334	23	36	26	14	41	7.5	292.4
	2022	48282	35	32	20	13	33	5.1	284.7
	2021	45530	37	35	18	10	28	-10.1	281.1
	2019	51224	26	36	26	12	38	1.6	289.1
	2018	50856	27	37	25	11	37	-4.1	289.4
	2017	50677	23	36	27	14	41		292.8
5	2023	40330	23	45	21	11	32	5.8	286.5
	2022	48340	32	41	18	8	26	4.2	279.0
	2021	46348	37	41	15	8	22	-8.7	276.0
	2019	51478	24	45	19	11	31	1.0	285.4
	2018	33251	25	46	20	10	30	-5.4	285.1
	2017	48460	22	43	23	12	35		287.9
6	2023	41302	28	45	22	5	27	5.0	283.1
	2022	49431	38	40	18	5	22	1.3	276.3
	2021	47153	37	42	16	5	21	-9.2	275.2
	2019	51213	27	43	25	6	30	2.4	284.5
	2018	49140	29	43	23	5	28	-7.5	282.3
	2017	46542	22	42	29	6	35		287.4
7	2023	42742	43	30	23	5	28	3.3	284.4
	2022	50842	48	28	20	4	24	4.3	279.0
	2021	47077	55	25	17	3	20	-13.1	274.7
	2019	49215	38	29	26	7	33	-1.1	285.9
	2018	46445	34	32	26	8	34	0.4	286.9
	2017	48149	35	31	27	7	34		286.6
8	2023	44323	57	27	10	6	17	0.7	271.5
	2022	50941	61	23	10	6	16	2.2	265.5
	2021	46900	65	21	9	5	14	-7.0	262.8
	2019	46819	50	30	11	10	21	0.7	276.1
	2018	47903	52	28	10	10	20	-3.2	274.9
	2017	47768	49	28	12	11	23		276.3

Table 1.1.3

Percentage of Students by Performance Level Categories

Science

Grade	Year	Count	BB	B	P	A	P+A	Delta	Ave. SS
5	2023	40653	20	39	34	7	40	2.6	293.4
	2022	48261	28	34	31	7	38	5.6	288.0
	2021	46250	28	40	27	5	32	-6.4	285.9
	2019	51476	22	40	30	8	39	-2.2	291.4
	2018	33201	20	39	32	9	41	-2.2	293.7
	2017	48450	22	35	34	9	43		295.0

Section 1.2

Theta Cuts and Scaling Constants

Table 1.2.1

Theta and Scale Score Cuts

Subject	Grade	Type	Theta 1	Theta 2	Theta 3	Minimum	Scale Score 1	Scale Score 2	Scale Score 3	Maximum
English Language Arts	Grade 3	Scaling	-0.53	0.34	1.40	200	277	300	329	399
English Language Arts	Grade 4	Scaling	-0.53	0.39	1.50	200	275	300	331	399
English Language Arts	Grade 5	Scaling	-0.78	0.33	1.17	200	271	300	323	399
English Language Arts	Grade 6	Scaling	-0.91	0.29	1.39	200	269	300	330	399
English Language Arts	Grade 7	Scaling	-0.50	0.47	1.26	200	273	300	323	399
English Language Arts	Grade 8	Scaling	-0.70	0.45	1.21	200	269	300	322	399
Mathematics	Grade 3	Scaling	-0.84	0.19	0.99	200	274	300	321	399
Mathematics	Grade 4	Scaling	-0.77	0.27	1.06	200	273	300	322	399
Mathematics	Grade 5	Scaling	-0.83	0.43	1.17	200	266	300	321	399
Mathematics	Grade 6	Scaling	-0.76	0.44	1.51	200	267	300	330	399
Mathematics	Grade 7	Scaling	-0.34	0.45	1.47	200	279	300	329	399
Mathematics	Grade 8	Scaling	-0.03	0.76	1.27	200	277	300	316	399
Science	Grade 5	Scaling	-0.91	0.18	1.32	200	272	300	330	399

Table 1.2.2

Scaling Slope and Intercept

Subject	Grade	Slope	Intercept
English Language Arts	Grade 3	27.0559812849131	290.7760748603470
	Grade 4	27.3940762385443	289.4236950458230
	Grade 5	26.9411947195258	291.2352211218970
	Grade 6	26.6498691733695	292.4005233065220
	Grade 7	28.0183392766174	286.9266428935300
	Grade 8	27.8928239371144	287.4287042515430
Mathematics	Grade 3	25.9610845964231	295.1556616143070
	Grade 4	26.5405587994016	292.8377648023930
	Grade 5	27.7068004802512	288.1727980789950
	Grade 6	27.8126606602557	287.7493573589770
	Grade 7	27.8662868594976	287.5348525620100
	Grade 8	30.5173147229089	276.9307411083640
Science	Grade 5	25.8870904479251	295.4516382083000

Section 1.3

Calibration Report

Calibration Report—Executive Summary

PARSCALE 4.1 was used for all analyses. All command files were set up in a way that all general settings were identical to last year. For example, the calibration statement reads:

CAL GRADED,LOGISTIC,CYCLE= (150,1,1,1,1),TPRIOR,SPRIOR,GPRIOR;

Thus, a 3PLM was used for all MC items, and a Graded Response Model was specified for the polytomous items. The logistic version of the IRT models was used, and default priors were used for all parameter estimates. Each item occupied its own unique block in the command file, and for most items initial guessing parameters were set to 0.22.

The resulting parameters demonstrated excellent model fit. In particular, the largest change in parameter values (from one iteration to the next) was monotonically decreasing and tended to flatten out towards the end of the calibration process. The number of Newton cycles to conversion for each grade/content for the initial calibrations are listed in the following table:

Table 1.3.1

Number of Cycles to Convergence

Subject	Grade	Initial Cycles
English Language Arts	Grade 3	54
English Language Arts	Grade 4	111
English Language Arts	Grade 5	24
English Language Arts	Grade 6	45
English Language Arts	Grade 7	43
English Language Arts	Grade 8	52
Mathematics	Grade 3	41
Mathematics	Grade 4	42
Mathematics	Grade 5	45
Mathematics	Grade 6	46
Mathematics	Grade 7	59
Mathematics	Grade 8	63
Science	Grade 5	41

For some items, the guessing parameter was poorly estimated. This is not at all unusual as difficulty in estimating the c-parameter has been well documented in the psychometric literature. This often happens when item discrimination is low (e.g., less than 0.50). After carefully studying these items, we found that fixing the lower asymptote (for example to a value of 0.00) resulted in stable and reasonable estimates for both the a and b parameters (relative to CTT statistics). This technique also produced item parameters that resulted in excellent model fit (comparing theoretical ICCs to observed ICCs).

Three methods of evaluating the suitability of the equating items were used: the delta analysis, the b/b analysis and the rescore analysis. As a result of all three analyses very few items were removed from the equating analysis. Results such as this are quite common particularly, given the number of grade/content combinations, and the number and types of items in the program. Results from these analyses are included in Section II of this report.

Items flagged by the delta, b/b, or rescore analyses, or any item that required intervention during the calibration process, were compiled and placed in our item watch list, which includes the final actions taken on these items. The final watch list is presented in the following table:

Table 1.3.2 Final Items Watch List

Subject	Grade	ItemID	Reason	Action
English Language Arts	3	482316	a-parameter	a set to initial
English Language Arts	3	482316	c-parameter	set c = 0
English Language Arts	3	482316	poor item fit	removed from equating
English Language Arts	3	484571	b/b analysis	removed from equating
English Language Arts	3	628709	delta analysis	retained for equating
English Language Arts	4	148686A	b/b analysis	removed from equating
English Language Arts	4	148719A	b/b analysis	removed from equating
English Language Arts	4	186016A	a-parameter	a set to initial
English Language Arts	4	186016A	c-parameter	set c = 0
English Language Arts	4	484648	delta analysis	retained for equating
English Language Arts	4	635530	a-parameter	a set to initial
English Language Arts	4	635530	c-parameter	set c = 0
English Language Arts	5	149321A	a-parameter	a set to initial
English Language Arts	5	149321A	c-parameter	set c = 0
English Language Arts	5	149339A	a-parameter	a set to initial
English Language Arts	5	149339A	c-parameter	set c = 0
English Language Arts	5	630607	a-parameter	a set to initial
English Language Arts	5	630607	c-parameter	set c = 0
English Language Arts	5	630607	b/b analysis	removed from equating
English Language Arts	5	630607	delta analysis	removed from equating
English Language Arts	6	158740A	a-parameter	a set to initial
English Language Arts	6	158740A	c-parameter	set c = 0
English Language Arts	6	181904A	delta analysis	removed from equating
English Language Arts	6	629863	b/b analysis	removed from equating
English Language Arts	7	160511A	a-parameter	a set to initial
English Language Arts	7	160511A	c-parameter	set c = 0
English Language Arts	7	161015A	delta analysis	removed from equating
English Language Arts	7	486597	b/b analysis	removed from equating
English Language Arts	8	148187A	c-parameter	set c = 0
English Language Arts	8	160788A	a-parameter	a set to initial
English Language Arts	8	160788A	c-parameter	set c = 0
English Language Arts	8	160790A	a-parameter	a set to initial
English Language Arts	8	160790A	c-parameter	set c = 0
English Language Arts	8	160875A	delta analysis	removed from equating
English Language Arts	8	160992A	a-parameter	a set to initial
English Language Arts	8	160992A	c-parameter	set c = 0
English Language Arts	8	160993A	a-parameter	a set to initial

Subject	Grade	ItemID	Reason	Action
English Language Arts	8	160993A	c-parameter	set c = 0
English Language Arts	8	486738	c-parameter	set c = 0
English Language Arts	8	486738	b/b analysis	removed from equating
English Language Arts	8	626814	b/b analysis	removed from equating
English Language Arts	8	760851	a-parameter	a set to initial
English Language Arts	8	760851	c-parameter	set c = 0
Mathematics	3	152031A	delta analysis	retained for equating
Mathematics	3	152620A	delta analysis	removed from equating
Mathematics	3	771992	b/b analysis	removed from equating
Mathematics	4	146951A	b/b analysis	removed from equating
Mathematics	4	151553A	delta analysis	removed from equating
Mathematics	4	152197A	a-parameter	a set to initial
Mathematics	4	152197A	c-parameter	set c = 0
Mathematics	4	154501A	delta analysis	retained for equating
Mathematics	5	151248A	b/b analysis	removed from equating
Mathematics	5	674588	c-parameter	set c = 0
Mathematics	5	674588	poor item fit	removed from equating
Mathematics	5	733188	b/b analysis	removed from equating
Mathematics	5	733188	delta analysis	removed from equating
Mathematics	6	148159A	a-parameter	a set to initial
Mathematics	6	148159A	c-parameter	set c = 0
Mathematics	6	149259A	b/b analysis	removed from equating
Mathematics	6	155138A	delta analysis	removed from equating
Mathematics	6	479081	delta analysis	retained for equating
Mathematics	7	149247A	delta analysis	removed from equating
Mathematics	7	152056A	delta analysis	removed from equating
Mathematics	8	148531A	delta analysis	removed from equating
Mathematics	8	153448A	delta analysis	retained for equating
Mathematics	8	484750	c-parameter	set c = 0
Mathematics	8	484750	poor item fit	removed from equating
Mathematics	8	484783	b/b analysis	removed from equating
Science	5	465317	b/b analysis	removed from equating
Science	5	465317	delta analysis	removed from equating
Science	5	638751	a-parameter	a set to initial
Science	5	638751	c-parameter	set c = 0
Science	5	638751	poor item fit	removed from equating
Science	5	701751	delta analysis	removed from equating

Stocking and Lord procedure was used to transform parameter estimates onto the operational scale. This procedure results in constants which were applied to the resulting IRT parameters for each grade/content. These transformation constants were found using the STUIRT program which can be found at the CASMA website: http://www.education.uiowa.edu/casma/. The Stocking & Lord transformation constants that were used in the equating process are listed in the following table:

Table 1.3.3

Stocking and Lord Constants

Subject	Grade	Slope	Intercept	Num Eq Items	Num Eq Items Rem
English Language Arts	3	1.14	-0.32	50	1
English Language Arts	4	1.11	-0.40	50	2
English Language Arts	5	0.94	-0.13	51	1
English Language Arts	6	1.10	-0.45	50	2
English Language Arts	7	1.11	-0.43	50	2
English Language Arts	8	1.01	-0.26	51	3
Mathematics	3	1.04	-0.18	50	2
Mathematics	4	1.04	0.04	50	2
Mathematics	5	1.06	-0.07	50	2
Mathematics	6	1.06	-0.16	50	2
Mathematics	7	0.98	-0.12	50	2
Mathematics	8	0.98	-0.14	50	2
Science	5	1.02	-0.09	45	2

Section 1.4

Equating Item Summary Statistics

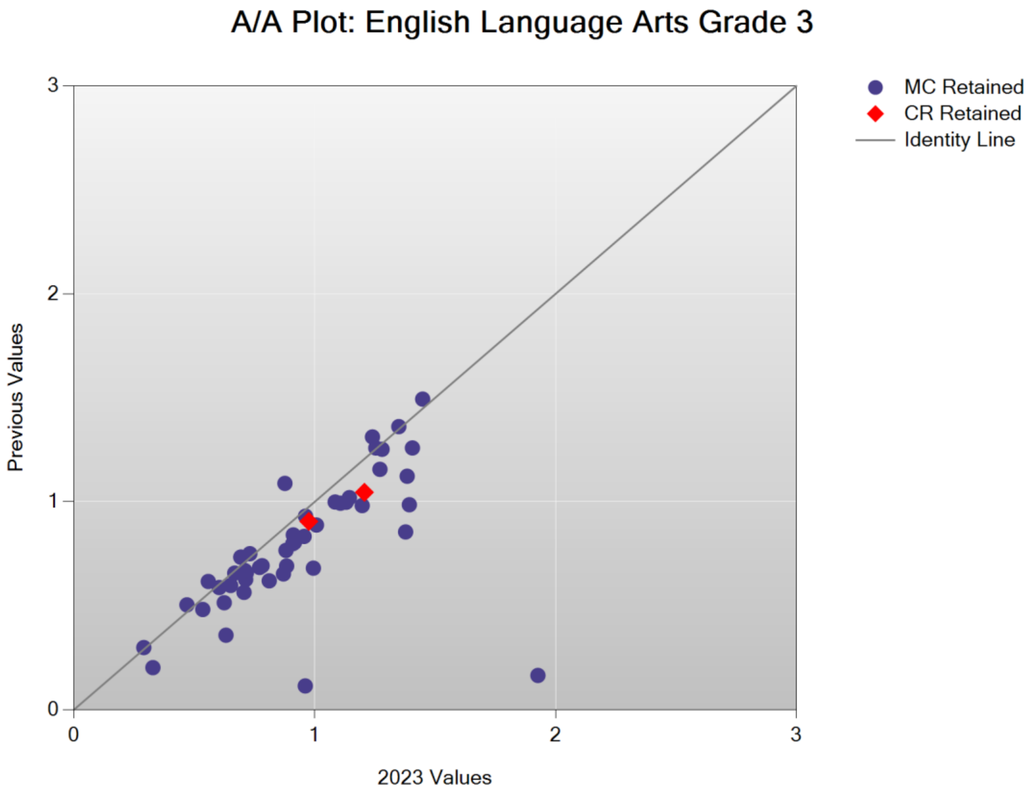
Table 1.4.1

Equating Item Summary Statistics

			P-Value		Point Biserial		a		b	
Subject	Grade	Year	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
English Language Arts	03	2023	0.55	0.14	0.43	0.12	0.94	0.32	0.19	0.90
		Previous	0.55	0.15	0.41	0.12	0.80	0.31	0.11	1.66
English Language Arts	04	2023	0.60	0.14	0.43	0.11	0.96	0.35	-0.09	0.83
		Previous	0.61	0.14	0.42	0.11	0.86	0.31	-0.53	0.97
English Language Arts	05	2023	0.68	0.14	0.44	0.07	0.89	0.27	-0.49	0.81
		Previous	0.70	0.13	0.43	0.06	0.96	0.29	-0.71	0.68
English Language Arts	06	2023	0.57	0.15	0.42	0.09	0.92	0.33	0.08	0.80
		Previous	0.59	0.16	0.41	0.09	0.83	0.30	-0.35	0.90
English Language Arts	07	2023	0.56	0.13	0.42	0.09	0.87	0.22	0.28	0.80
		Previous	0.58	0.14	0.41	0.09	0.78	0.21	-0.15	0.91
English Language Arts	08	2023	0.60	0.17	0.38	0.11	0.82	0.35	-0.21	1.20
		Previous	0.62	0.20	0.38	0.10	0.81	0.36	-0.48	1.18
Mathematics	03	2023	0.66	0.16	0.45	0.10	0.99	0.28	-0.37	0.90
		Previous	0.64	0.17	0.46	0.11	0.99	0.30	-0.57	0.97
Mathematics	04	2023	0.63	0.16	0.45	0.08	1.01	0.29	-0.25	0.82
		Previous	0.60	0.17	0.45	0.10	0.97	0.29	-0.21	0.85
Mathematics	05	2023	0.62	0.17	0.44	0.08	0.99	0.30	-0.22	0.92
		Previous	0.57	0.17	0.43	0.08	0.96	0.31	-0.21	0.95
Mathematics	06	2023	0.55	0.18	0.41	0.09	1.00	0.28	0.21	0.97
		Previous	0.52	0.18	0.40	0.10	0.96	0.29	0.07	1.01
Mathematics	07	2023	0.44	0.15	0.41	0.09	1.08	0.29	0.78	0.70
		Previous	0.42	0.16	0.39	0.10	1.14	0.32	0.65	0.71
Mathematics	08	2023	0.45	0.15	0.40	0.10	1.13	0.44	0.65	0.87
		Previous	0.44	0.16	0.39	0.11	1.11	0.42	0.49	0.96
Science	05	2023	0.57	0.16	0.39	0.08	0.94	0.35	0.23	0.87
		Previous	0.54	0.16	0.39	0.09	0.92	0.31	0.13	0.89

Section 2.1

A/A, B/B, Delta, and Cumulative Scale Score Distribution Plots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Previous Values
2023 Values
MC Retained
CR Retained
Identity Line
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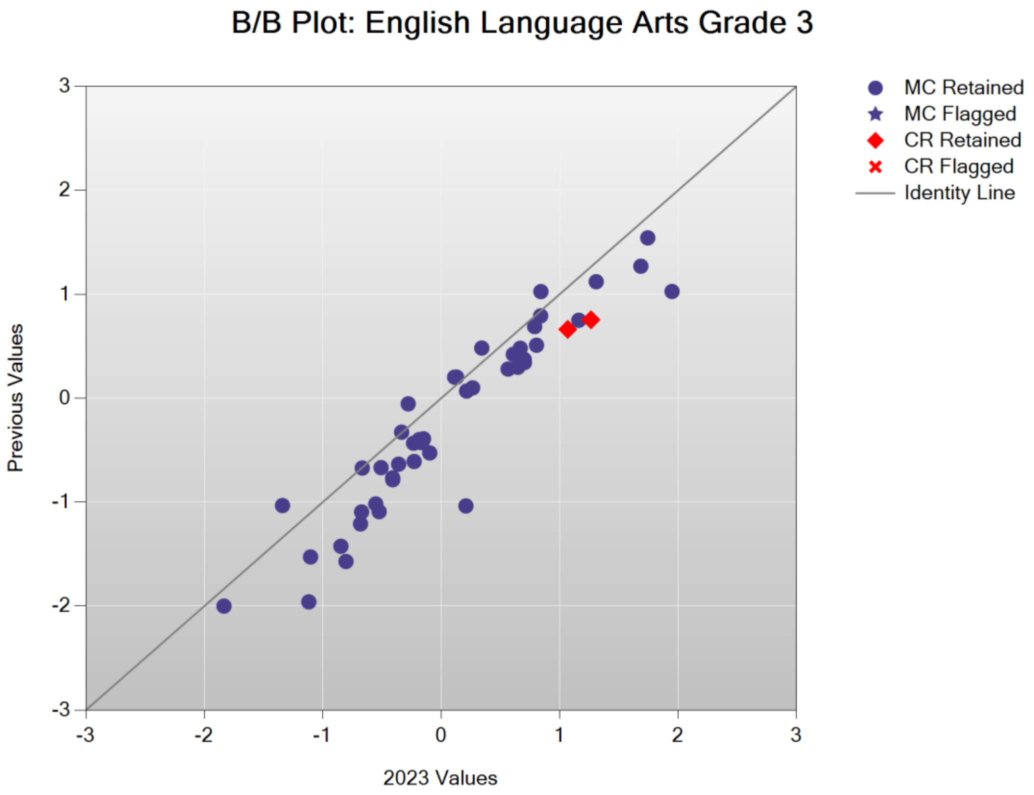
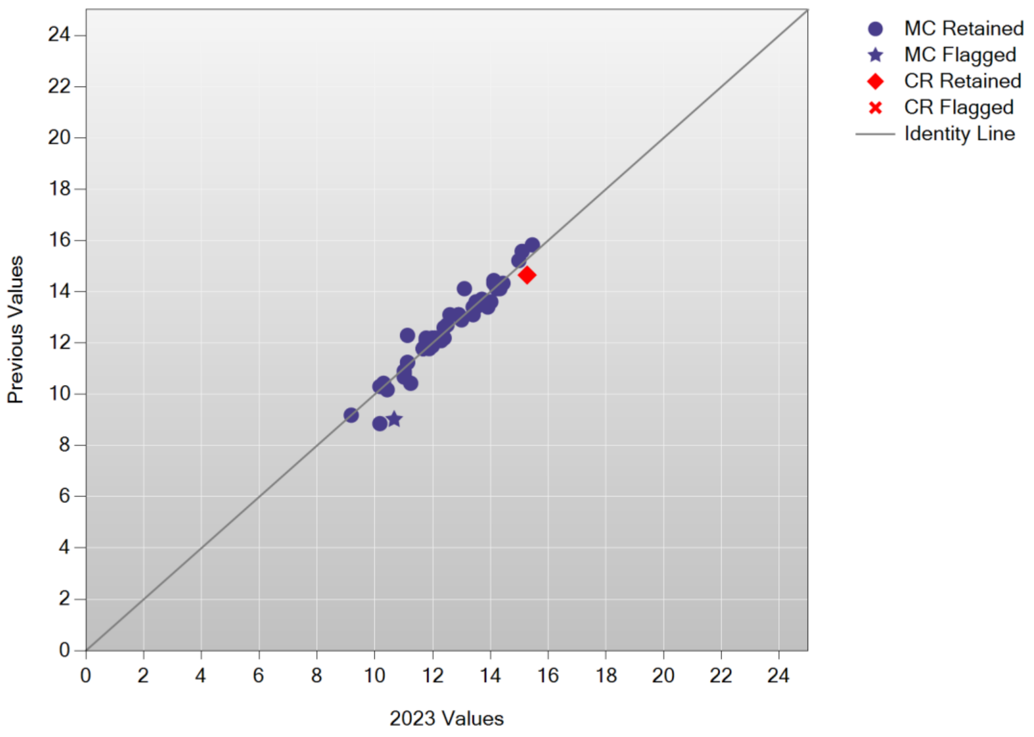
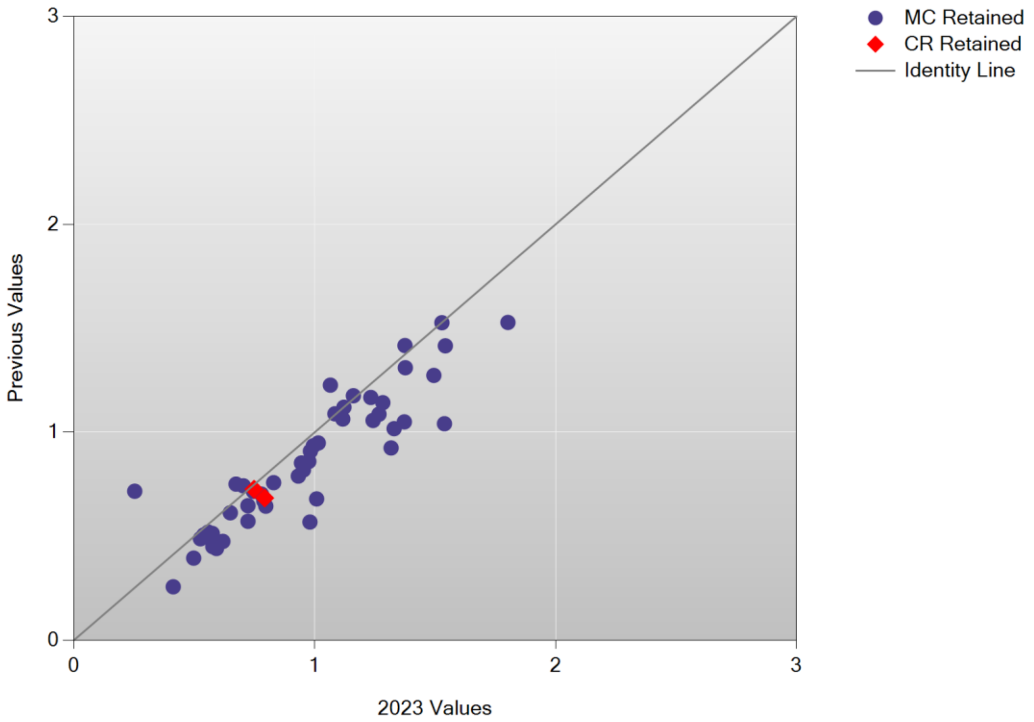
1
2
3

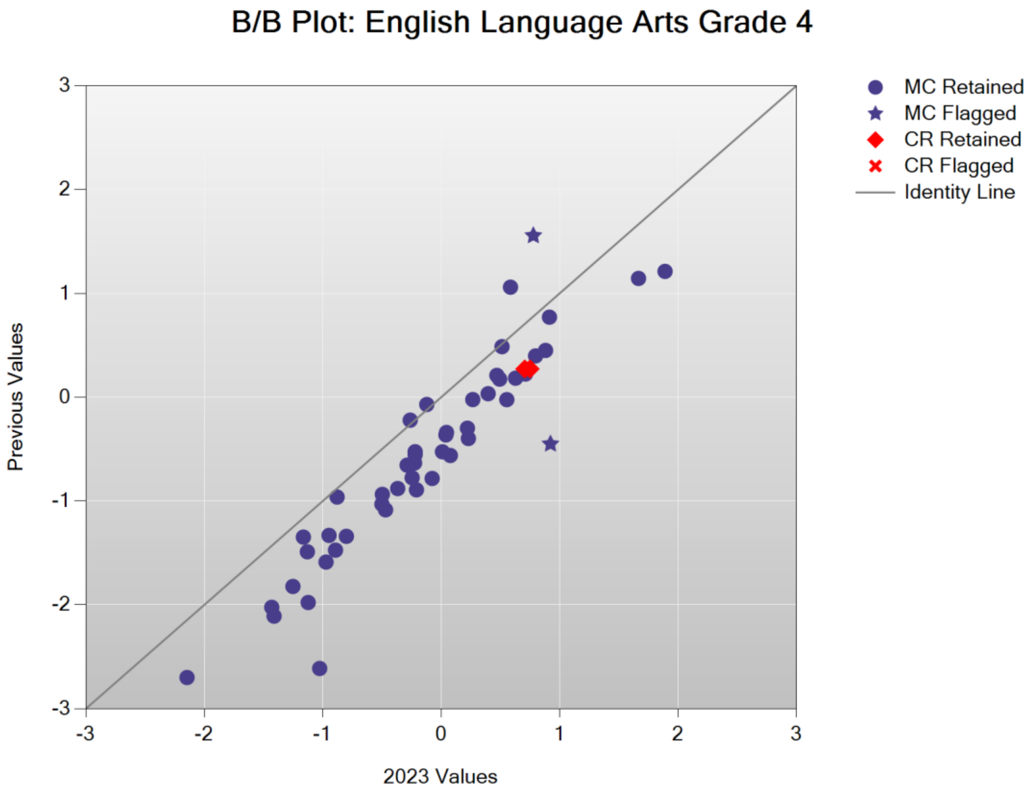

B/B Plot: English Language Arts Grade 3
Previous Values
2023 Values
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line
-3
-2
-1
0
1
2
3

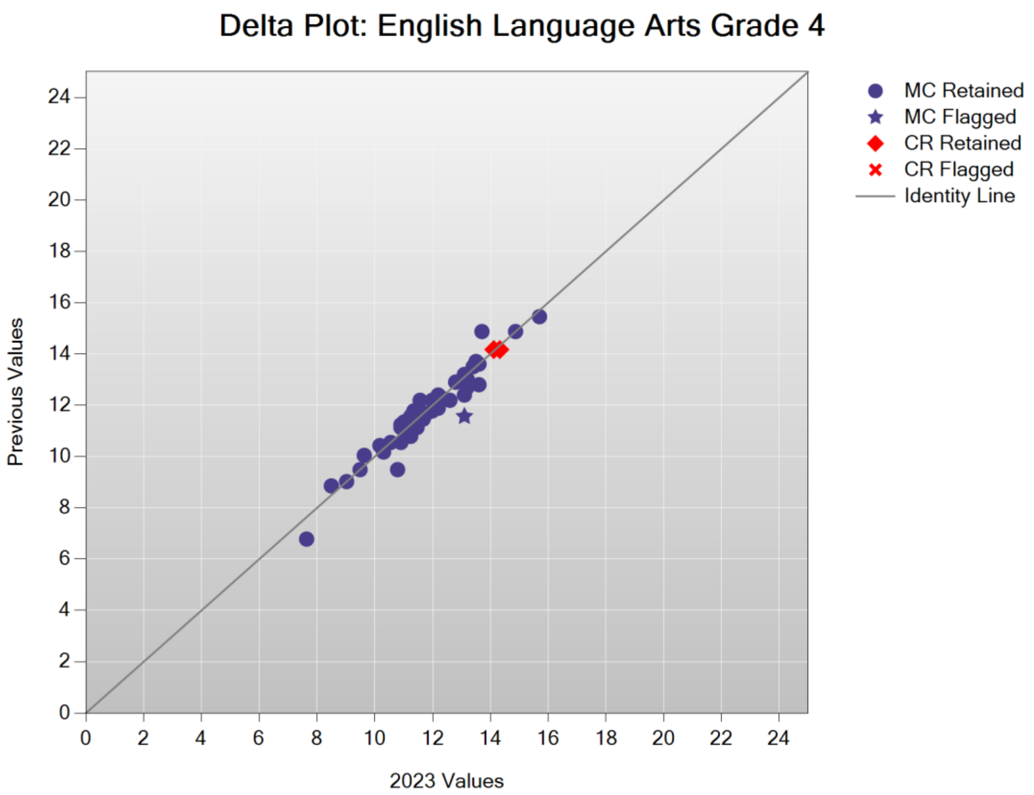
Delta Plot: English Language Arts Grade 3

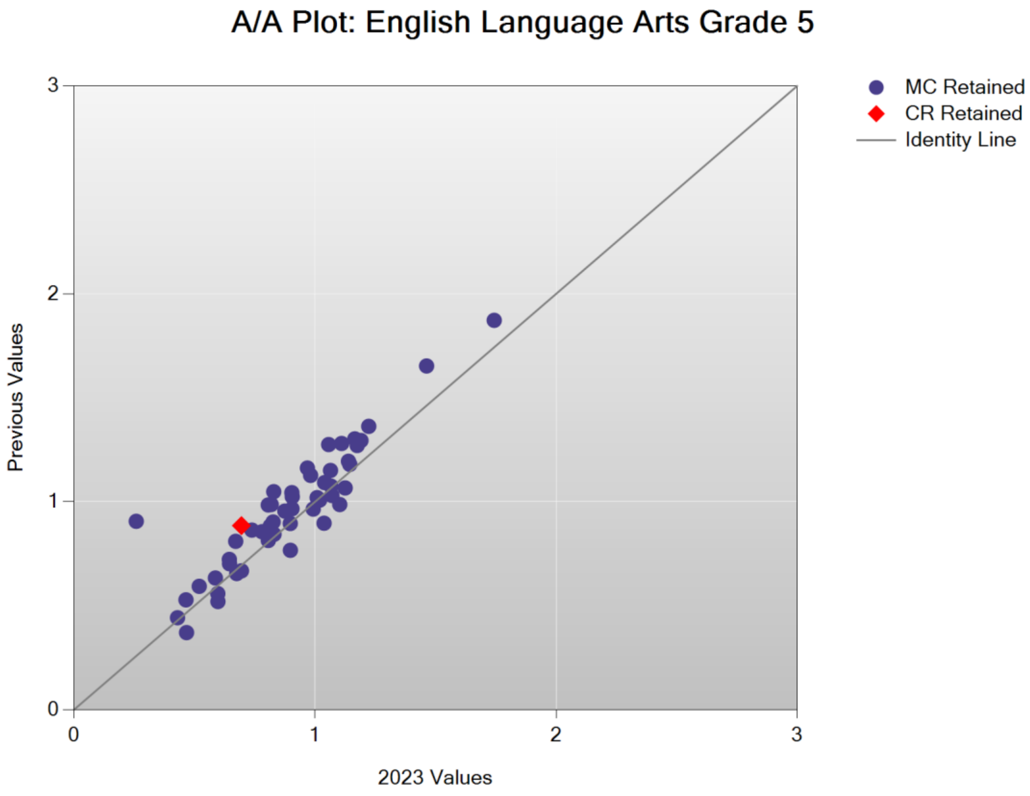


A/A Plot: English Language Arts Grade 4




B/B Plot: English Language Arts Grade 4
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line
Previous Values
2023 Values


Delta Plot: English Language Arts Grade 4
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line
Previous Values
2023 Values


A/A Plot: English Language Arts Grade 5
MC Retained
CR Retained
Identity Line
Previous Values
2023 Values
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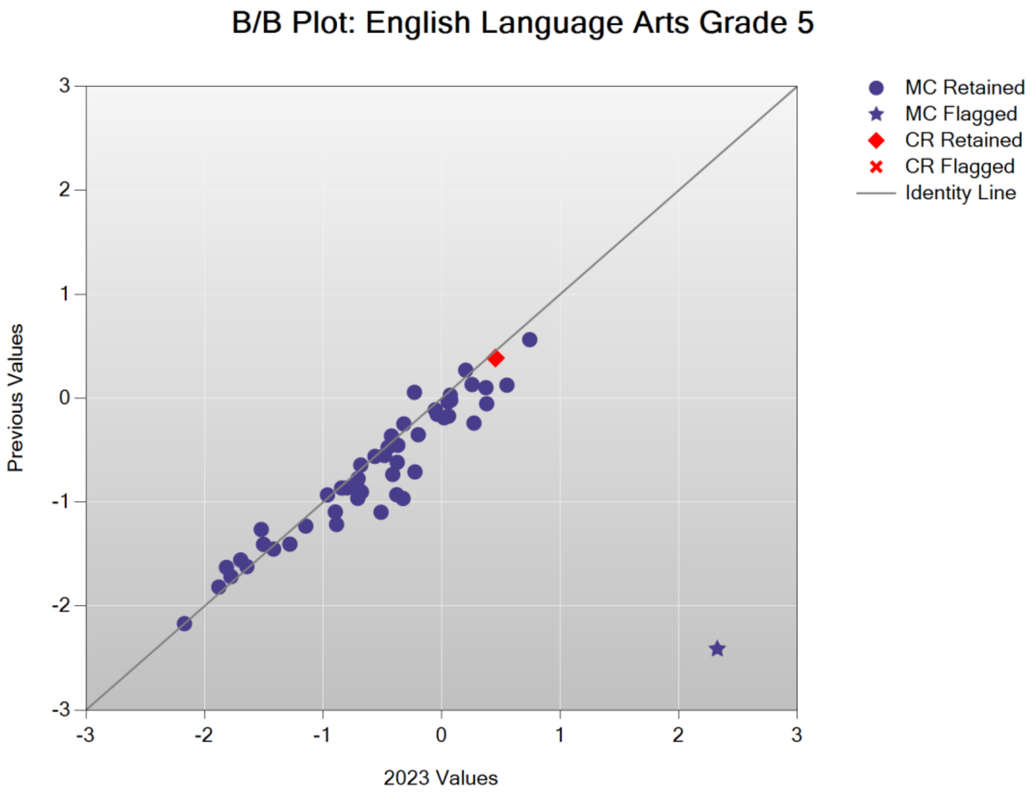
2
3


B/B Plot: English Language Arts Grade 5
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line
Previous Values
2023 Values
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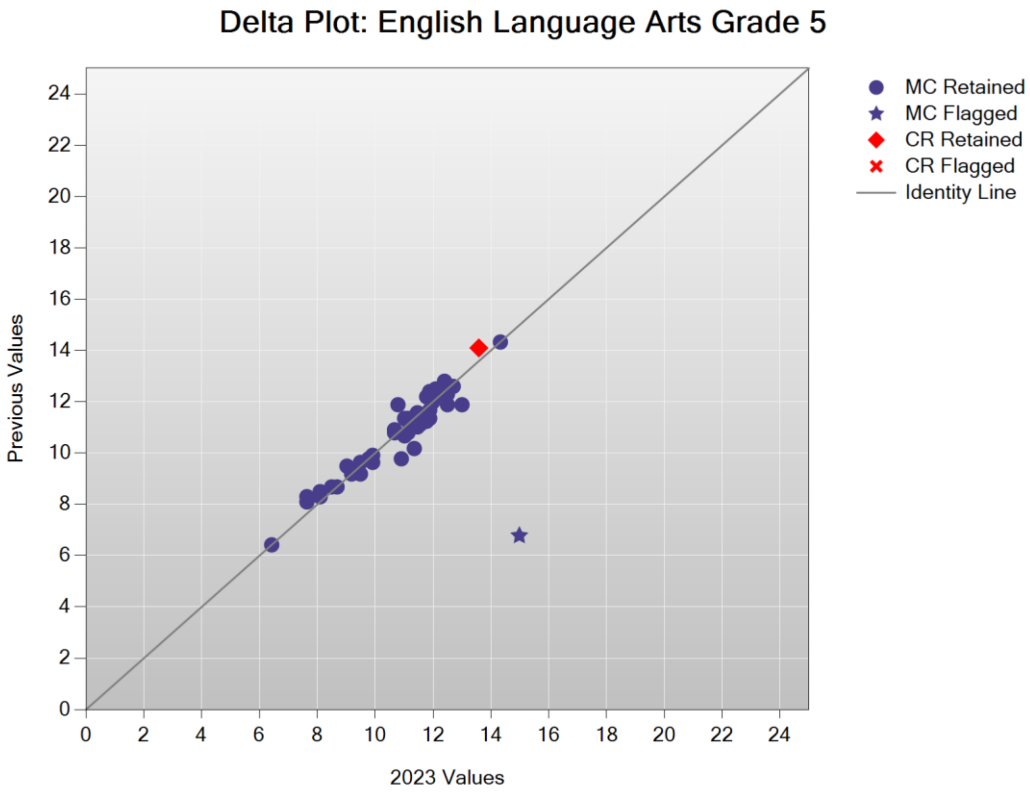
-1
0
1
2
3


Delta Plot: English Language Arts Grade 5
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line
Previous Values
2023 Values
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4
6
8
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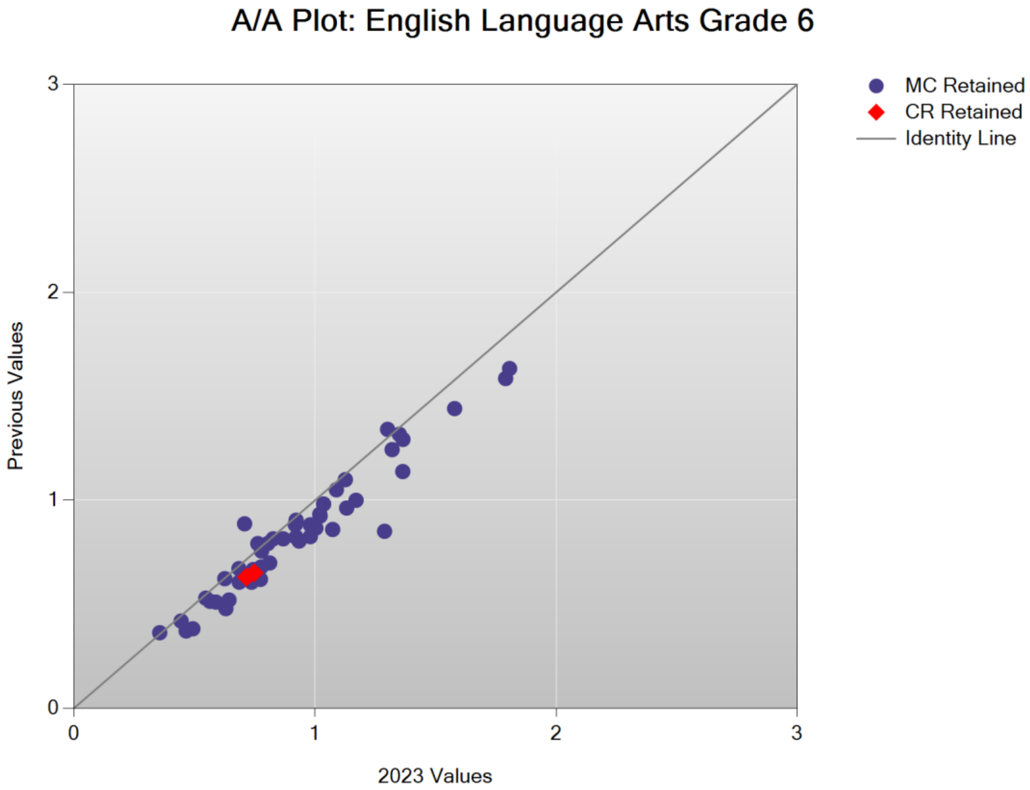
16
18
20
22
24


A/A Plot: English Language Arts Grade 6
MC Retained
CR Retained
Identity Line
Previous Values
2023 Values
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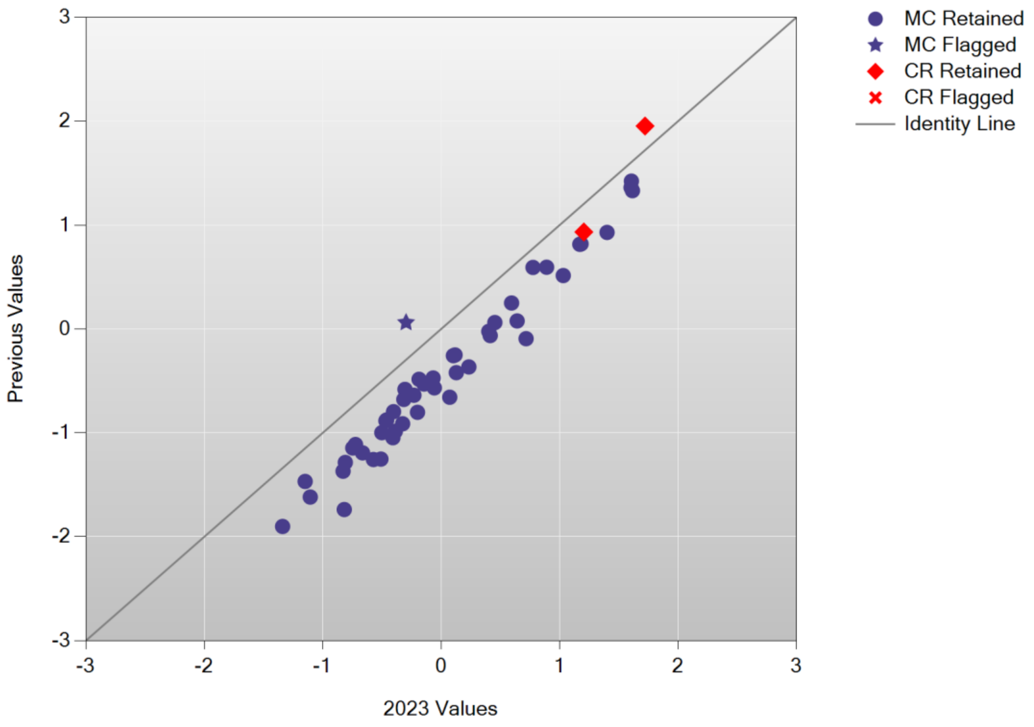
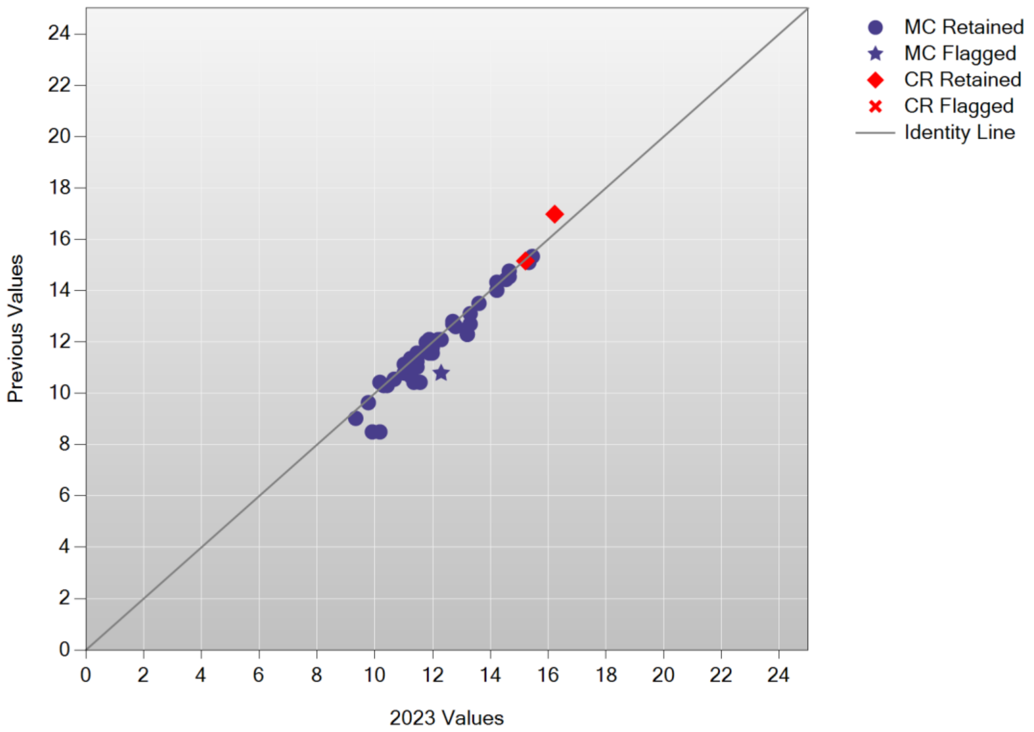
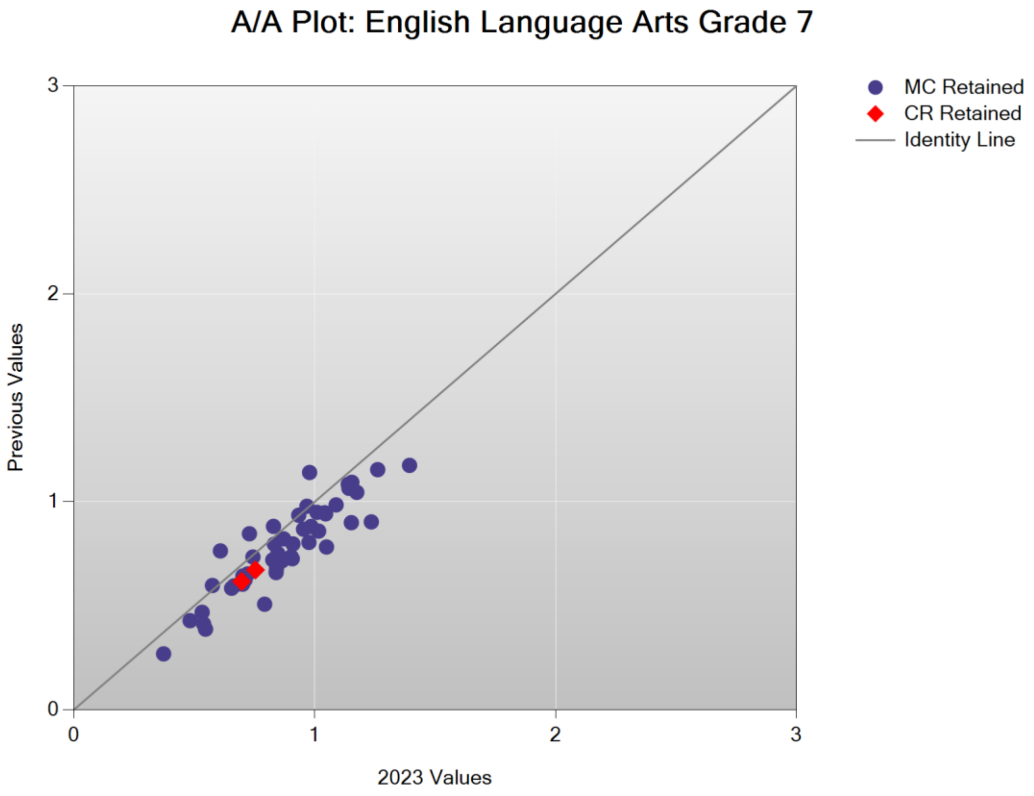
2
3

B/B Plot: English Language Arts Grade 6



Delta Plot: English Language Arts Grade 6

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MC Retained
CR Retained
Identity Line
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2023 Values
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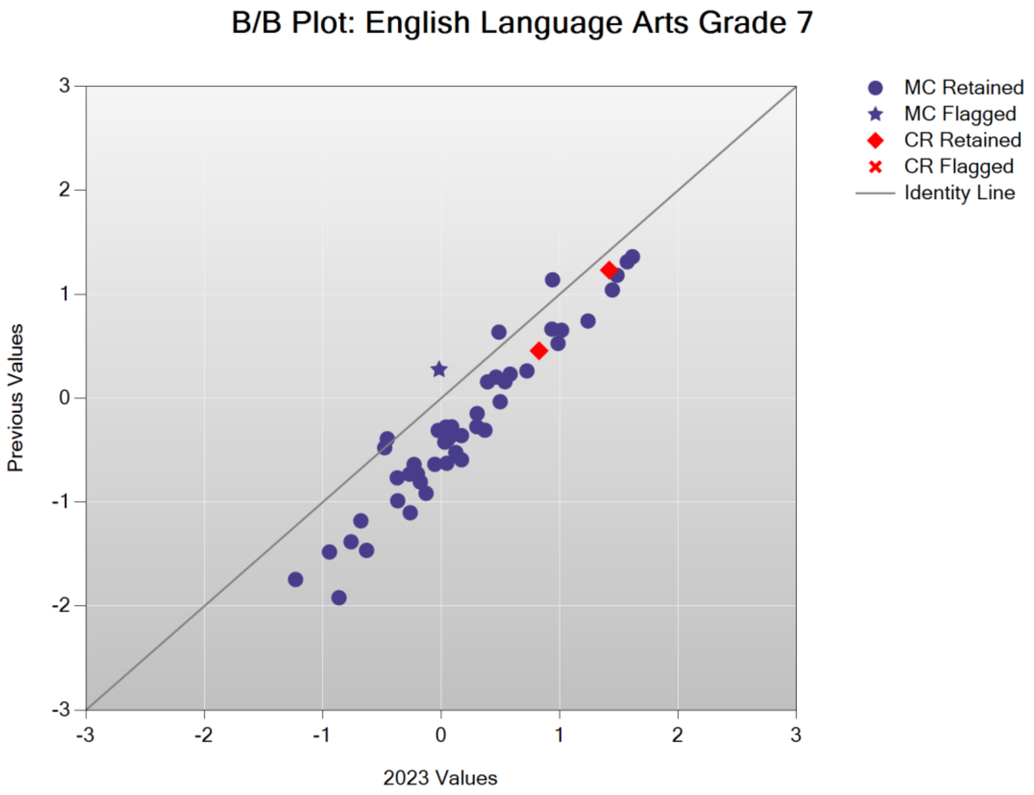
2
3


B/B Plot: English Language Arts Grade 7
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line
Previous Values
2023 Values
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-2
-1
0
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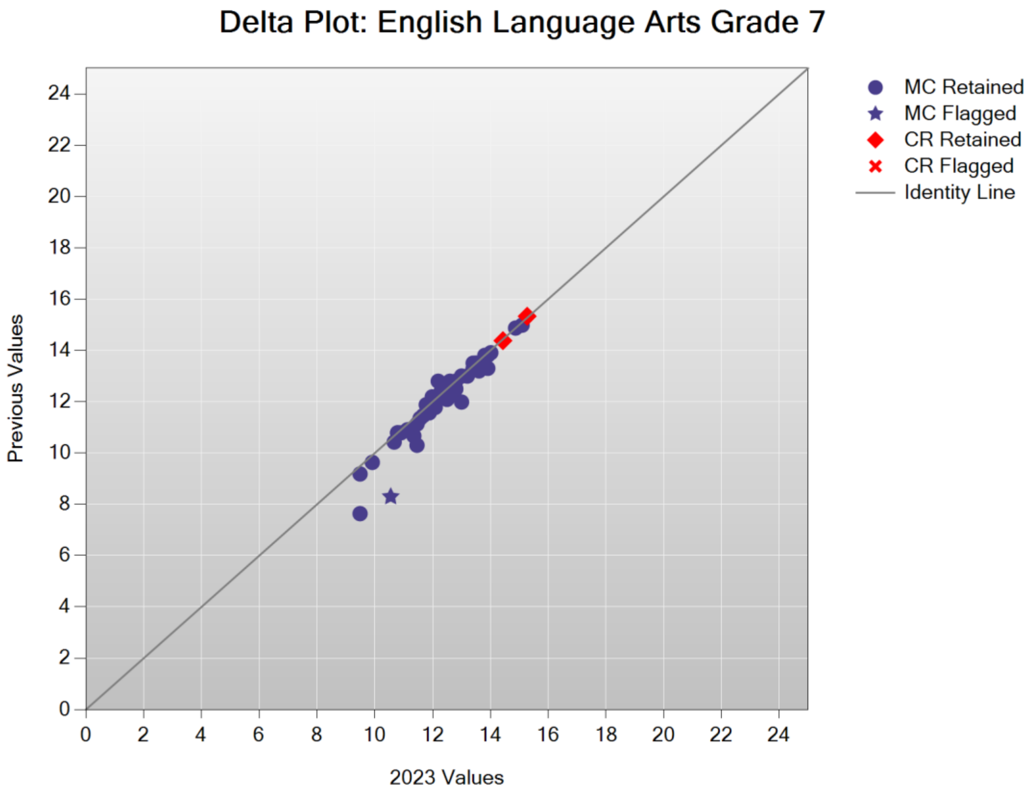
2
3


Delta Plot: English Language Arts Grade 7
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line
Previous Values
2023 Values
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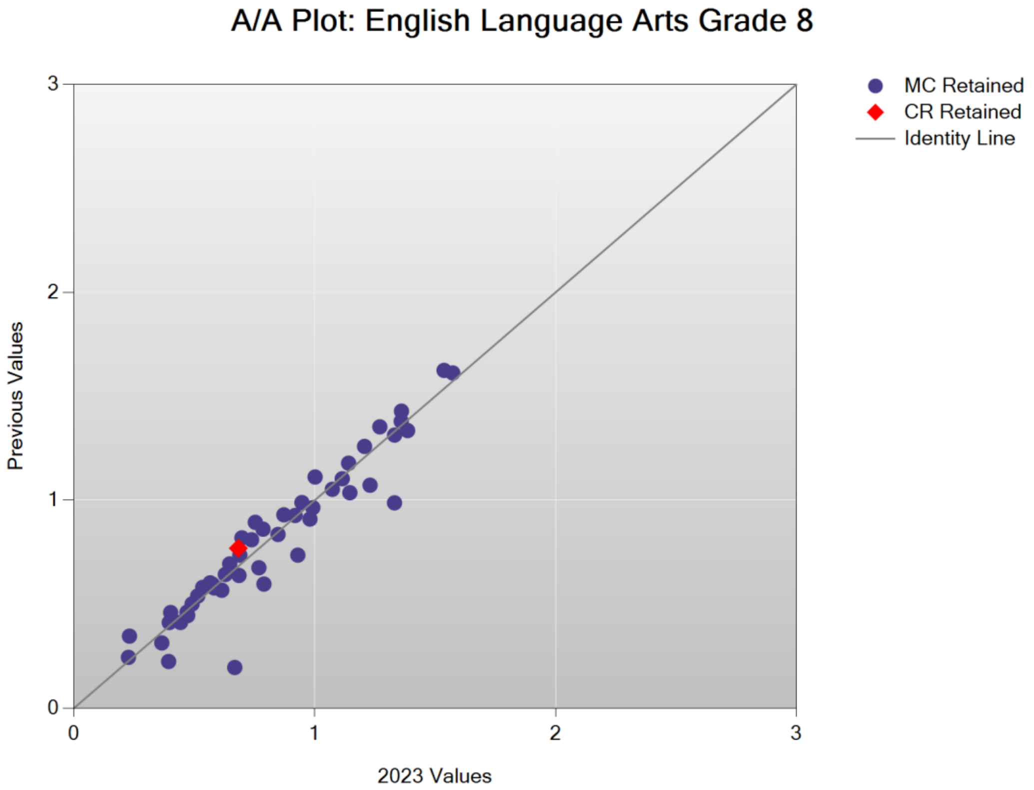
4
6
8
10
12
14
16
18
20
22
24


A/A Plot: English Language Arts Grade 8
MC Retained
CR Retained
Identity Line
Previous Values
2023 Values
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2
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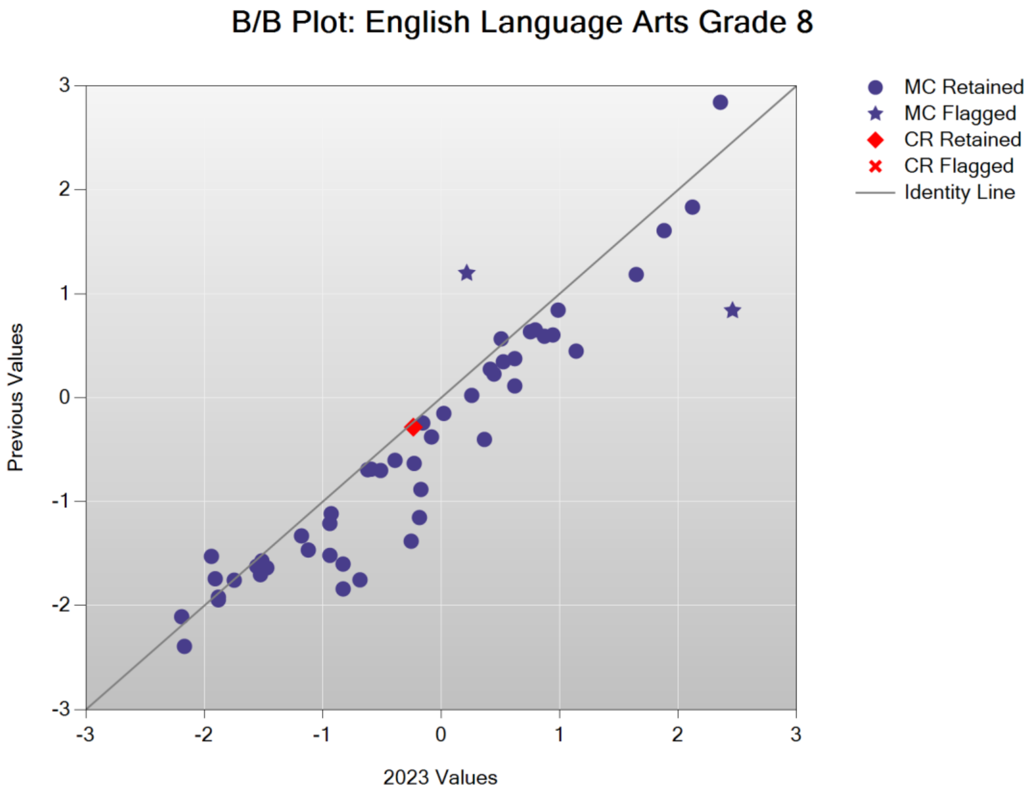
B/B Plot: English Language Arts Grade 8
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MC Flagged
CR Retained
CR Flagged
Identity Line
Previous Values
2023 Values
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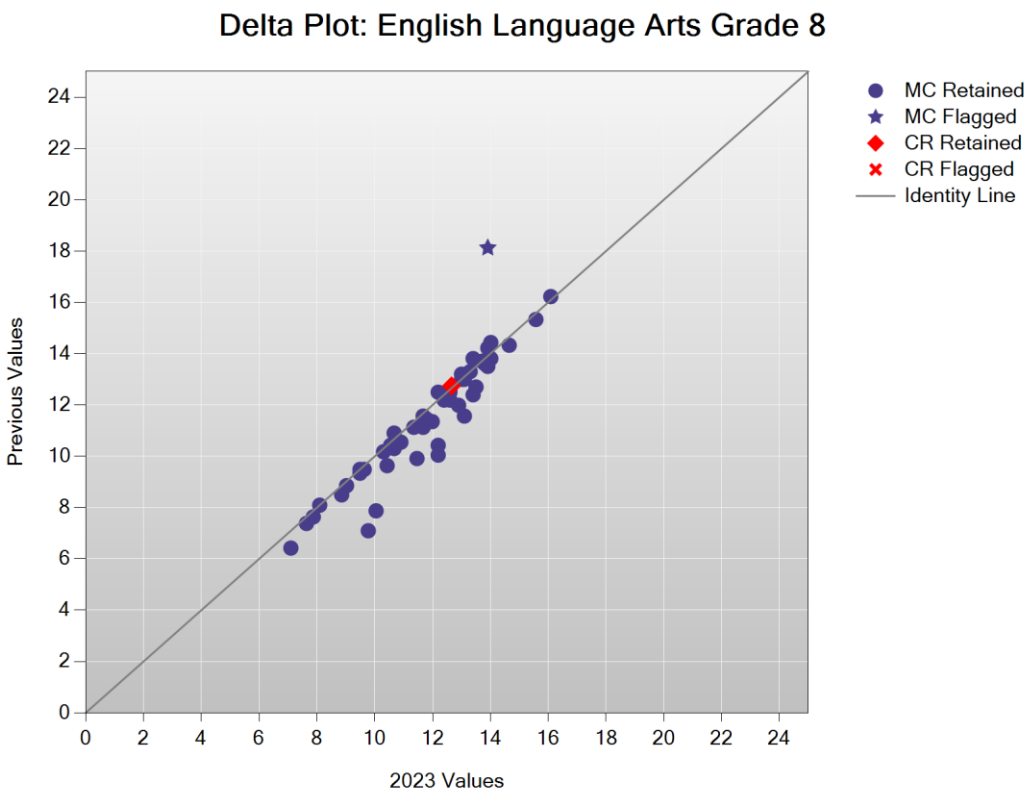
-2
-3


Delta Plot: English Language Arts Grade 8
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line
Previous Values
2023 Values
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6
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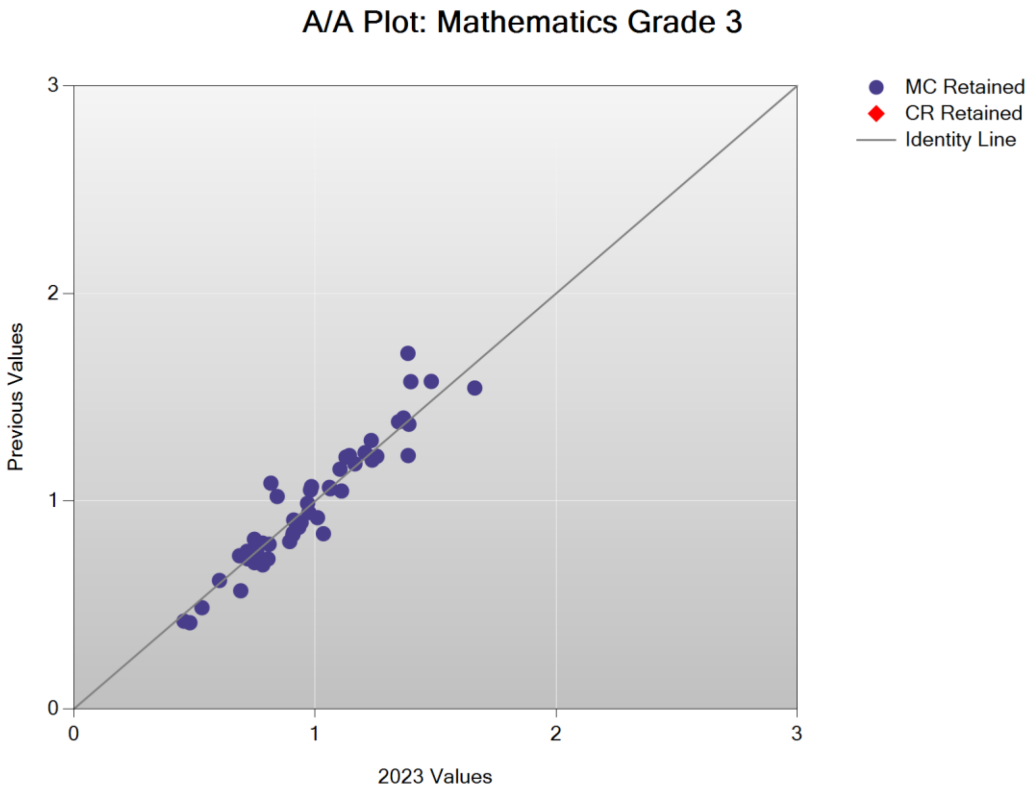
10
12
14
16
18
20
22
24


A/A Plot: Mathematics Grade 3
MC Retained
CR Retained
Identity Line
Previous Values
2023 Values
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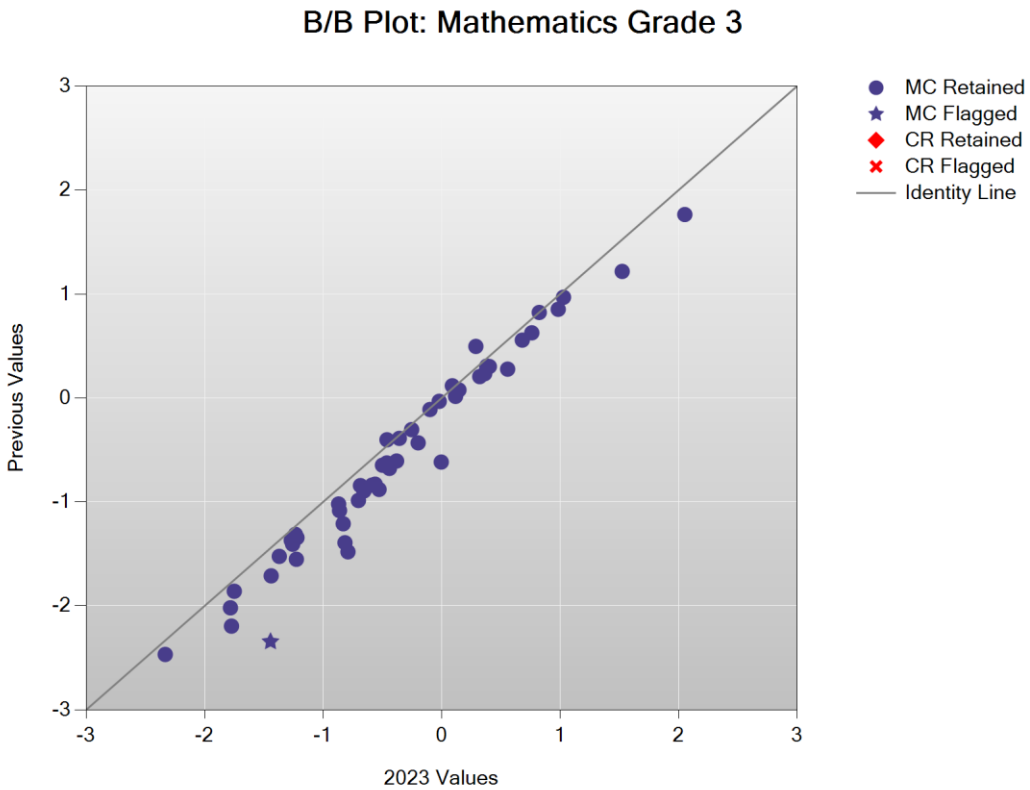
1
2
3


B/B Plot: Mathematics Grade 3
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line
Previous Values
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-1
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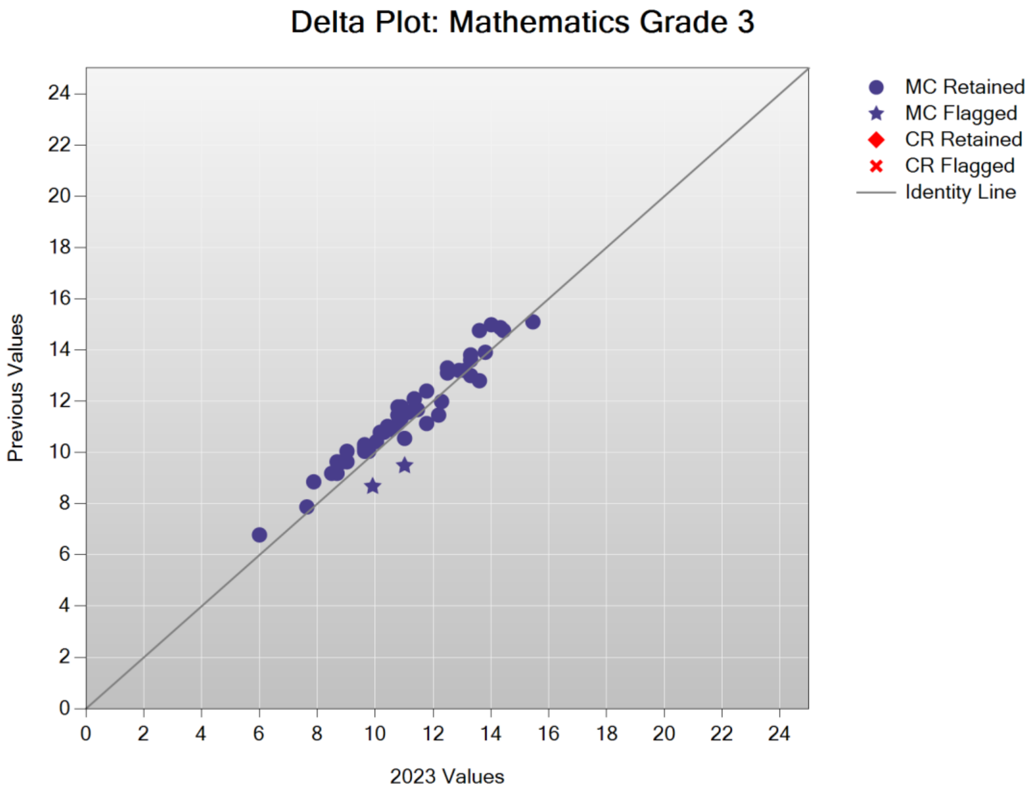
1
2
3


Delta Plot: Mathematics Grade 3
Previous Values
2023 Values
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8
10
12
14
16
18
20
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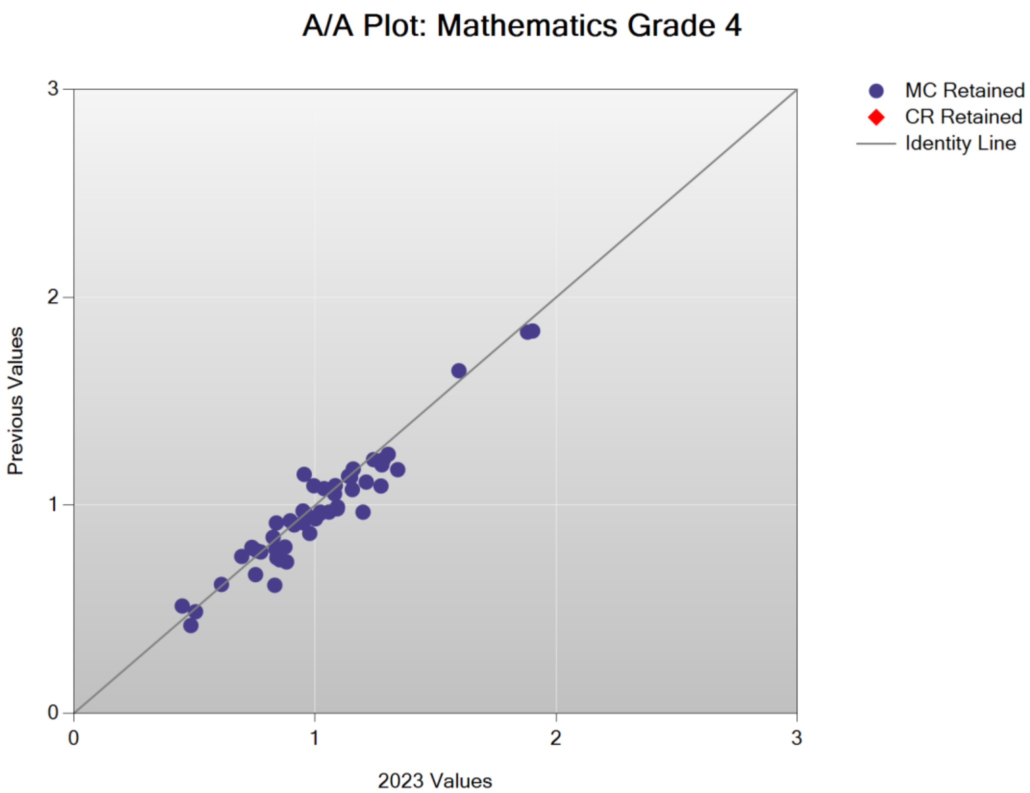
24
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line


A/A Plot: Mathematics Grade 4
Previous Values
2023 Values
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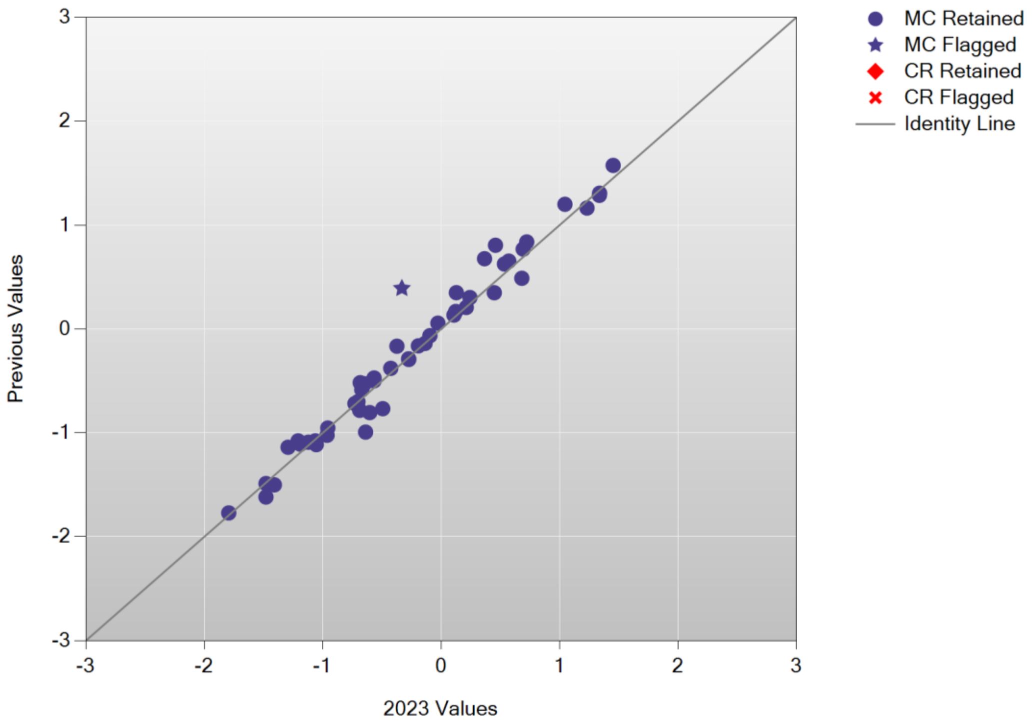
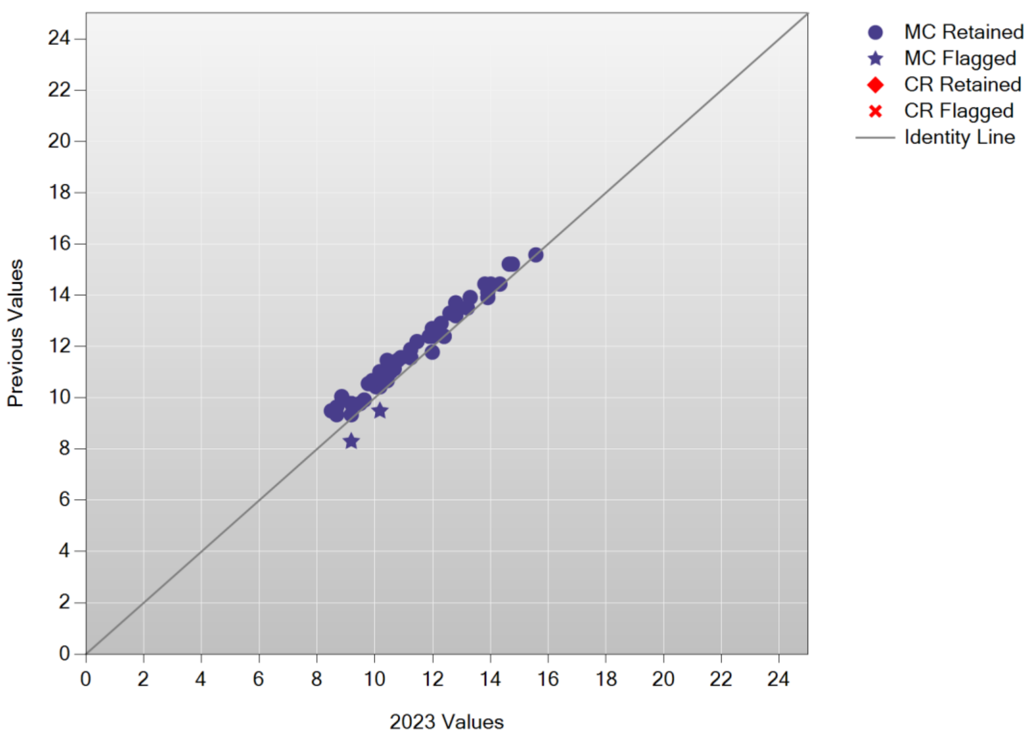
1
2
3
MC Retained
CR Retained
Identity Line

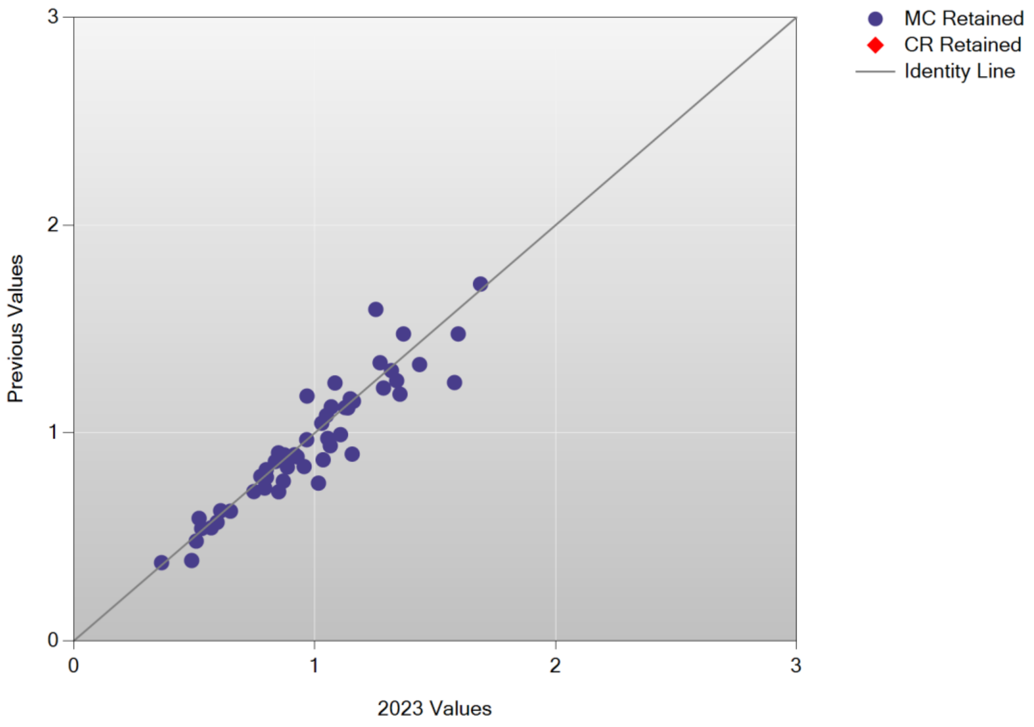
B/B Plot: Mathematics Grade 4



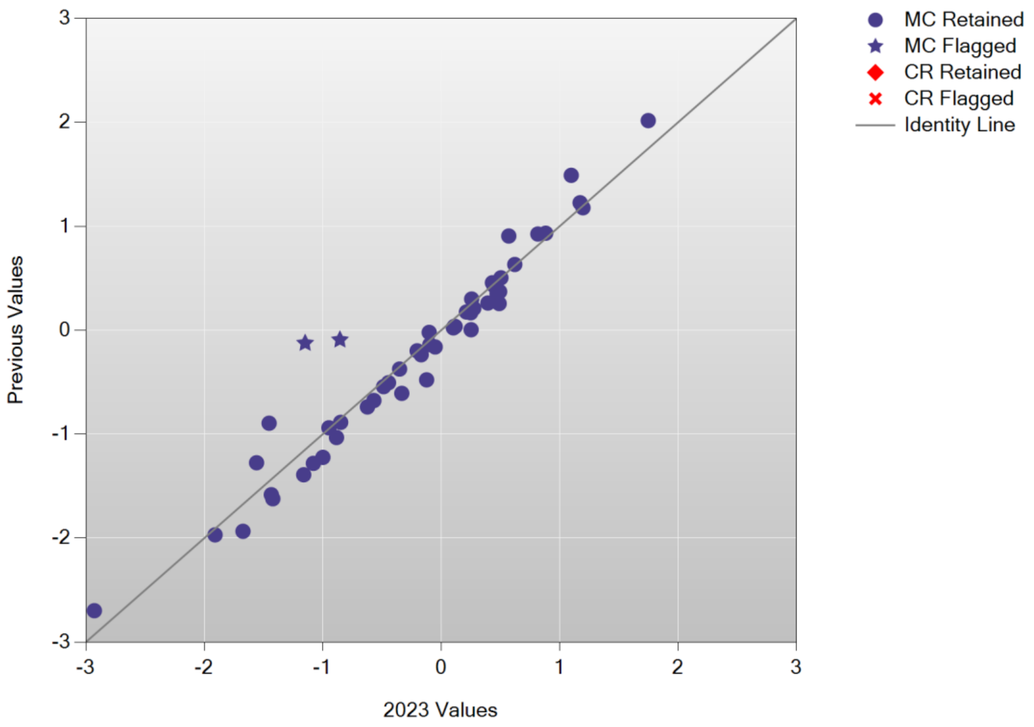
Delta Plot: Mathematics Grade 4

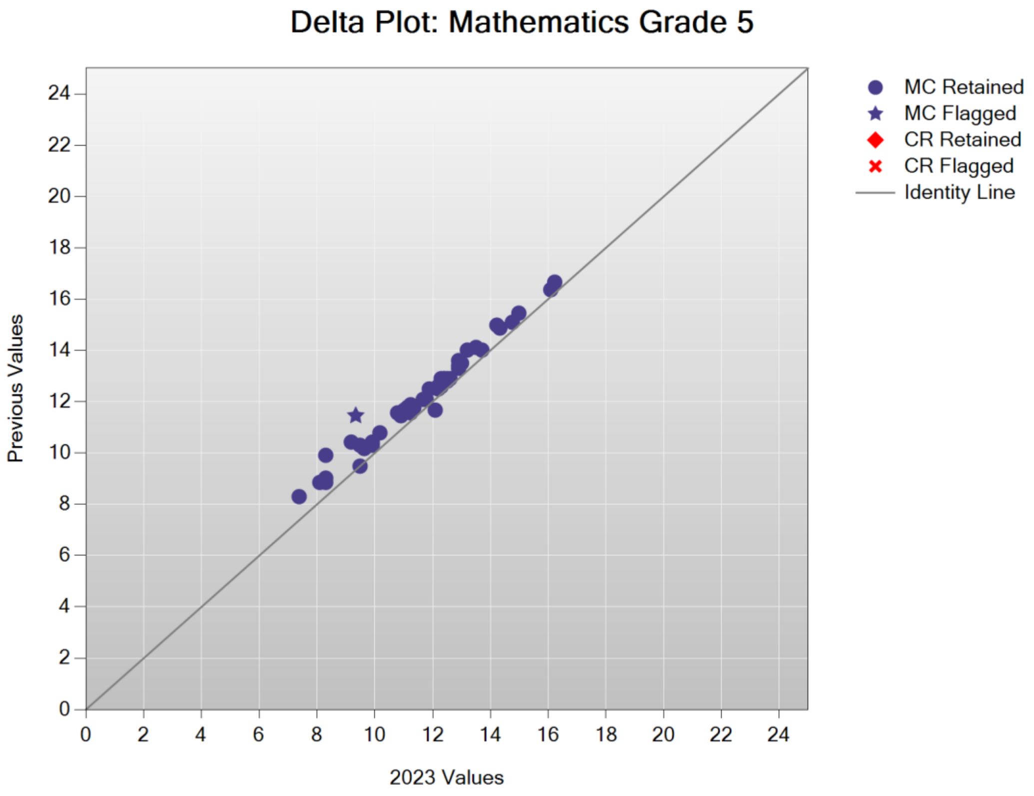


A/A Plot: Mathematics Grade 5



B/B Plot: Mathematics Grade 5




Delta Plot: Mathematics Grade 5
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line
Previous Values
2023 Values
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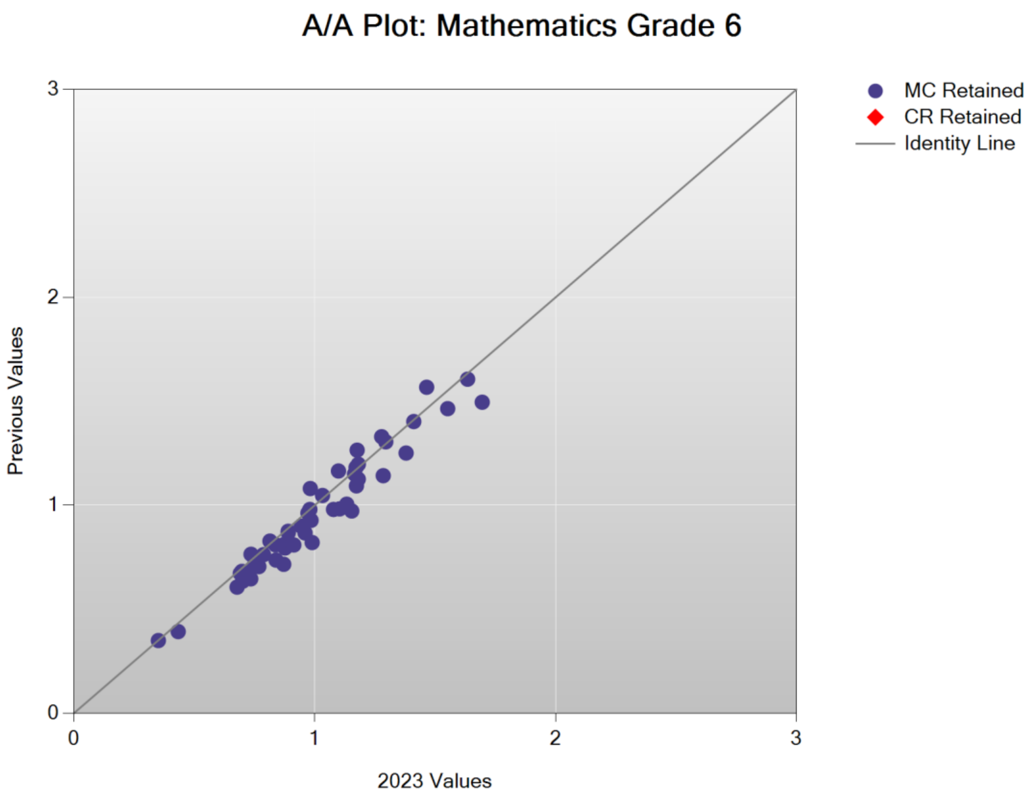
2
4
6
8
10
12
14
16
18
20
22
24


A/A Plot: Mathematics Grade 6
MC Retained
CR Retained
Identity Line
Previous Values
2023 Values
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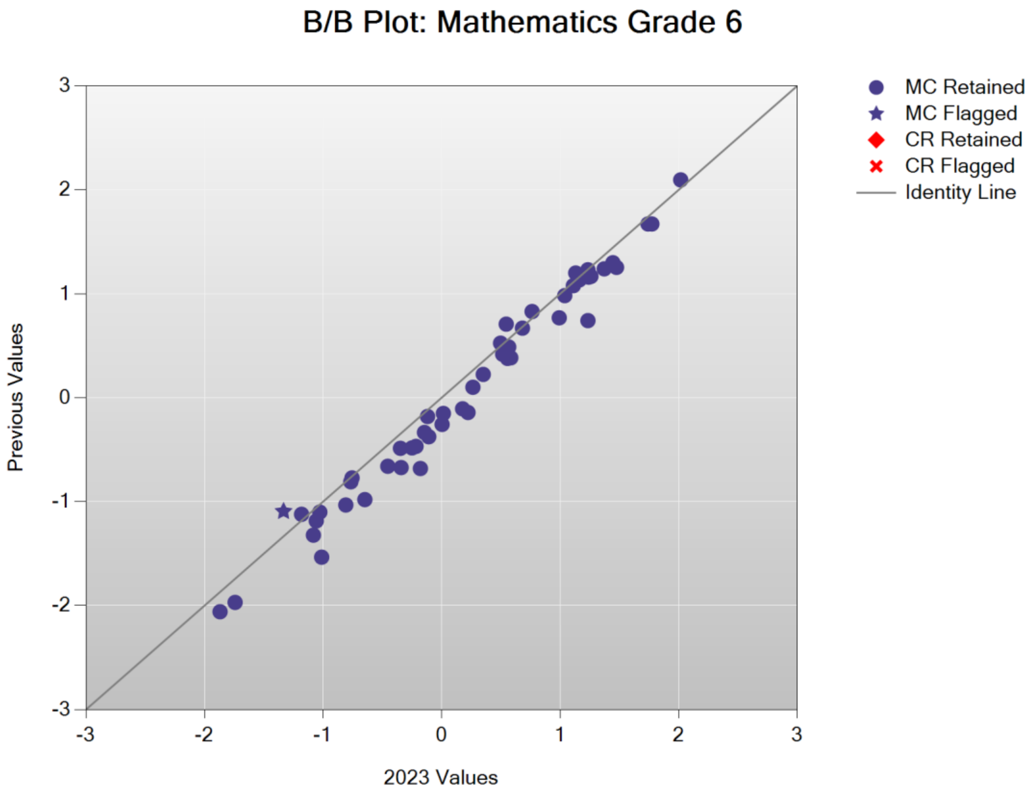
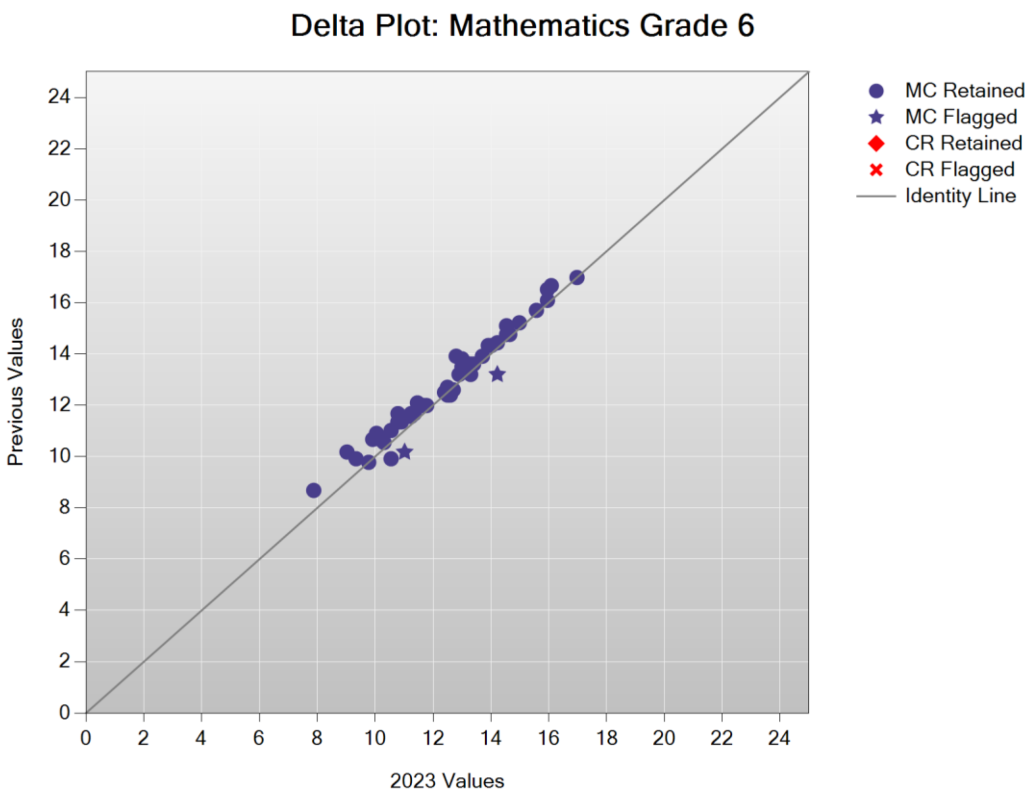
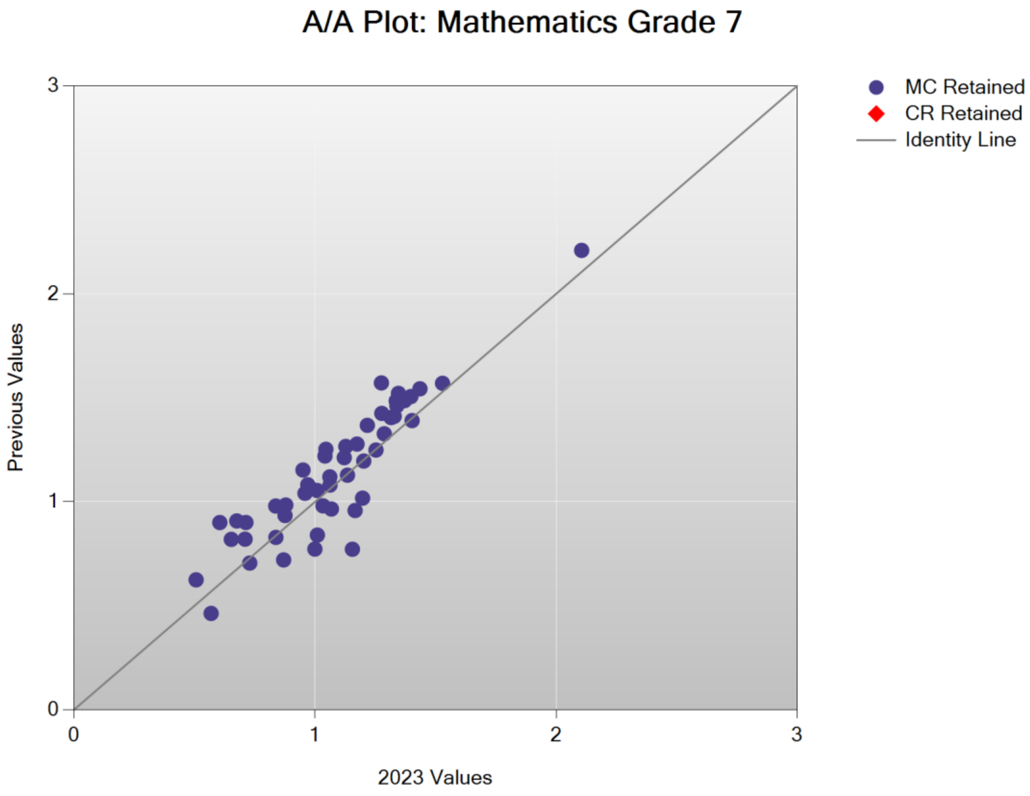
1
2
3


B/B Plot: Mathematics Grade 6
Previous Values
2023 Values
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line


Delta Plot: Mathematics Grade 6
Previous Values
2023 Values
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line


A/A Plot: Mathematics Grade 7
MC Retained
CR Retained
Identity Line
Previous Values
2023 Values
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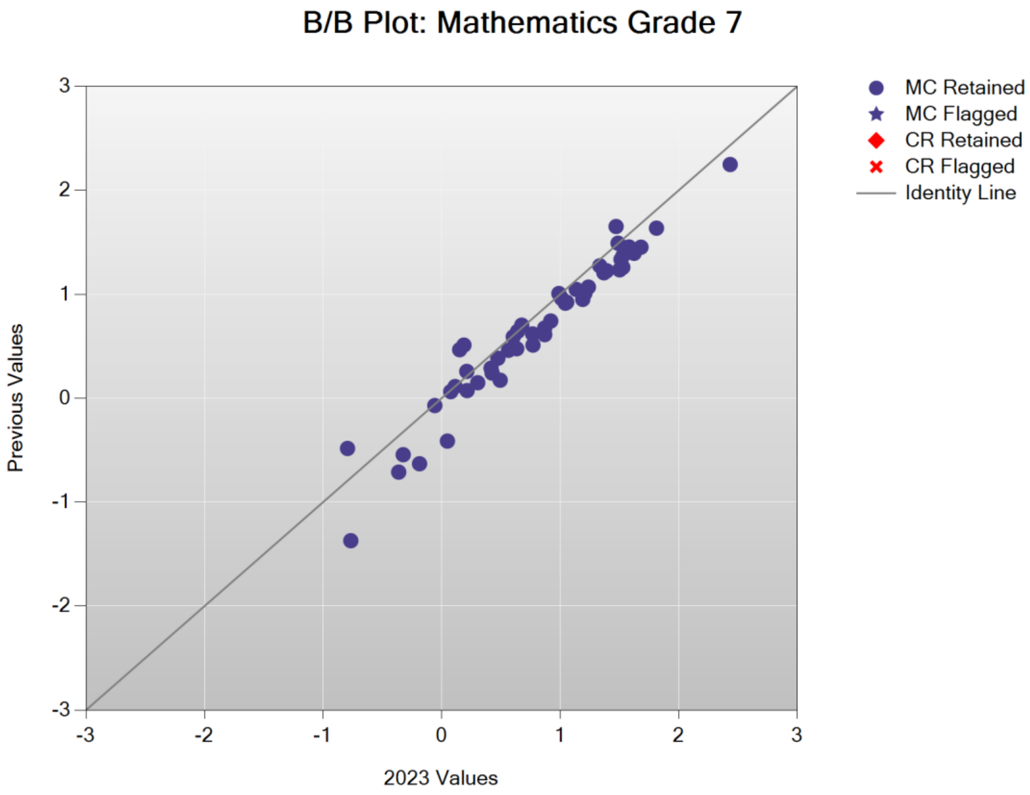
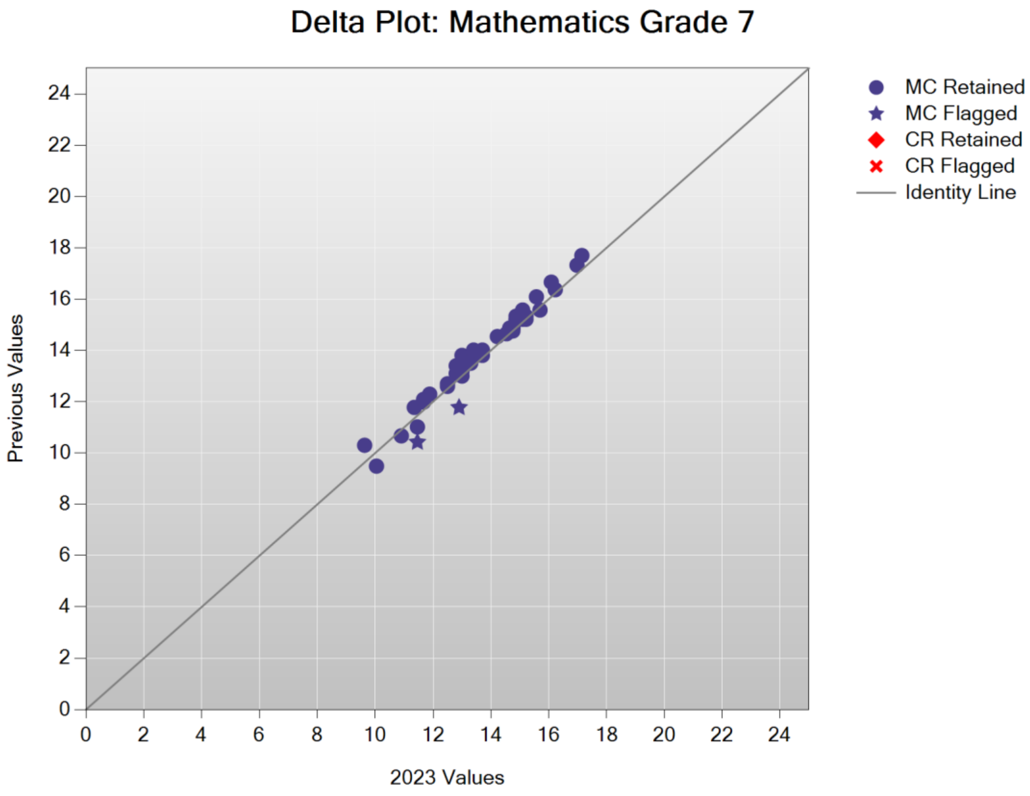
1
2
3


B/B Plot: Mathematics Grade 7
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line
Previous Values
2023 Values
-3
-2
-1
0
1
2
3


Delta Plot: Mathematics Grade 7
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line
Previous Values
2023 Values
0
2
4
6
8
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20
22
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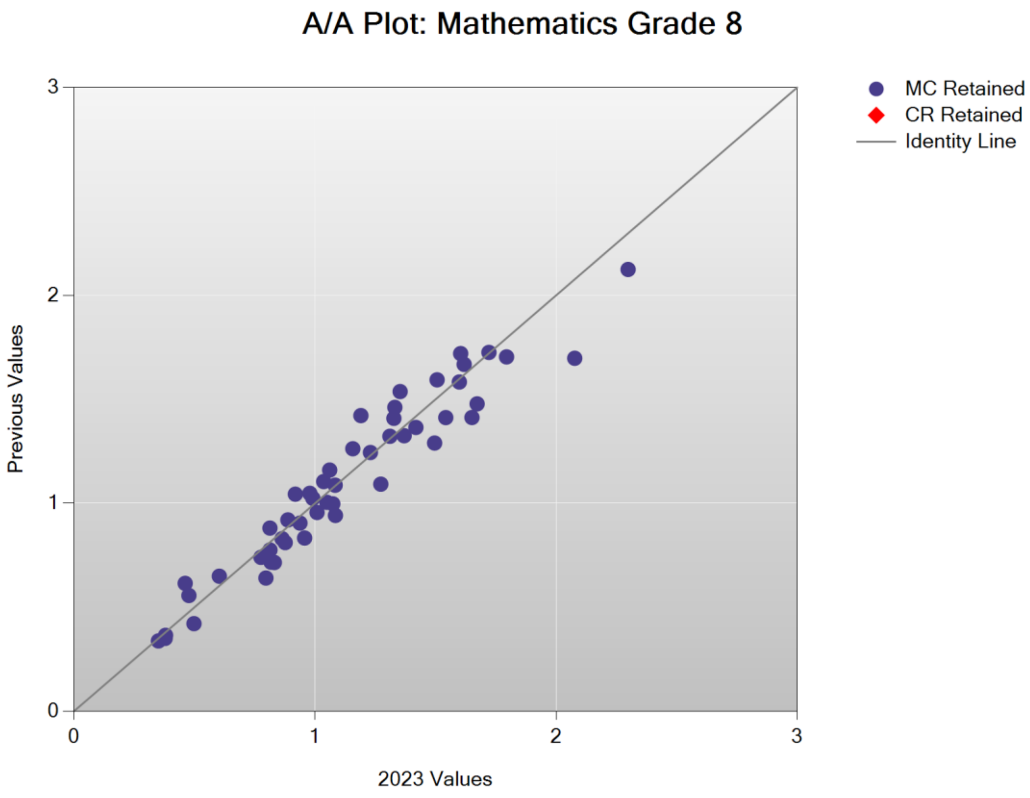
A/A Plot: Mathematics Grade 8
MC Retained
CR Retained
Identity Line
Previous Values
2023 Values
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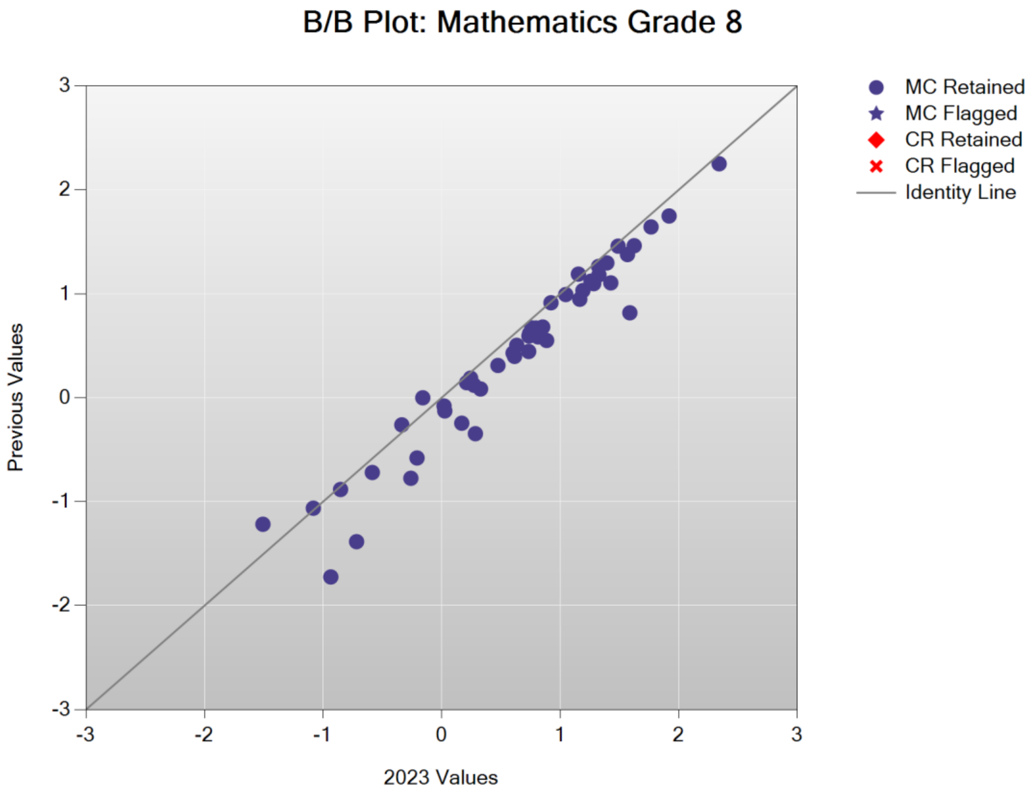
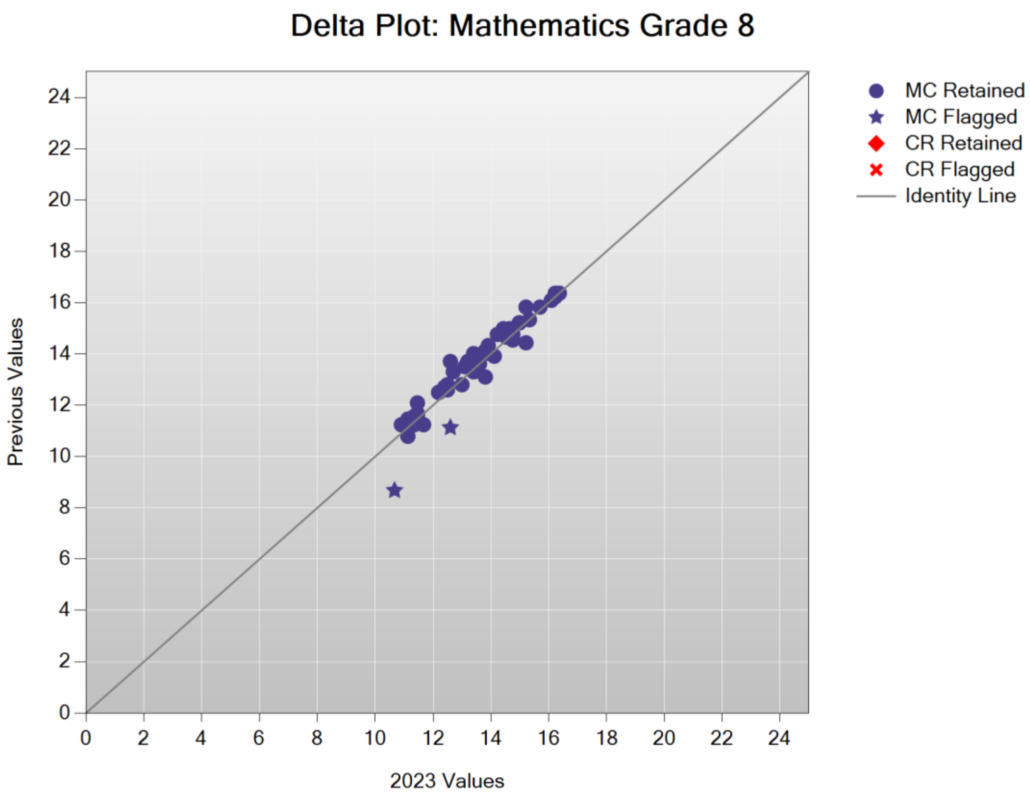
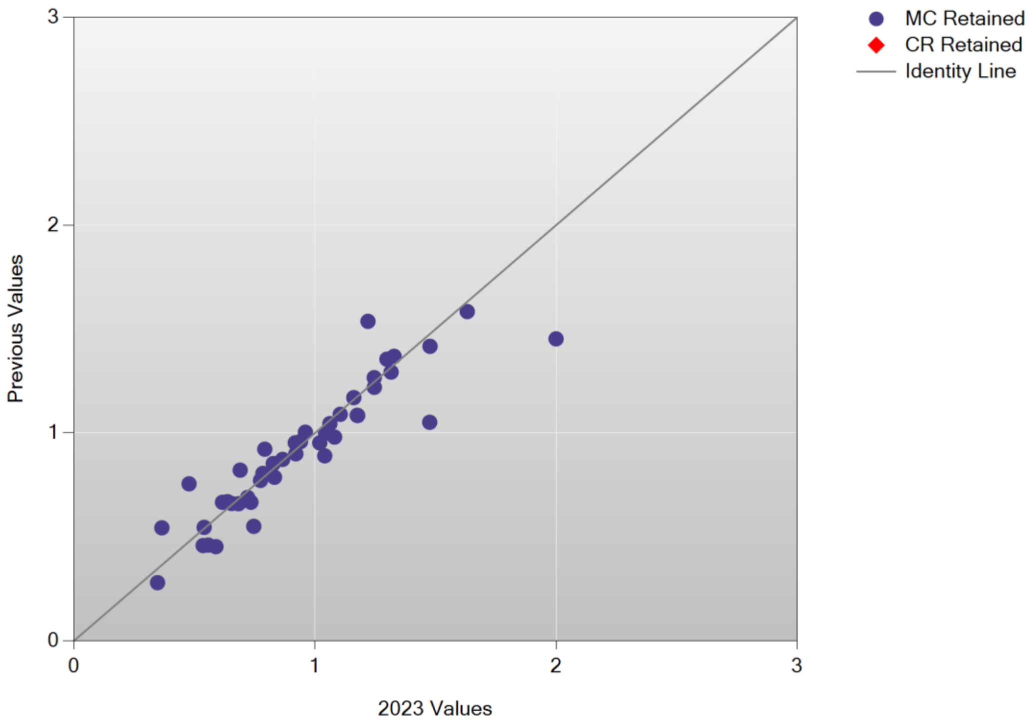
1
2
3

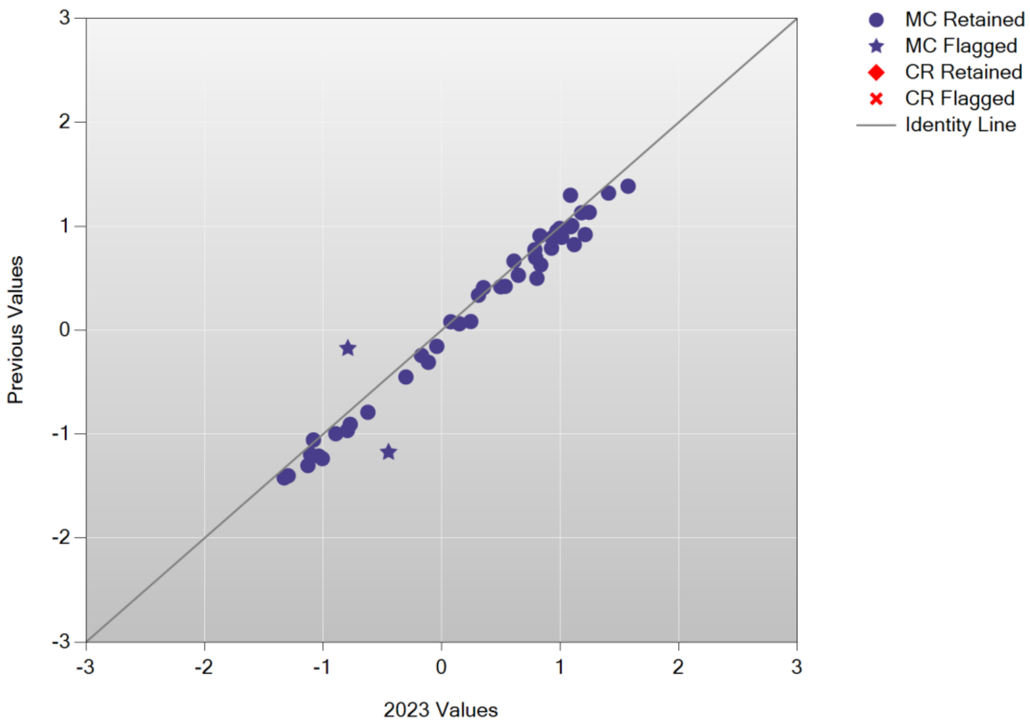

B/B Plot: Mathematics Grade 8
Previous Values
2023 Values
-3
-2
-1
0
1
2
3
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line

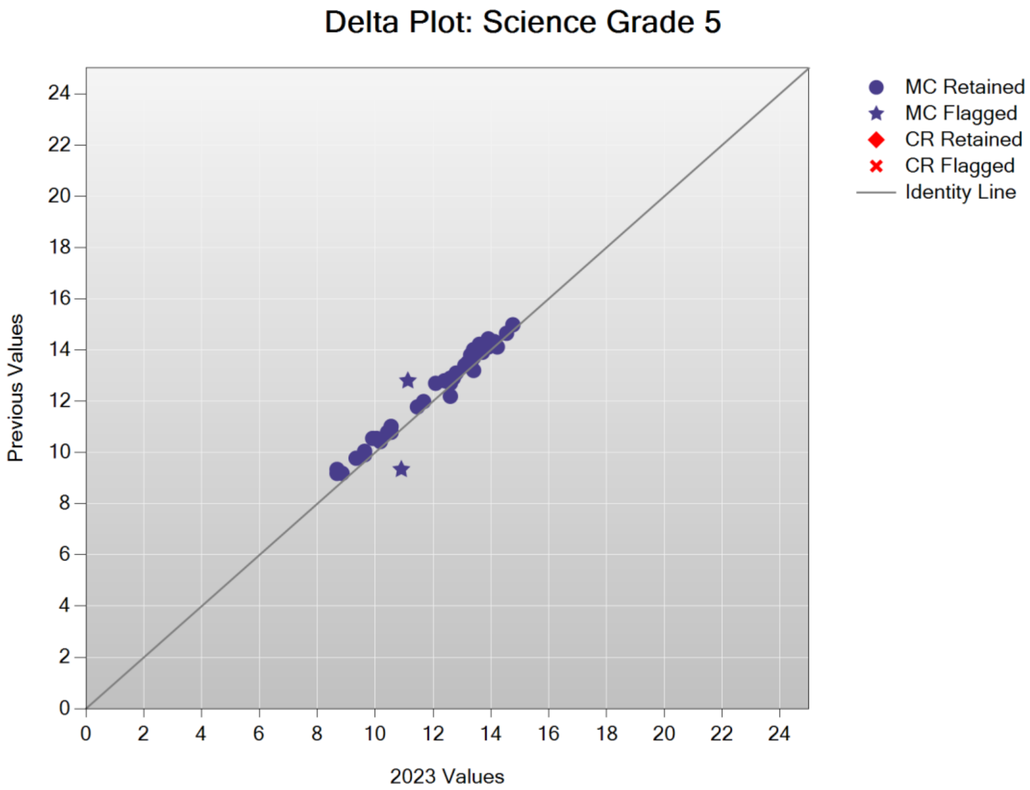

Delta Plot: Mathematics Grade 8
Previous Values
2023 Values
0
2
4
6
8
10
12
14
16
18
20
22
24
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line

A/A Plot: Science Grade 5



B/B Plot: Science Grade 5




Delta Plot: Science Grade 5
Previous Values
2023 Values
0
2
4
6
8
10
12
14
16
18
20
22
24
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line

Section 2.2

Cumulative Scale Score Distribution Tables

Table 2.2.1
Cumulative Scale Score Distribution
English Language Arts Grade 3

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
215	BB	5	0.00010	0.00010
216	BB	7	0.00014	0.00024
217	BB	24	0.00048	0.00073
218	BB	31	0.00062	0.00135
219	BB	49	0.00099	0.00234
220	BB	49	0.00099	0.00333
221	BB	77	0.00155	0.00488
222	BB	85	0.00171	0.00659
223	BB	109	0.00220	0.00879
224	BB	130	0.00262	0.01141
225	BB	129	0.00260	0.01401
226	BB	141	0.00284	0.01685
227	BB	150	0.00302	0.01987
228	BB	200	0.00403	0.02390
229	BB	226	0.00455	0.02846
230	BB	228	0.00460	0.03305
231	BB	272	0.00548	0.03853
232	BB	253	0.00510	0.04363
233	BB	278	0.00560	0.04924
234	BB	261	0.00526	0.05450
235	BB	297	0.00599	0.06048
236	BB	351	0.00707	0.06756
237	BB	289	0.00582	0.07338
238	BB	329	0.00663	0.08001
239	BB	344	0.00693	0.08694
240	BB	325	0.00655	0.09349
241	BB	349	0.00703	0.10053
242	BB	396	0.00798	0.10851
243	BB	404	0.00814	0.11665
244	BB	388	0.00782	0.12447
245	BB	364	0.00734	0.13181
246	BB	327	0.00659	0.13840
247	BB	389	0.00784	0.14624
248	BB	354	0.00713	0.15337
249	BB	382	0.00770	0.16107
250	BB	382	0.00770	0.16877
251	BB	371	0.00748	0.17625
252	BB	401	0.00808	0.18433
253	BB	387	0.00780	0.19213
254	BB	375	0.00756	0.19969

Table 2.2.1 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 3

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
255	BB	414	0.00834	0.20803
256	BB	390	0.00786	0.21589
257	BB	417	0.00840	0.22429
258	BB	408	0.00822	0.23252
259	BB	411	0.00828	0.24080
260	BB	407	0.00820	0.24900
261	BB	428	0.00863	0.25763
262	BB	435	0.00877	0.26640
263	BB	443	0.00893	0.27532
264	BB	439	0.00885	0.28417
265	BB	461	0.00929	0.29346
266	BB	476	0.00959	0.30306
267	BB	459	0.00925	0.31231
268	BB	501	0.01010	0.32240
269	BB	494	0.00996	0.33236
270	BB	542	0.01092	0.34328
271	BB	507	0.01022	0.35350
272	BB	519	0.01046	0.36396
273	BB	503	0.01014	0.37410
274	BB	582	0.01173	0.38583
275	BB	552	0.01112	0.39695
276	BB	498	0.01004	0.40699
277	B	669	0.01348	0.42047
278	B	594	0.01197	0.43244
279	B	652	0.01314	0.44558
280	B	613	0.01235	0.45794
281	B	611	0.01231	0.47025
282	B	667	0.01344	0.48370
283	B	649	0.01308	0.49678
284	B	649	0.01308	0.50986
285	B	605	0.01219	0.52205
286	B	663	0.01336	0.53541
287	B	640	0.01290	0.54831
288	B	655	0.01320	0.56151
289	B	656	0.01322	0.57473
290	B	629	0.01268	0.58741
291	B	644	0.01298	0.60039
292	B	685	0.01381	0.61419
293	B	650	0.01310	0.62729
294	B	668	0.01346	0.64076

Table 2.2.1 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 3

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
295	B	632	0.01274	0.65349
296	B	649	0.01308	0.66657
297	B	627	0.01264	0.67921
298	B	643	0.01296	0.69217
299	B	1021	0.02058	0.71275
300	P	289	0.00582	0.71857
301	P	629	0.01268	0.73125
302	P	591	0.01191	0.74316
303	P	605	0.01219	0.75535
304	P	587	0.01183	0.76718
305	P	568	0.01145	0.77863
306	P	541	0.01090	0.78953
307	P	570	0.01149	0.80102
308	P	549	0.01106	0.81208
309	P	502	0.01012	0.82220
310	P	510	0.01028	0.83248
311	P	514	0.01036	0.84284
312	P	513	0.01034	0.85318
313	P	431	0.00869	0.86186
314	P	455	0.00917	0.87103
315	P	395	0.00796	0.87900
316	P	395	0.00796	0.88696
317	P	389	0.00784	0.89480
318	P	367	0.00740	0.90219
319	P	395	0.00796	0.91015
320	P	362	0.00730	0.91745
321	P	332	0.00669	0.92414
322	P	307	0.00619	0.93033
323	P	293	0.00591	0.93623
324	P	289	0.00582	0.94206
325	P	254	0.00512	0.94718
326	P	249	0.00502	0.95219
327	P	221	0.00445	0.95665
328	P	213	0.00429	0.96094
329	A	166	0.00335	0.96429
330	A	193	0.00389	0.96818
331	A	169	0.00341	0.97158
332	A	153	0.00308	0.97467
333	A	144	0.00290	0.97757
334	A	115	0.00232	0.97989

Table 2.2.1 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 3

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
335	A	135	0.00272	0.98261
336	A	114	0.00230	0.98490
337	A	99	0.00200	0.98690
338	A	99	0.00200	0.98890
339	A	98	0.00198	0.99087
340	A	70	0.00141	0.99228
341	A	46	0.00093	0.99321
342	A	60	0.00121	0.99442
343	A	44	0.00089	0.99530
344	A	36	0.00073	0.99603
345	A	24	0.00048	0.99651
346	A	27	0.00054	0.99706
347	A	25	0.00050	0.99756
348	A	30	0.00060	0.99817
349	A	15	0.00030	0.99847
350	A	10	0.00020	0.99867
351	A	13	0.00026	0.99893
352	A	10	0.00020	0.99913
353	A	11	0.00022	0.99936
354	A	8	0.00016	0.99952
355	A	6	0.00012	0.99964
356	A	5	0.00010	0.99974
357	A	1	0.00002	0.99976
358	A	1	0.00002	0.99978
359	A	1	0.00002	0.99980
360	A	3	0.00006	0.99986
361	A	1	0.00002	0.99988
362	A	4	0.00008	0.99996
363	A	1	0.00002	0.99998
365	A	1	0.00002	1.00000

Table 2.2.2
Cumulative Scale Score Distribution
English Language Arts Grade 4

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
208	BB	1	0.00002	0.00002
209	BB	5	0.00010	0.00012
210	BB	9	0.00018	0.00031
211	BB	23	0.00047	0.00077
212	BB	26	0.00053	0.00130
213	BB	40	0.00082	0.00212
214	BB	51	0.00104	0.00316
215	BB	55	0.00112	0.00428
216	BB	66	0.00135	0.00563
217	BB	102	0.00208	0.00771
218	BB	105	0.00214	0.00985
219	BB	128	0.00261	0.01246
220	BB	141	0.00287	0.01533
221	BB	154	0.00314	0.01847
222	BB	158	0.00322	0.02169
223	BB	186	0.00379	0.02548
224	BB	178	0.00363	0.02911
225	BB	241	0.00491	0.03402
226	BB	233	0.00475	0.03877
227	BB	207	0.00422	0.04299
228	BB	245	0.00499	0.04799
229	BB	225	0.00459	0.05257
230	BB	254	0.00518	0.05775
231	BB	246	0.00501	0.06277
232	BB	270	0.00550	0.06827
233	BB	273	0.00557	0.07384
234	BB	291	0.00593	0.07977
235	BB	267	0.00544	0.08521
236	BB	289	0.00589	0.09110
237	BB	287	0.00585	0.09695
238	BB	273	0.00557	0.10252
239	BB	291	0.00593	0.10845
240	BB	309	0.00630	0.11475
241	BB	307	0.00626	0.12101
242	BB	312	0.00636	0.12737
243	BB	292	0.00595	0.13332
244	BB	278	0.00567	0.13899
245	BB	333	0.00679	0.14578
246	BB	314	0.00640	0.15218
247	BB	326	0.00665	0.15882

Table 2.2.2 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 4

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
248	BB	330	0.00673	0.16555
249	BB	323	0.00658	0.17214
250	BB	304	0.00620	0.17833
251	BB	337	0.00687	0.18520
252	BB	362	0.00738	0.19258
253	BB	354	0.00722	0.19980
254	BB	354	0.00722	0.20702
255	BB	382	0.00779	0.21480
256	BB	372	0.00758	0.22239
257	BB	375	0.00764	0.23003
258	BB	390	0.00795	0.23798
259	BB	439	0.00895	0.24693
260	BB	413	0.00842	0.25535
261	BB	418	0.00852	0.26387
262	BB	461	0.00940	0.27327
263	BB	457	0.00932	0.28259
264	BB	479	0.00976	0.29235
265	BB	464	0.00946	0.30181
266	BB	511	0.01042	0.31223
267	BB	520	0.01060	0.32283
268	BB	548	0.01117	0.33400
269	BB	534	0.01089	0.34489
270	BB	553	0.01127	0.35616
271	BB	546	0.01113	0.36729
272	BB	592	0.01207	0.37936
273	BB	584	0.01191	0.39126
274	BB	929	0.01894	0.41020
275	B	318	0.00648	0.41668
276	B	672	0.01370	0.43038
277	B	604	0.01231	0.44270
278	B	626	0.01276	0.45546
279	B	675	0.01376	0.46922
280	B	678	0.01382	0.48304
281	B	717	0.01462	0.49766
282	B	703	0.01433	0.51199
283	B	710	0.01447	0.52646
284	B	689	0.01405	0.54051
285	B	711	0.01449	0.55500
286	B	684	0.01394	0.56894
287	B	714	0.01456	0.58350

Table 2.2.2 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 4

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
288	B	765	0.01560	0.59909
289	B	689	0.01405	0.61314
290	B	661	0.01347	0.62662
291	B	682	0.01390	0.64052
292	B	744	0.01517	0.65569
293	B	708	0.01443	0.67012
294	B	727	0.01482	0.68494
295	B	663	0.01352	0.69845
296	B	700	0.01427	0.71272
297	B	654	0.01333	0.72606
298	B	652	0.01329	0.73935
299	B	965	0.01967	0.75902
300	P	319	0.00650	0.76552
301	P	613	0.01250	0.77802
302	P	584	0.01191	0.78993
303	P	611	0.01246	0.80238
304	P	579	0.01180	0.81418
305	P	559	0.01140	0.82558
306	P	571	0.01164	0.83722
307	P	500	0.01019	0.84741
308	P	511	0.01042	0.85783
309	P	514	0.01048	0.86831
310	P	426	0.00868	0.87699
311	P	432	0.00881	0.88580
312	P	380	0.00775	0.89355
313	P	370	0.00754	0.90109
314	P	368	0.00750	0.90859
315	P	370	0.00754	0.91613
316	P	338	0.00689	0.92302
317	P	326	0.00665	0.92967
318	P	296	0.00603	0.93570
319	P	233	0.00475	0.94045
320	P	296	0.00603	0.94649
321	P	247	0.00504	0.95152
322	P	239	0.00487	0.95639
323	P	227	0.00463	0.96102
324	P	180	0.00367	0.96469
325	P	187	0.00381	0.96850
326	P	174	0.00355	0.97205
327	P	154	0.00314	0.97519

Table 2.2.2 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 4

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
328	P	132	0.00269	0.97788
329	P	130	0.00265	0.98053
330	P	99	0.00202	0.98255
331	A	108	0.00220	0.98475
332	A	97	0.00198	0.98673
333	A	74	0.00151	0.98824
334	A	86	0.00175	0.98999
335	A	51	0.00104	0.99103
336	A	57	0.00116	0.99219
337	A	50	0.00102	0.99321
338	A	44	0.00090	0.99411
339	A	49	0.00100	0.99511
340	A	37	0.00075	0.99586
341	A	32	0.00065	0.99651
342	A	19	0.00039	0.99690
343	A	25	0.00051	0.99741
344	A	14	0.00029	0.99770
345	A	27	0.00055	0.99825
346	A	16	0.00033	0.99857
347	A	18	0.00037	0.99894
348	A	16	0.00033	0.99927
349	A	1	0.00002	0.99929
350	A	6	0.00012	0.99941
351	A	2	0.00004	0.99945
352	A	14	0.00029	0.99973
353	A	1	0.00002	0.99976
354	A	3	0.00006	0.99982
356	A	2	0.00004	0.99986
358	A	1	0.00002	0.99988
399	A	6	0.00012	1.00000

Table 2.2.3
Cumulative Scale Score Distribution
English Language Arts Grade 5

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
210	BB	1	0.00002	0.00002
213	BB	3	0.00007	0.00010
214	BB	3	0.00007	0.00017
215	BB	9	0.00021	0.00038
216	BB	9	0.00021	0.00060
217	BB	13	0.00031	0.00091
218	BB	15	0.00036	0.00126
219	BB	12	0.00029	0.00155
220	BB	29	0.00069	0.00224
221	BB	18	0.00043	0.00267
222	BB	40	0.00095	0.00362
223	BB	39	0.00093	0.00455
224	BB	50	0.00119	0.00575
225	BB	41	0.00098	0.00672
226	BB	44	0.00105	0.00777
227	BB	57	0.00136	0.00913
228	BB	72	0.00172	0.01085
229	BB	61	0.00145	0.01230
230	BB	61	0.00145	0.01376
231	BB	66	0.00157	0.01533
232	BB	89	0.00212	0.01745
233	BB	102	0.00243	0.01989
234	BB	95	0.00227	0.02215
235	BB	106	0.00253	0.02468
236	BB	109	0.00260	0.02728
237	BB	104	0.00248	0.02976
238	BB	112	0.00267	0.03243
239	BB	132	0.00315	0.03557
240	BB	124	0.00296	0.03853
241	BB	121	0.00289	0.04142
242	BB	113	0.00269	0.04411
243	BB	146	0.00348	0.04759
244	BB	151	0.00360	0.05119
245	BB	150	0.00358	0.05477
246	BB	149	0.00355	0.05832
247	BB	167	0.00398	0.06230
248	BB	165	0.00393	0.06624
249	BB	190	0.00453	0.07077
250	BB	174	0.00415	0.07491
251	BB	188	0.00448	0.07940

Table 2.2.3 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 5

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
252	BB	215	0.00513	0.08452
253	BB	205	0.00489	0.08941
254	BB	217	0.00517	0.09459
255	BB	277	0.00660	0.10119
256	BB	263	0.00627	0.10746
257	BB	292	0.00696	0.11442
258	BB	292	0.00696	0.12138
259	BB	308	0.00734	0.12873
260	BB	329	0.00784	0.13657
261	BB	335	0.00799	0.14456
262	BB	340	0.00811	0.15267
263	BB	331	0.00789	0.16056
264	BB	364	0.00868	0.16924
265	BB	390	0.00930	0.17854
266	BB	392	0.00935	0.18788
267	BB	430	0.01025	0.19814
268	BB	457	0.01090	0.20903
269	BB	441	0.01051	0.21955
270	BB	303	0.00722	0.22677
271	B	710	0.01693	0.24370
272	B	531	0.01266	0.25636
273	B	507	0.01209	0.26845
274	B	563	0.01342	0.28187
275	B	526	0.01254	0.29441
276	B	585	0.01395	0.30836
277	B	597	0.01423	0.32260
278	B	558	0.01330	0.33590
279	B	624	0.01488	0.35078
280	B	657	0.01566	0.36644
281	B	633	0.01509	0.38154
282	B	630	0.01502	0.39656
283	B	657	0.01566	0.41222
284	B	664	0.01583	0.42805
285	B	650	0.01550	0.44355
286	B	666	0.01588	0.45943
287	B	696	0.01659	0.47603
288	B	717	0.01710	0.49312
289	B	690	0.01645	0.50957
290	B	711	0.01695	0.52653
291	B	663	0.01581	0.54233

Table 2.2.3 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 5

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
292	B	713	0.01700	0.55933
293	B	757	0.01805	0.57738
294	B	681	0.01624	0.59362
295	B	733	0.01748	0.61110
296	B	675	0.01609	0.62719
297	B	668	0.01593	0.64312
298	B	686	0.01636	0.65947
299	B	963	0.02296	0.68243
300	P	341	0.00813	0.69057
301	P	655	0.01562	0.70618
302	P	614	0.01464	0.72082
303	P	600	0.01431	0.73513
304	P	588	0.01402	0.74915
305	P	575	0.01371	0.76286
306	P	541	0.01290	0.77576
307	P	543	0.01295	0.78870
308	P	528	0.01259	0.80129
309	P	513	0.01223	0.81352
310	P	510	0.01216	0.82568
311	P	496	0.01183	0.83751
312	P	466	0.01111	0.84862
313	P	440	0.01049	0.85911
314	P	452	0.01078	0.86989
315	P	360	0.00858	0.87847
316	P	414	0.00987	0.88834
317	P	382	0.00911	0.89745
318	P	363	0.00866	0.90611
319	P	303	0.00722	0.91333
320	P	299	0.00713	0.92046
321	P	292	0.00696	0.92742
322	P	321	0.00765	0.93508
323	A	162	0.00386	0.93894
324	A	246	0.00587	0.94480
325	A	227	0.00541	0.95022
326	A	203	0.00484	0.95506
327	A	193	0.00460	0.95966
328	A	165	0.00393	0.96359
329	A	204	0.00486	0.96846
330	A	125	0.00298	0.97144
331	A	144	0.00343	0.97487

Table 2.2.3 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 5

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
332	A	109	0.00260	0.97747
333	A	118	0.00281	0.98028
334	A	101	0.00241	0.98269
335	A	90	0.00215	0.98484
336	A	44	0.00105	0.98588
337	A	103	0.00246	0.98834
338	A	35	0.00083	0.98918
339	A	111	0.00265	0.99182
340	A	29	0.00069	0.99251
341	A	47	0.00112	0.99363
342	A	89	0.00212	0.99576
343	A	12	0.00029	0.99604
344	A	31	0.00074	0.99678
345	A	1	0.00002	0.99681
346	A	66	0.00157	0.99838
348	A	2	0.00005	0.99843
350	A	50	0.00119	0.99962
353	A	7	0.00017	0.99979
399	A	9	0.00021	1.00000

Table 2.2.4
Cumulative Scale Score Distribution
English Language Arts Grade 6

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
215	BB	4	0.00008	0.00008
216	BB	6	0.00012	0.00021
217	BB	12	0.00025	0.00045
218	BB	11	0.00023	0.00068
219	BB	22	0.00045	0.00113
220	BB	46	0.00094	0.00207
221	BB	40	0.00082	0.00289
222	BB	28	0.00057	0.00347
223	BB	66	0.00135	0.00482
224	BB	76	0.00156	0.00638
225	BB	83	0.00170	0.00808
226	BB	128	0.00263	0.01071
227	BB	133	0.00273	0.01344
228	BB	122	0.00250	0.01594
229	BB	135	0.00277	0.01871
230	BB	175	0.00359	0.02230
231	BB	188	0.00386	0.02615
232	BB	212	0.00435	0.03050
233	BB	211	0.00433	0.03483
234	BB	242	0.00496	0.03980
235	BB	267	0.00548	0.04527
236	BB	264	0.00542	0.05069
237	BB	287	0.00589	0.05658
238	BB	294	0.00603	0.06261
239	BB	336	0.00689	0.06950
240	BB	335	0.00687	0.07637
241	BB	350	0.00718	0.08355
242	BB	305	0.00626	0.08981
243	BB	370	0.00759	0.09740
244	BB	356	0.00730	0.10470
245	BB	374	0.00767	0.11237
246	BB	393	0.00806	0.12044
247	BB	347	0.00712	0.12755
248	BB	382	0.00784	0.13539
249	BB	395	0.00810	0.14349
250	BB	370	0.00759	0.15108
251	BB	396	0.00812	0.15921
252	BB	424	0.00870	0.16790
253	BB	386	0.00792	0.17582
254	BB	390	0.00800	0.18382

Table 2.2.4 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 6

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
255	BB	430	0.00882	0.19264
256	BB	427	0.00876	0.20140
257	BB	424	0.00870	0.21010
258	BB	434	0.00890	0.21900
259	BB	466	0.00956	0.22856
260	BB	495	0.01015	0.23872
261	BB	446	0.00915	0.24787
262	BB	443	0.00909	0.25695
263	BB	449	0.00921	0.26616
264	BB	544	0.01116	0.27732
265	BB	507	0.01040	0.28772
266	BB	532	0.01091	0.29864
267	BB	526	0.01079	0.30943
268	BB	359	0.00736	0.31679
269	B	761	0.01561	0.33240
270	B	571	0.01171	0.34412
271	B	572	0.01173	0.35585
272	B	596	0.01223	0.36808
273	B	595	0.01221	0.38028
274	B	633	0.01299	0.39327
275	B	633	0.01299	0.40625
276	B	618	0.01268	0.41893
277	B	624	0.01280	0.43173
278	B	671	0.01376	0.44550
279	B	687	0.01409	0.45959
280	B	653	0.01340	0.47298
281	B	678	0.01391	0.48689
282	B	677	0.01389	0.50078
283	B	735	0.01508	0.51586
284	B	658	0.01350	0.52936
285	B	695	0.01426	0.54361
286	B	705	0.01446	0.55807
287	B	654	0.01342	0.57149
288	B	670	0.01374	0.58523
289	B	664	0.01362	0.59886
290	B	707	0.01450	0.61336
291	B	689	0.01413	0.62749
292	B	667	0.01368	0.64118
293	B	638	0.01309	0.65426
294	B	662	0.01358	0.66784

Table 2.2.4 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 6

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
295	B	699	0.01434	0.68218
296	B	636	0.01305	0.69523
297	B	616	0.01264	0.70786
298	B	591	0.01212	0.71999
299	B	918	0.01883	0.73882
300	P	296	0.00607	0.74489
301	P	623	0.01278	0.75767
302	P	566	0.01161	0.76928
303	P	545	0.01118	0.78046
304	P	544	0.01116	0.79162
305	P	547	0.01122	0.80284
306	P	504	0.01034	0.81318
307	P	527	0.01081	0.82399
308	P	484	0.00993	0.83392
309	P	511	0.01048	0.84440
310	P	507	0.01040	0.85480
311	P	433	0.00888	0.86369
312	P	472	0.00968	0.87337
313	P	403	0.00827	0.88164
314	P	378	0.00775	0.88939
315	P	423	0.00868	0.89807
316	P	361	0.00741	0.90547
317	P	362	0.00743	0.91290
318	P	317	0.00650	0.91940
319	P	304	0.00624	0.92564
320	P	301	0.00617	0.93181
321	P	264	0.00542	0.93723
322	P	255	0.00523	0.94246
323	P	241	0.00494	0.94740
324	P	254	0.00521	0.95261
325	P	188	0.00386	0.95647
326	P	201	0.00412	0.96059
327	P	185	0.00380	0.96439
328	P	187	0.00384	0.96822
329	P	173	0.00355	0.97177
330	A	151	0.00310	0.97487
331	A	145	0.00297	0.97785
332	A	123	0.00252	0.98037
333	A	98	0.00201	0.98238
334	A	97	0.00199	0.98437

Table 2.2.4 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 6

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
335	A	90	0.00185	0.98621
336	A	81	0.00166	0.98788
337	A	76	0.00156	0.98944
338	A	62	0.00127	0.99071
339	A	60	0.00123	0.99194
340	A	49	0.00101	0.99294
341	A	46	0.00094	0.99389
342	A	50	0.00103	0.99491
343	A	24	0.00049	0.99540
344	A	42	0.00086	0.99627
345	A	23	0.00047	0.99674
346	A	32	0.00066	0.99739
347	A	24	0.00049	0.99789
348	A	10	0.00021	0.99809
349	A	13	0.00027	0.99836
350	A	16	0.00033	0.99869
351	A	5	0.00010	0.99879
352	A	9	0.00018	0.99897
353	A	9	0.00018	0.99916
354	A	1	0.00002	0.99918
355	A	1	0.00002	0.99920
356	A	15	0.00031	0.99951
357	A	8	0.00016	0.99967
358	A	5	0.00010	0.99977
359	A	1	0.00002	0.99979
360	A	3	0.00006	0.99986
399	A	7	0.00014	1.00000

Table 2.2.5
Cumulative Scale Score Distribution
English Language Arts Grade 7

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
211	BB	1	0.00002	0.00002
212	BB	7	0.00014	0.00016
213	BB	9	0.00018	0.00034
214	BB	12	0.00024	0.00058
215	BB	31	0.00062	0.00120
216	BB	51	0.00102	0.00223
217	BB	79	0.00158	0.00381
218	BB	77	0.00154	0.00536
219	BB	107	0.00215	0.00750
220	BB	156	0.00313	0.01063
221	BB	179	0.00359	0.01422
222	BB	167	0.00335	0.01757
223	BB	196	0.00393	0.02150
224	BB	217	0.00435	0.02586
225	BB	257	0.00516	0.03101
226	BB	271	0.00544	0.03645
227	BB	258	0.00518	0.04163
228	BB	272	0.00546	0.04708
229	BB	300	0.00602	0.05310
230	BB	300	0.00602	0.05912
231	BB	356	0.00714	0.06626
232	BB	351	0.00704	0.07330
233	BB	332	0.00666	0.07996
234	BB	310	0.00622	0.08618
235	BB	392	0.00786	0.09404
236	BB	362	0.00726	0.10131
237	BB	347	0.00696	0.10827
238	BB	347	0.00696	0.11523
239	BB	340	0.00682	0.12205
240	BB	382	0.00766	0.12971
241	BB	431	0.00865	0.13836
242	BB	384	0.00770	0.14606
243	BB	400	0.00802	0.15409
244	BB	389	0.00780	0.16189
245	BB	401	0.00804	0.16993
246	BB	399	0.00800	0.17794
247	BB	436	0.00875	0.18668
248	BB	412	0.00826	0.19495
249	BB	409	0.00820	0.20315
250	BB	372	0.00746	0.21062

Table 2.2.5 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 7

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
251	BB	420	0.00843	0.21904
252	BB	477	0.00957	0.22861
253	BB	446	0.00895	0.23756
254	BB	433	0.00869	0.24624
255	BB	470	0.00943	0.25567
256	BB	487	0.00977	0.26544
257	BB	446	0.00895	0.27439
258	BB	504	0.01011	0.28450
259	BB	543	0.01089	0.29539
260	BB	487	0.00977	0.30516
261	BB	485	0.00973	0.31489
262	BB	517	0.01037	0.32526
263	BB	506	0.01015	0.33541
264	BB	488	0.00979	0.34520
265	BB	581	0.01166	0.35686
266	BB	553	0.01109	0.36795
267	BB	552	0.01107	0.37902
268	BB	568	0.01139	0.39042
269	BB	567	0.01137	0.40179
270	BB	606	0.01216	0.41395
271	BB	606	0.01216	0.42611
272	BB	919	0.01844	0.44454
273	B	317	0.00636	0.45090
274	B	618	0.01240	0.46330
275	B	660	0.01324	0.47654
276	B	607	0.01218	0.48872
277	B	701	0.01406	0.50278
278	B	673	0.01350	0.51628
279	B	692	0.01388	0.53016
280	B	649	0.01302	0.54318
281	B	639	0.01282	0.55600
282	B	670	0.01344	0.56944
283	B	632	0.01268	0.58212
284	B	609	0.01222	0.59433
285	B	643	0.01290	0.60723
286	B	614	0.01232	0.61955
287	B	704	0.01412	0.63367
288	B	662	0.01328	0.64695
289	B	637	0.01278	0.65973
290	B	627	0.01258	0.67231

Table 2.2.5 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 7

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
291	B	631	0.01266	0.68497
292	B	635	0.01274	0.69771
293	B	604	0.01212	0.70982
294	B	622	0.01248	0.72230
295	B	566	0.01135	0.73366
296	B	595	0.01194	0.74559
297	B	592	0.01188	0.75747
298	B	600	0.01204	0.76950
299	B	810	0.01625	0.78575
300	P	286	0.00574	0.79149
301	P	541	0.01085	0.80234
302	P	509	0.01021	0.81255
303	P	544	0.01091	0.82347
304	P	511	0.01025	0.83372
305	P	476	0.00955	0.84327
306	P	466	0.00935	0.85261
307	P	474	0.00951	0.86212
308	P	440	0.00883	0.87095
309	P	407	0.00816	0.87911
310	P	391	0.00784	0.88696
311	P	408	0.00818	0.89514
312	P	366	0.00734	0.90249
313	P	370	0.00742	0.90991
314	P	328	0.00658	0.91649
315	P	307	0.00616	0.92265
316	P	313	0.00628	0.92893
317	P	280	0.00562	0.93454
318	P	298	0.00598	0.94052
319	P	254	0.00510	0.94562
320	P	272	0.00546	0.95107
321	P	234	0.00469	0.95577
322	P	140	0.00281	0.95857
323	A	244	0.00489	0.96347
324	A	162	0.00325	0.96672
325	A	181	0.00363	0.97035
326	A	166	0.00333	0.97368
327	A	127	0.00255	0.97623
328	A	120	0.00241	0.97864
329	A	109	0.00219	0.98082
330	A	109	0.00219	0.98301

Table 2.2.5 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 7

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
331	A	83	0.00167	0.98467
332	A	100	0.00201	0.98668
333	A	92	0.00185	0.98853
334	A	79	0.00158	0.99011
335	A	53	0.00106	0.99117
336	A	55	0.00110	0.99228
337	A	52	0.00104	0.99332
338	A	41	0.00082	0.99414
339	A	38	0.00076	0.99490
340	A	39	0.00078	0.99569
341	A	23	0.00046	0.99615
342	A	43	0.00086	0.99701
343	A	20	0.00040	0.99741
344	A	30	0.00060	0.99801
345	A	10	0.00020	0.99821
346	A	7	0.00014	0.99836
347	A	17	0.00034	0.99870
348	A	11	0.00022	0.99892
349	A	10	0.00020	0.99912
350	A	5	0.00010	0.99922
351	A	10	0.00020	0.99942
352	A	3	0.00006	0.99948
353	A	7	0.00014	0.99962
354	A	3	0.00006	0.99968
355	A	2	0.00004	0.99972
356	A	4	0.00008	0.99980
357	A	3	0.00006	0.99986
358	A	2	0.00004	0.99990
361	A	2	0.00004	0.99994
399	A	3	0.00006	1.00000

Table 2.2.6
Cumulative Scale Score Distribution
English Language Arts Grade 8

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
204	BB	1	0.00002	0.00002
205	BB	3	0.00006	0.00009
206	BB	10	0.00022	0.00030
207	BB	14	0.00030	0.00060
208	BB	38	0.00082	0.00143
209	BB	39	0.00084	0.00227
210	BB	66	0.00143	0.00369
211	BB	68	0.00147	0.00516
212	BB	67	0.00145	0.00661
213	BB	84	0.00181	0.00842
214	BB	89	0.00192	0.01035
215	BB	92	0.00199	0.01233
216	BB	101	0.00218	0.01452
217	BB	108	0.00233	0.01685
218	BB	105	0.00227	0.01912
219	BB	107	0.00231	0.02143
220	BB	125	0.00270	0.02413
221	BB	117	0.00253	0.02666
222	BB	113	0.00244	0.02910
223	BB	119	0.00257	0.03167
224	BB	111	0.00240	0.03406
225	BB	133	0.00287	0.03694
226	BB	115	0.00248	0.03942
227	BB	165	0.00356	0.04299
228	BB	150	0.00324	0.04623
229	BB	123	0.00266	0.04888
230	BB	160	0.00346	0.05234
231	BB	162	0.00350	0.05584
232	BB	158	0.00341	0.05925
233	BB	167	0.00361	0.06286
234	BB	152	0.00328	0.06614
235	BB	177	0.00382	0.06997
236	BB	203	0.00439	0.07435
237	BB	187	0.00404	0.07839
238	BB	214	0.00462	0.08301
239	BB	216	0.00467	0.08768
240	BB	220	0.00475	0.09243
241	BB	208	0.00449	0.09692
242	BB	249	0.00538	0.10230
243	BB	261	0.00564	0.10794

Table 2.2.6 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 8

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
244	BB	296	0.00639	0.11433
245	BB	298	0.00644	0.12077
246	BB	300	0.00648	0.12725
247	BB	272	0.00588	0.13313
248	BB	331	0.00715	0.14028
249	BB	301	0.00650	0.14678
250	BB	339	0.00732	0.15410
251	BB	329	0.00711	0.16121
252	BB	324	0.00700	0.16821
253	BB	422	0.00912	0.17732
254	BB	386	0.00834	0.18566
255	BB	362	0.00782	0.19348
256	BB	426	0.00920	0.20268
257	BB	409	0.00883	0.21152
258	BB	409	0.00883	0.22035
259	BB	456	0.00985	0.23020
260	BB	485	0.01048	0.24068
261	BB	455	0.00983	0.25051
262	BB	531	0.01147	0.26198
263	BB	495	0.01069	0.27267
264	BB	525	0.01134	0.28401
265	BB	531	0.01147	0.29548
266	BB	551	0.01190	0.30738
267	BB	598	0.01292	0.32030
268	BB	299	0.00646	0.32676
269	B	860	0.01858	0.34534
270	B	623	0.01346	0.35879
271	B	624	0.01348	0.37227
272	B	646	0.01395	0.38623
273	B	665	0.01436	0.40059
274	B	653	0.01411	0.41470
275	B	672	0.01452	0.42921
276	B	700	0.01512	0.44433
277	B	757	0.01635	0.46069
278	B	725	0.01566	0.47635
279	B	711	0.01536	0.49171
280	B	727	0.01570	0.50741
281	B	718	0.01551	0.52292
282	B	741	0.01601	0.53893
283	B	718	0.01551	0.55443

Table 2.2.6 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 8

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
284	B	712	0.01538	0.56981
285	B	705	0.01523	0.58504
286	B	705	0.01523	0.60027
287	B	725	0.01566	0.61593
288	B	731	0.01579	0.63172
289	B	686	0.01482	0.64654
290	B	679	0.01467	0.66121
291	B	708	0.01529	0.67650
292	B	630	0.01361	0.69011
293	B	622	0.01344	0.70355
294	B	635	0.01372	0.71726
295	B	594	0.01283	0.73009
296	B	588	0.01270	0.74280
297	B	659	0.01424	0.75703
298	B	577	0.01246	0.76949
299	B	912	0.01970	0.78920
300	P	313	0.00676	0.79596
301	P	470	0.01015	0.80611
302	P	526	0.01136	0.81747
303	P	560	0.01210	0.82957
304	P	458	0.00989	0.83946
305	P	464	0.01002	0.84948
306	P	491	0.01061	0.86009
307	P	461	0.00996	0.87005
308	P	407	0.00879	0.87884
309	P	418	0.00903	0.88787
310	P	374	0.00808	0.89595
311	P	353	0.00763	0.90357
312	P	352	0.00760	0.91118
313	P	330	0.00713	0.91830
314	P	342	0.00739	0.92569
315	P	303	0.00655	0.93224
316	P	305	0.00659	0.93883
317	P	231	0.00499	0.94382
318	P	207	0.00447	0.94829
319	P	211	0.00456	0.95284
320	P	207	0.00447	0.95732
321	P	120	0.00259	0.95991
322	A	272	0.00588	0.96578
323	A	147	0.00318	0.96896

Table 2.2.6 (continued)
Cumulative Scale Score Distribution
English Language Arts Grade 8

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
324	A	146	0.00315	0.97211
325	A	129	0.00279	0.97490
326	A	137	0.00296	0.97786
327	A	113	0.00244	0.98030
328	A	107	0.00231	0.98261
329	A	87	0.00188	0.98449
330	A	86	0.00186	0.98635
331	A	85	0.00184	0.98818
332	A	63	0.00136	0.98955
333	A	52	0.00112	0.99067
334	A	50	0.00108	0.99175
335	A	51	0.00110	0.99285
336	A	43	0.00093	0.99378
337	A	41	0.00089	0.99466
338	A	31	0.00067	0.99533
339	A	35	0.00076	0.99609
340	A	31	0.00067	0.99676
341	A	20	0.00043	0.99719
342	A	19	0.00041	0.99760
343	A	11	0.00024	0.99784
344	A	16	0.00035	0.99819
345	A	13	0.00028	0.99847
346	A	10	0.00022	0.99868
347	A	12	0.00026	0.99894
348	A	6	0.00013	0.99907
349	A	14	0.00030	0.99937
350	A	5	0.00011	0.99948
351	A	4	0.00009	0.99957
352	A	7	0.00015	0.99972
353	A	5	0.00011	0.99983
354	A	3	0.00006	0.99989
356	A	2	0.00004	0.99994
358	A	1	0.00002	0.99996
359	A	1	0.00002	0.99998
399	A	1	0.00002	1.00000

Table 2.2.7
Cumulative Scale Score Distribution
Mathematics Grade 3

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
215	BB	1	0.00002	0.00002
217	BB	1	0.00002	0.00005
218	BB	3	0.00007	0.00012
219	BB	4	0.00010	0.00022
220	BB	5	0.00012	0.00034
221	BB	15	0.00036	0.00070
222	BB	24	0.00058	0.00128
223	BB	22	0.00053	0.00182
224	BB	30	0.00073	0.00254
225	BB	29	0.00070	0.00324
226	BB	32	0.00077	0.00402
227	BB	37	0.00090	0.00491
228	BB	35	0.00085	0.00576
229	BB	53	0.00128	0.00704
230	BB	70	0.00169	0.00874
231	BB	65	0.00157	0.01031
232	BB	71	0.00172	0.01203
233	BB	77	0.00186	0.01390
234	BB	85	0.00206	0.01595
235	BB	88	0.00213	0.01808
236	BB	90	0.00218	0.02026
237	BB	119	0.00288	0.02314
238	BB	118	0.00286	0.02600
239	BB	130	0.00315	0.02915
240	BB	129	0.00312	0.03227
241	BB	166	0.00402	0.03629
242	BB	158	0.00383	0.04011
243	BB	156	0.00378	0.04389
244	BB	175	0.00424	0.04813
245	BB	155	0.00375	0.05188
246	BB	199	0.00482	0.05670
247	BB	199	0.00482	0.06151
248	BB	192	0.00465	0.06616
249	BB	196	0.00474	0.07091
250	BB	199	0.00482	0.07573
251	BB	206	0.00499	0.08071
252	BB	224	0.00542	0.08614
253	BB	236	0.00571	0.09185
254	BB	214	0.00518	0.09703
255	BB	235	0.00569	0.10272

Table 2.2.7 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 3

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
256	BB	262	0.00634	0.10906
257	BB	260	0.00629	0.11536
258	BB	283	0.00685	0.12221
259	BB	297	0.00719	0.12940
260	BB	287	0.00695	0.13634
261	BB	287	0.00695	0.14329
262	BB	312	0.00755	0.15085
263	BB	344	0.00833	0.15917
264	BB	335	0.00811	0.16728
265	BB	318	0.00770	0.17498
266	BB	384	0.00930	0.18428
267	BB	364	0.00881	0.19309
268	BB	380	0.00920	0.20229
269	BB	389	0.00942	0.21171
270	BB	374	0.00905	0.22076
271	BB	411	0.00995	0.23071
272	BB	420	0.01017	0.24088
273	BB	330	0.00799	0.24887
274	B	544	0.01317	0.26204
275	B	414	0.01002	0.27206
276	B	480	0.01162	0.28368
277	B	424	0.01026	0.29395
278	B	503	0.01218	0.30612
279	B	485	0.01174	0.31786
280	B	539	0.01305	0.33091
281	B	513	0.01242	0.34333
282	B	522	0.01264	0.35597
283	B	506	0.01225	0.36822
284	B	541	0.01310	0.38132
285	B	557	0.01348	0.39480
286	B	591	0.01431	0.40911
287	B	568	0.01375	0.42286
288	B	595	0.01440	0.43726
289	B	580	0.01404	0.45130
290	B	660	0.01598	0.46728
291	B	609	0.01474	0.48202
292	B	652	0.01578	0.49781
293	B	660	0.01598	0.51379
294	B	651	0.01576	0.52955
295	B	655	0.01586	0.54540

Table 2.2.7 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 3

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
296	B	611	0.01479	0.56020
297	B	640	0.01549	0.57569
298	B	642	0.01554	0.59123
299	B	1001	0.02423	0.61546
300	P	339	0.00821	0.62367
301	P	637	0.01542	0.63909
302	P	601	0.01455	0.65364
303	P	612	0.01482	0.66846
304	P	632	0.01530	0.68376
305	P	649	0.01571	0.69947
306	P	585	0.01416	0.71363
307	P	601	0.01455	0.72818
308	P	626	0.01515	0.74334
309	P	597	0.01445	0.75779
310	P	625	0.01513	0.77292
311	P	497	0.01203	0.78495
312	P	505	0.01223	0.79718
313	P	459	0.01111	0.80829
314	P	509	0.01232	0.82061
315	P	456	0.01104	0.83165
316	P	425	0.01029	0.84194
317	P	453	0.01097	0.85291
318	P	421	0.01019	0.86310
319	P	409	0.00990	0.87300
320	P	492	0.01191	0.88491
321	A	253	0.00612	0.89104
322	A	351	0.00850	0.89953
323	A	317	0.00767	0.90721
324	A	281	0.00680	0.91401
325	A	290	0.00702	0.92103
326	A	264	0.00639	0.92742
327	A	268	0.00649	0.93391
328	A	234	0.00566	0.93957
329	A	209	0.00506	0.94463
330	A	230	0.00557	0.95020
331	A	210	0.00508	0.95529
332	A	162	0.00392	0.95921
333	A	168	0.00407	0.96327
334	A	168	0.00407	0.96734
335	A	106	0.00257	0.96991

Table 2.2.7 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 3

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
336	A	128	0.00310	0.97301
337	A	119	0.00288	0.97589
338	A	84	0.00203	0.97792
339	A	169	0.00409	0.98201
340	A	69	0.00167	0.98368
341	A	83	0.00201	0.98569
342	A	53	0.00128	0.98698
343	A	122	0.00295	0.98993
344	A	27	0.00065	0.99058
345	A	46	0.00111	0.99170
346	A	61	0.00148	0.99317
347	A	85	0.00206	0.99523
348	A	40	0.00097	0.99620
399	A	157	0.00380	1.00000

Table 2.2.8
Cumulative Scale Score Distribution
Mathematics Grade 4

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
220	BB	1	0.00002	0.00002
221	BB	7	0.00017	0.00020
222	BB	3	0.00007	0.00027
223	BB	10	0.00025	0.00052
224	BB	12	0.00030	0.00082
225	BB	19	0.00047	0.00129
226	BB	25	0.00062	0.00191
227	BB	40	0.00099	0.00290
228	BB	45	0.00112	0.00402
229	BB	43	0.00107	0.00508
230	BB	54	0.00134	0.00642
231	BB	65	0.00161	0.00803
232	BB	67	0.00166	0.00969
233	BB	63	0.00156	0.01126
234	BB	91	0.00226	0.01351
235	BB	87	0.00216	0.01567
236	BB	95	0.00236	0.01802
237	BB	96	0.00238	0.02040
238	BB	123	0.00305	0.02345
239	BB	138	0.00342	0.02688
240	BB	136	0.00337	0.03025
241	BB	145	0.00359	0.03384
242	BB	139	0.00345	0.03729
243	BB	141	0.00350	0.04078
244	BB	148	0.00367	0.04445
245	BB	164	0.00407	0.04852
246	BB	176	0.00436	0.05288
247	BB	172	0.00426	0.05715
248	BB	194	0.00481	0.06196
249	BB	183	0.00454	0.06649
250	BB	189	0.00469	0.07118
251	BB	238	0.00590	0.07708
252	BB	231	0.00573	0.08281
253	BB	231	0.00573	0.08854
254	BB	204	0.00506	0.09359
255	BB	262	0.00650	0.10009
256	BB	222	0.00550	0.10559
257	BB	231	0.00573	0.11132
258	BB	269	0.00667	0.11799
259	BB	295	0.00731	0.12530

Table 2.2.8 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 4

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
260	BB	257	0.00637	0.13168
261	BB	302	0.00749	0.13916
262	BB	332	0.00823	0.14739
263	BB	321	0.00796	0.15535
264	BB	277	0.00687	0.16222
265	BB	329	0.00816	0.17038
266	BB	357	0.00885	0.17923
267	BB	320	0.00793	0.18716
268	BB	396	0.00982	0.19698
269	BB	347	0.00860	0.20558
270	BB	357	0.00885	0.21443
271	BB	413	0.01024	0.22467
272	BB	350	0.00868	0.23335
273	B	465	0.01153	0.24488
274	B	414	0.01026	0.25514
275	B	439	0.01088	0.26603
276	B	446	0.01106	0.27709
277	B	463	0.01148	0.28857
278	B	459	0.01138	0.29995
279	B	434	0.01076	0.31071
280	B	455	0.01128	0.32199
281	B	512	0.01269	0.33468
282	B	500	0.01240	0.34708
283	B	519	0.01287	0.35994
284	B	498	0.01235	0.37229
285	B	528	0.01309	0.38538
286	B	521	0.01292	0.39830
287	B	551	0.01366	0.41196
288	B	593	0.01470	0.42666
289	B	600	0.01488	0.44154
290	B	585	0.01450	0.45604
291	B	614	0.01522	0.47126
292	B	601	0.01490	0.48617
293	B	612	0.01517	0.50134
294	B	557	0.01381	0.51515
295	B	573	0.01421	0.52935
296	B	555	0.01376	0.54311
297	B	580	0.01438	0.55749
298	B	622	0.01542	0.57292
299	B	863	0.02140	0.59431

Table 2.2.8 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 4

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
300	P	299	0.00741	0.60173
301	P	616	0.01527	0.61700
302	P	610	0.01512	0.63212
303	P	579	0.01436	0.64648
304	P	558	0.01383	0.66031
305	P	587	0.01455	0.67486
306	P	556	0.01378	0.68865
307	P	538	0.01334	0.70199
308	P	532	0.01319	0.71518
309	P	546	0.01354	0.72872
310	P	520	0.01289	0.74161
311	P	541	0.01341	0.75502
312	P	484	0.01200	0.76702
313	P	502	0.01245	0.77947
314	P	456	0.01131	0.79077
315	P	440	0.01091	0.80168
316	P	432	0.01071	0.81239
317	P	445	0.01103	0.82342
318	P	435	0.01078	0.83421
319	P	428	0.01061	0.84482
320	P	385	0.00955	0.85437
321	P	187	0.00464	0.85900
322	A	569	0.01411	0.87311
323	A	337	0.00836	0.88146
324	A	327	0.00811	0.88957
325	A	357	0.00885	0.89842
326	A	287	0.00712	0.90554
327	A	293	0.00726	0.91280
328	A	279	0.00692	0.91972
329	A	233	0.00578	0.92550
330	A	228	0.00565	0.93115
331	A	230	0.00570	0.93685
332	A	223	0.00553	0.94238
333	A	191	0.00474	0.94712
334	A	183	0.00454	0.95165
335	A	147	0.00364	0.95530
336	A	191	0.00474	0.96003
337	A	174	0.00431	0.96435
338	A	152	0.00377	0.96812
339	A	103	0.00255	0.97067

Table 2.2.8 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 4

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
340	A	109	0.00270	0.97337
341	A	114	0.00283	0.97620
342	A	136	0.00337	0.97957
343	A	77	0.00191	0.98148
344	A	84	0.00208	0.98356
345	A	51	0.00126	0.98483
346	A	29	0.00072	0.98555
347	A	62	0.00154	0.98708
348	A	72	0.00179	0.98887
349	A	80	0.00198	0.99085
350	A	108	0.00268	0.99353
351	A	26	0.00064	0.99417
352	A	21	0.00052	0.99469
353	A	23	0.00057	0.99526
399	A	191	0.00474	1.00000

Table 2.2.9
Cumulative Scale Score Distribution
Mathematics Grade 5

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
211	BB	2	0.00005	0.00005
212	BB	2	0.00005	0.00010
213	BB	2	0.00005	0.00015
214	BB	2	0.00005	0.00020
215	BB	4	0.00010	0.00030
216	BB	7	0.00017	0.00047
217	BB	10	0.00025	0.00072
218	BB	23	0.00057	0.00129
219	BB	18	0.00045	0.00174
220	BB	30	0.00074	0.00248
221	BB	35	0.00087	0.00335
222	BB	38	0.00094	0.00429
223	BB	45	0.00112	0.00541
224	BB	53	0.00131	0.00672
225	BB	61	0.00151	0.00823
226	BB	62	0.00154	0.00977
227	BB	68	0.00169	0.01146
228	BB	91	0.00226	0.01371
229	BB	95	0.00236	0.01607
230	BB	88	0.00218	0.01825
231	BB	118	0.00293	0.02118
232	BB	90	0.00223	0.02341
233	BB	113	0.00280	0.02621
234	BB	120	0.00298	0.02918
235	BB	128	0.00317	0.03236
236	BB	137	0.00340	0.03576
237	BB	145	0.00360	0.03935
238	BB	156	0.00387	0.04322
239	BB	160	0.00397	0.04719
240	BB	187	0.00464	0.05182
241	BB	189	0.00469	0.05651
242	BB	184	0.00456	0.06107
243	BB	202	0.00501	0.06608
244	BB	214	0.00531	0.07139
245	BB	220	0.00545	0.07684
246	BB	244	0.00605	0.08289
247	BB	230	0.00570	0.08859
248	BB	229	0.00568	0.09427
249	BB	282	0.00699	0.10126
250	BB	265	0.00657	0.10784

Table 2.2.9 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 5

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
251	BB	272	0.00674	0.11458
252	BB	293	0.00727	0.12184
253	BB	286	0.00709	0.12894
254	BB	286	0.00709	0.13603
255	BB	307	0.00761	0.14364
256	BB	326	0.00808	0.15172
257	BB	305	0.00756	0.15929
258	BB	339	0.00841	0.16769
259	BB	363	0.00900	0.17669
260	BB	357	0.00885	0.18554
261	BB	396	0.00982	0.19536
262	BB	400	0.00992	0.20528
263	BB	434	0.01076	0.21604
264	BB	418	0.01036	0.22641
265	BB	287	0.00712	0.23352
266	B	586	0.01453	0.24805
267	B	447	0.01108	0.25914
268	B	441	0.01093	0.27007
269	B	476	0.01180	0.28187
270	B	500	0.01240	0.29427
271	B	422	0.01046	0.30474
272	B	447	0.01108	0.31582
273	B	487	0.01208	0.32789
274	B	477	0.01183	0.33972
275	B	483	0.01198	0.35170
276	B	538	0.01334	0.36504
277	B	524	0.01299	0.37803
278	B	536	0.01329	0.39132
279	B	533	0.01322	0.40454
280	B	523	0.01297	0.41751
281	B	538	0.01334	0.43085
282	B	529	0.01312	0.44396
283	B	545	0.01351	0.45748
284	B	548	0.01359	0.47106
285	B	530	0.01314	0.48421
286	B	558	0.01384	0.49804
287	B	518	0.01284	0.51089
288	B	550	0.01364	0.52452
289	B	571	0.01416	0.53868
290	B	547	0.01356	0.55224

Table 2.2.9 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 5

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
291	B	565	0.01401	0.56625
292	B	551	0.01366	0.57992
293	B	570	0.01413	0.59405
294	B	528	0.01309	0.60714
295	B	500	0.01240	0.61954
296	B	541	0.01341	0.63295
297	B	512	0.01270	0.64565
298	B	550	0.01364	0.65929
299	B	793	0.01966	0.67895
300	P	250	0.00620	0.68515
301	P	508	0.01260	0.69774
302	P	520	0.01289	0.71064
303	P	491	0.01217	0.72281
304	P	493	0.01222	0.73504
305	P	463	0.01148	0.74652
306	P	481	0.01193	0.75844
307	P	440	0.01091	0.76935
308	P	426	0.01056	0.77992
309	P	421	0.01044	0.79035
310	P	382	0.00947	0.79983
311	P	377	0.00935	0.80917
312	P	433	0.01074	0.81991
313	P	380	0.00942	0.82933
314	P	388	0.00962	0.83895
315	P	368	0.00912	0.84808
316	P	346	0.00858	0.85666
317	P	353	0.00875	0.86541
318	P	328	0.00813	0.87354
319	P	309	0.00766	0.88121
320	P	347	0.00860	0.88981
321	A	278	0.00689	0.89670
322	A	269	0.00667	0.90337
323	A	257	0.00637	0.90974
324	A	248	0.00615	0.91589
325	A	207	0.00513	0.92103
326	A	209	0.00518	0.92621
327	A	209	0.00518	0.93139
328	A	239	0.00593	0.93732
329	A	189	0.00469	0.94200
330	A	196	0.00486	0.94686

Table 2.2.9 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 5

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
331	A	175	0.00434	0.95120
332	A	162	0.00402	0.95522
333	A	127	0.00315	0.95837
334	A	163	0.00404	0.96241
335	A	142	0.00352	0.96593
336	A	115	0.00285	0.96878
337	A	113	0.00280	0.97158
338	A	86	0.00213	0.97372
339	A	128	0.00317	0.97689
340	A	97	0.00241	0.97930
341	A	75	0.00186	0.98116
342	A	76	0.00188	0.98304
343	A	66	0.00164	0.98468
344	A	55	0.00136	0.98604
345	A	87	0.00216	0.98820
346	A	78	0.00193	0.99013
347	A	72	0.00179	0.99192
348	A	2	0.00005	0.99197
349	A	54	0.00134	0.99331
350	A	46	0.00114	0.99445
351	A	19	0.00047	0.99492
399	A	205	0.00508	1.00000

Table 2.2.10
Cumulative Scale Score Distribution
Mathematics Grade 6

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
214	BB	2	0.00005	0.00005
215	BB	9	0.00022	0.00027
216	BB	8	0.00019	0.00046
217	BB	19	0.00046	0.00092
218	BB	28	0.00068	0.00160
219	BB	30	0.00073	0.00232
220	BB	44	0.00107	0.00339
221	BB	52	0.00126	0.00465
222	BB	60	0.00145	0.00610
223	BB	50	0.00121	0.00731
224	BB	82	0.00199	0.00930
225	BB	92	0.00223	0.01152
226	BB	80	0.00194	0.01346
227	BB	102	0.00247	0.01593
228	BB	101	0.00245	0.01838
229	BB	111	0.00269	0.02106
230	BB	122	0.00295	0.02402
231	BB	118	0.00286	0.02688
232	BB	148	0.00358	0.03046
233	BB	153	0.00370	0.03416
234	BB	171	0.00414	0.03830
235	BB	204	0.00494	0.04324
236	BB	173	0.00419	0.04743
237	BB	163	0.00395	0.05138
238	BB	172	0.00416	0.05554
239	BB	183	0.00443	0.05997
240	BB	205	0.00496	0.06494
241	BB	186	0.00450	0.06944
242	BB	239	0.00579	0.07523
243	BB	233	0.00564	0.08087
244	BB	242	0.00586	0.08673
245	BB	254	0.00615	0.09288
246	BB	266	0.00644	0.09932
247	BB	275	0.00666	0.10598
248	BB	276	0.00668	0.11266
249	BB	290	0.00702	0.11968
250	BB	298	0.00722	0.12689
251	BB	268	0.00649	0.13338
252	BB	299	0.00724	0.14062
253	BB	320	0.00775	0.14837

Table 2.2.10 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 6

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
254	BB	331	0.00801	0.15638
255	BB	387	0.00937	0.16575
256	BB	377	0.00913	0.17488
257	BB	385	0.00932	0.18420
258	BB	394	0.00954	0.19374
259	BB	405	0.00981	0.20355
260	BB	460	0.01114	0.21469
261	BB	408	0.00988	0.22457
262	BB	433	0.01048	0.23505
263	BB	445	0.01077	0.24582
264	BB	440	0.01065	0.25648
265	BB	448	0.01085	0.26732
266	BB	557	0.01349	0.28081
267	B	447	0.01082	0.29163
268	B	529	0.01281	0.30444
269	B	489	0.01184	0.31628
270	B	555	0.01344	0.32972
271	B	535	0.01295	0.34267
272	B	558	0.01351	0.35618
273	B	574	0.01390	0.37008
274	B	548	0.01327	0.38335
275	B	559	0.01353	0.39688
276	B	553	0.01339	0.41027
277	B	557	0.01349	0.42376
278	B	603	0.01460	0.43836
279	B	611	0.01479	0.45315
280	B	565	0.01368	0.46683
281	B	594	0.01438	0.48121
282	B	600	0.01453	0.49574
283	B	614	0.01487	0.51060
284	B	571	0.01382	0.52443
285	B	532	0.01288	0.53731
286	B	512	0.01240	0.54971
287	B	579	0.01402	0.56373
288	B	554	0.01341	0.57714
289	B	630	0.01525	0.59239
290	B	585	0.01416	0.60656
291	B	529	0.01281	0.61936
292	B	579	0.01402	0.63338
293	B	520	0.01259	0.64597

Table 2.2.10 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 6

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
294	B	529	0.01281	0.65878
295	B	553	0.01339	0.67217
296	B	509	0.01232	0.68449
297	B	552	0.01336	0.69786
298	B	489	0.01184	0.70970
299	B	741	0.01794	0.72764
300	P	235	0.00569	0.73333
301	P	490	0.01186	0.74519
302	P	441	0.01068	0.75587
303	P	478	0.01157	0.76744
304	P	445	0.01077	0.77822
305	P	445	0.01077	0.78899
306	P	439	0.01063	0.79962
307	P	389	0.00942	0.80904
308	P	371	0.00898	0.81802
309	P	359	0.00869	0.82672
310	P	362	0.00876	0.83548
311	P	391	0.00947	0.84495
312	P	330	0.00799	0.85294
313	P	325	0.00787	0.86081
314	P	330	0.00799	0.86880
315	P	317	0.00768	0.87647
316	P	281	0.00680	0.88327
317	P	270	0.00654	0.88981
318	P	263	0.00637	0.89618
319	P	238	0.00576	0.90194
320	P	230	0.00557	0.90751
321	P	260	0.00630	0.91381
322	P	245	0.00593	0.91974
323	P	211	0.00511	0.92485
324	P	200	0.00484	0.92969
325	P	211	0.00511	0.93480
326	P	192	0.00465	0.93945
327	P	163	0.00395	0.94339
328	P	176	0.00426	0.94765
329	P	195	0.00472	0.95238
330	A	111	0.00269	0.95506
331	A	151	0.00366	0.95872
332	A	152	0.00368	0.96240
333	A	118	0.00286	0.96526

Table 2.2.10 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 6

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
334	A	121	0.00293	0.96819
335	A	112	0.00271	0.97090
336	A	104	0.00252	0.97342
337	A	102	0.00247	0.97588
338	A	86	0.00208	0.97797
339	A	87	0.00211	0.98007
340	A	76	0.00184	0.98191
341	A	66	0.00160	0.98351
342	A	73	0.00177	0.98528
343	A	69	0.00167	0.98695
344	A	70	0.00169	0.98864
345	A	39	0.00094	0.98959
346	A	41	0.00099	0.99058
347	A	51	0.00123	0.99182
348	A	55	0.00133	0.99315
349	A	18	0.00044	0.99358
350	A	38	0.00092	0.99450
351	A	43	0.00104	0.99555
352	A	4	0.00010	0.99564
353	A	23	0.00056	0.99620
354	A	7	0.00017	0.99637
355	A	18	0.00044	0.99680
356	A	42	0.00102	0.99782
357	A	23	0.00056	0.99838
359	A	5	0.00012	0.99850
360	A	4	0.00010	0.99860
399	A	58	0.00140	1.00000

Table 2.2.11
Cumulative Scale Score Distribution
Mathematics Grade 7

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
231	BB	6	0.00014	0.00014
232	BB	12	0.00028	0.00042
233	BB	37	0.00087	0.00129
234	BB	65	0.00152	0.00281
235	BB	61	0.00143	0.00423
236	BB	90	0.00211	0.00634
237	BB	117	0.00274	0.00908
238	BB	147	0.00344	0.01252
239	BB	179	0.00419	0.01670
240	BB	209	0.00489	0.02159
241	BB	222	0.00519	0.02679
242	BB	246	0.00576	0.03254
243	BB	263	0.00615	0.03870
244	BB	288	0.00674	0.04544
245	BB	320	0.00749	0.05292
246	BB	296	0.00693	0.05985
247	BB	325	0.00760	0.06745
248	BB	347	0.00812	0.07557
249	BB	373	0.00873	0.08430
250	BB	369	0.00863	0.09293
251	BB	392	0.00917	0.10210
252	BB	392	0.00917	0.11127
253	BB	428	0.01001	0.12129
254	BB	447	0.01046	0.13174
255	BB	437	0.01022	0.14197
256	BB	467	0.01093	0.15289
257	BB	449	0.01050	0.16340
258	BB	479	0.01121	0.17461
259	BB	504	0.01179	0.18640
260	BB	525	0.01228	0.19868
261	BB	496	0.01160	0.21028
262	BB	498	0.01165	0.22194
263	BB	506	0.01184	0.23377
264	BB	548	0.01282	0.24660
265	BB	543	0.01270	0.25930
266	BB	504	0.01179	0.27109
267	BB	550	0.01287	0.28396
268	BB	591	0.01383	0.29779
269	BB	581	0.01359	0.31138
270	BB	529	0.01238	0.32376

Table 2.2.11 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 7

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
271	BB	556	0.01301	0.33676
272	BB	563	0.01317	0.34994
273	BB	546	0.01277	0.36271
274	BB	592	0.01385	0.37656
275	BB	629	0.01472	0.39128
276	BB	581	0.01359	0.40487
277	BB	635	0.01486	0.41973
278	BB	413	0.00966	0.42939
279	B	772	0.01806	0.44745
280	B	584	0.01366	0.46112
281	B	631	0.01476	0.47588
282	B	596	0.01394	0.48982
283	B	595	0.01392	0.50374
284	B	614	0.01437	0.51811
285	B	625	0.01462	0.53273
286	B	571	0.01336	0.54609
287	B	598	0.01399	0.56008
288	B	563	0.01317	0.57325
289	B	572	0.01338	0.58664
290	B	618	0.01446	0.60109
291	B	593	0.01387	0.61497
292	B	601	0.01406	0.62903
293	B	550	0.01287	0.64190
294	B	565	0.01322	0.65512
295	B	573	0.01341	0.66852
296	B	530	0.01240	0.68092
297	B	622	0.01455	0.69548
298	B	513	0.01200	0.70748
299	B	732	0.01713	0.72460
300	P	210	0.00491	0.72952
301	P	493	0.01153	0.74105
302	P	482	0.01128	0.75233
303	P	471	0.01102	0.76335
304	P	476	0.01114	0.77448
305	P	473	0.01107	0.78555
306	P	479	0.01121	0.79676
307	P	419	0.00980	0.80656
308	P	411	0.00962	0.81618
309	P	427	0.00999	0.82617
310	P	383	0.00896	0.83513

Table 2.2.11 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 7

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
311	P	351	0.00821	0.84334
312	P	377	0.00882	0.85216
313	P	398	0.00931	0.86147
314	P	350	0.00819	0.86966
315	P	304	0.00711	0.87677
316	P	313	0.00732	0.88410
317	P	315	0.00737	0.89147
318	P	310	0.00725	0.89872
319	P	314	0.00735	0.90606
320	P	283	0.00662	0.91269
321	P	238	0.00557	0.91825
322	P	271	0.00634	0.92459
323	P	234	0.00547	0.93007
324	P	241	0.00564	0.93571
325	P	217	0.00508	0.94078
326	P	194	0.00454	0.94532
327	P	188	0.00440	0.94972
328	P	176	0.00412	0.95384
329	A	151	0.00353	0.95737
330	A	146	0.00342	0.96079
331	A	149	0.00349	0.96427
332	A	137	0.00321	0.96748
333	A	142	0.00332	0.97080
334	A	114	0.00267	0.97347
335	A	117	0.00274	0.97621
336	A	107	0.00250	0.97871
337	A	93	0.00218	0.98089
338	A	68	0.00159	0.98248
339	A	82	0.00192	0.98439
340	A	76	0.00178	0.98617
341	A	41	0.00096	0.98713
342	A	56	0.00131	0.98844
343	A	60	0.00140	0.98985
344	A	37	0.00087	0.99071
345	A	47	0.00110	0.99181
346	A	45	0.00105	0.99286
347	A	27	0.00063	0.99350
348	A	23	0.00054	0.99403
349	A	31	0.00073	0.99476
350	A	23	0.00054	0.99530

Table 2.2.11 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 7

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
351	A	28	0.00066	0.99595
352	A	28	0.00066	0.99661
353	A	15	0.00035	0.99696
354	A	13	0.00030	0.99726
355	A	23	0.00054	0.99780
356	A	14	0.00033	0.99813
357	A	7	0.00016	0.99829
358	A	5	0.00012	0.99841
359	A	11	0.00026	0.99867
360	A	7	0.00016	0.99883
361	A	8	0.00019	0.99902
362	A	5	0.00012	0.99913
399	A	37	0.00087	1.00000

Table 2.2.12
Cumulative Scale Score Distribution
Mathematics Grade 8

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
215	BB	6	0.00014	0.00014
216	BB	23	0.00052	0.00065
217	BB	29	0.00065	0.00131
218	BB	51	0.00115	0.00246
219	BB	78	0.00176	0.00422
220	BB	116	0.00262	0.00684
221	BB	133	0.00300	0.00984
222	BB	164	0.00370	0.01354
223	BB	192	0.00433	0.01787
224	BB	222	0.00501	0.02288
225	BB	218	0.00492	0.02780
226	BB	247	0.00557	0.03337
227	BB	277	0.00625	0.03962
228	BB	308	0.00695	0.04657
229	BB	310	0.00699	0.05356
230	BB	368	0.00830	0.06186
231	BB	363	0.00819	0.07005
232	BB	359	0.00810	0.07815
233	BB	405	0.00914	0.08729
234	BB	386	0.00871	0.09600
235	BB	442	0.00997	0.10597
236	BB	403	0.00909	0.11506
237	BB	456	0.01029	0.12535
238	BB	444	0.01002	0.13537
239	BB	454	0.01024	0.14561
240	BB	451	0.01018	0.15579
241	BB	444	0.01002	0.16581
242	BB	481	0.01085	0.17666
243	BB	459	0.01036	0.18701
244	BB	497	0.01121	0.19823
245	BB	507	0.01144	0.20967
246	BB	489	0.01103	0.22070
247	BB	463	0.01045	0.23114
248	BB	437	0.00986	0.24100
249	BB	471	0.01063	0.25163
250	BB	480	0.01083	0.26246
251	BB	523	0.01180	0.27426
252	BB	469	0.01058	0.28484
253	BB	514	0.01160	0.29644
254	BB	472	0.01065	0.30709

Table 2.2.12 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 8

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
255	BB	504	0.01137	0.31846
256	BB	518	0.01169	0.33014
257	BB	498	0.01124	0.34138
258	BB	513	0.01157	0.35295
259	BB	500	0.01128	0.36424
260	BB	514	0.01160	0.37583
261	BB	520	0.01173	0.38756
262	BB	507	0.01144	0.39900
263	BB	599	0.01351	0.41252
264	BB	517	0.01166	0.42418
265	BB	489	0.01103	0.43521
266	BB	560	0.01263	0.44785
267	BB	542	0.01223	0.46008
268	BB	516	0.01164	0.47172
269	BB	537	0.01212	0.48383
270	BB	558	0.01259	0.49642
271	BB	538	0.01214	0.50856
272	BB	577	0.01302	0.52158
273	BB	494	0.01115	0.53273
274	BB	543	0.01225	0.54498
275	BB	605	0.01365	0.55863
276	BB	344	0.00776	0.56639
277	B	818	0.01846	0.58484
278	B	552	0.01245	0.59730
279	B	558	0.01259	0.60989
280	B	568	0.01282	0.62270
281	B	566	0.01277	0.63547
282	B	550	0.01241	0.64788
283	B	535	0.01207	0.65995
284	B	584	0.01318	0.67313
285	B	515	0.01162	0.68475
286	B	545	0.01230	0.69704
287	B	476	0.01074	0.70778
288	B	495	0.01117	0.71895
289	B	518	0.01169	0.73064
290	B	494	0.01115	0.74178
291	B	467	0.01054	0.75232
292	B	489	0.01103	0.76335
293	B	435	0.00981	0.77317
294	B	425	0.00959	0.78275

Table 2.2.12 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 8

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
295	B	459	0.01036	0.79311
296	B	437	0.00986	0.80297
297	B	411	0.00927	0.81224
298	B	394	0.00889	0.82113
299	B	607	0.01369	0.83483
300	P	188	0.00424	0.83907
301	P	366	0.00826	0.84733
302	P	347	0.00783	0.85515
303	P	360	0.00812	0.86328
304	P	322	0.00726	0.87054
305	P	313	0.00706	0.87760
306	P	310	0.00699	0.88460
307	P	296	0.00668	0.89128
308	P	283	0.00638	0.89766
309	P	268	0.00605	0.90371
310	P	245	0.00553	0.90923
311	P	263	0.00593	0.91517
312	P	259	0.00584	0.92101
313	P	233	0.00526	0.92627
314	P	226	0.00510	0.93137
315	P	213	0.00481	0.93617
316	A	134	0.00302	0.93920
317	A	183	0.00413	0.94333
318	A	197	0.00444	0.94777
319	A	180	0.00406	0.95183
320	A	161	0.00363	0.95546
321	A	148	0.00334	0.95880
322	A	137	0.00309	0.96189
323	A	137	0.00309	0.96498
324	A	121	0.00273	0.96771
325	A	97	0.00219	0.96990
326	A	104	0.00235	0.97225
327	A	105	0.00237	0.97462
328	A	86	0.00194	0.97656
329	A	75	0.00169	0.97825
330	A	100	0.00226	0.98051
331	A	69	0.00156	0.98206
332	A	77	0.00174	0.98380
333	A	68	0.00153	0.98533
334	A	72	0.00162	0.98696

Table 2.2.12 (continued)
Cumulative Scale Score Distribution
Mathematics Grade 8

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
335	A	50	0.00113	0.98809
336	A	54	0.00122	0.98931
337	A	52	0.00117	0.99048
338	A	34	0.00077	0.99125
339	A	38	0.00086	0.99210
340	A	33	0.00074	0.99285
341	A	35	0.00079	0.99364
342	A	28	0.00063	0.99427
343	A	21	0.00047	0.99474
344	A	32	0.00072	0.99547
345	A	14	0.00032	0.99578
346	A	23	0.00052	0.99630
347	A	18	0.00041	0.99671
348	A	18	0.00041	0.99711
349	A	18	0.00041	0.99752
350	A	11	0.00025	0.99777
351	A	9	0.00020	0.99797
352	A	14	0.00032	0.99829
353	A	16	0.00036	0.99865
355	A	7	0.00016	0.99880
356	A	19	0.00043	0.99923
357	A	13	0.00029	0.99953
399	A	21	0.00047	1.00000

Table 2.2.13
Cumulative Scale Score Distribution
Science Grade 5

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
227	BB	1	0.00002	0.00002
229	BB	9	0.00022	0.00025
230	BB	4	0.00010	0.00034
231	BB	7	0.00017	0.00052
232	BB	13	0.00032	0.00084
233	BB	16	0.00039	0.00123
234	BB	26	0.00064	0.00187
235	BB	32	0.00079	0.00266
236	BB	34	0.00084	0.00349
237	BB	50	0.00123	0.00472
238	BB	60	0.00148	0.00620
239	BB	77	0.00189	0.00809
240	BB	86	0.00212	0.01021
241	BB	87	0.00214	0.01235
242	BB	115	0.00283	0.01518
243	BB	115	0.00283	0.01801
244	BB	130	0.00320	0.02120
245	BB	138	0.00339	0.02460
246	BB	143	0.00352	0.02812
247	BB	174	0.00428	0.03240
248	BB	158	0.00389	0.03628
249	BB	197	0.00485	0.04113
250	BB	188	0.00462	0.04575
251	BB	174	0.00428	0.05003
252	BB	212	0.00521	0.05525
253	BB	211	0.00519	0.06044
254	BB	205	0.00504	0.06548
255	BB	235	0.00578	0.07126
256	BB	274	0.00674	0.07800
257	BB	245	0.00603	0.08403
258	BB	278	0.00684	0.09087
259	BB	246	0.00605	0.09692
260	BB	287	0.00706	0.10398
261	BB	295	0.00726	0.11123
262	BB	288	0.00708	0.11832
263	BB	348	0.00856	0.12688
264	BB	316	0.00777	0.13465
265	BB	325	0.00799	0.14265
266	BB	381	0.00937	0.15202
267	BB	347	0.00854	0.16055

Table 2.2.13 (continued)
Cumulative Scale Score Distribution
Science Grade 5

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
268	BB	370	0.00910	0.16966
269	BB	398	0.00979	0.17945
270	BB	394	0.00969	0.18914
271	BB	506	0.01245	0.20158
272	B	290	0.00713	0.20872
273	B	428	0.01053	0.21925
274	B	413	0.01016	0.22940
275	B	458	0.01127	0.24067
276	B	452	0.01112	0.25179
277	B	483	0.01188	0.26367
278	B	529	0.01301	0.27668
279	B	489	0.01203	0.28871
280	B	568	0.01397	0.30268
281	B	559	0.01375	0.31643
282	B	555	0.01365	0.33009
283	B	551	0.01355	0.34364
284	B	580	0.01427	0.35791
285	B	537	0.01321	0.37112
286	B	566	0.01392	0.38504
287	B	565	0.01390	0.39894
288	B	601	0.01478	0.41372
289	B	624	0.01535	0.42907
290	B	611	0.01503	0.44410
291	B	646	0.01589	0.45999
292	B	624	0.01535	0.47534
293	B	624	0.01535	0.49069
294	B	665	0.01636	0.50705
295	B	605	0.01488	0.52193
296	B	665	0.01636	0.53829
297	B	663	0.01631	0.55460
298	B	687	0.01690	0.57150
299	B	983	0.02418	0.59568
300	P	322	0.00792	0.60360
301	P	617	0.01518	0.61877
302	P	571	0.01405	0.63282
303	P	682	0.01678	0.64960
304	P	598	0.01471	0.66431
305	P	578	0.01422	0.67852
306	P	534	0.01314	0.69166
307	P	611	0.01503	0.70669

Table 2.2.13 (continued)
Cumulative Scale Score Distribution
Science Grade 5

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
308	P	562	0.01382	0.72051
309	P	570	0.01402	0.73453
310	P	536	0.01318	0.74772
311	P	525	0.01291	0.76063
312	P	492	0.01210	0.77274
313	P	504	0.01240	0.78513
314	P	460	0.01132	0.79645
315	P	468	0.01151	0.80796
316	P	469	0.01154	0.81950
317	P	449	0.01104	0.83054
318	P	406	0.00999	0.84053
319	P	392	0.00964	0.85017
320	P	375	0.00922	0.85940
321	P	401	0.00986	0.86926
322	P	339	0.00834	0.87760
323	P	361	0.00888	0.88648
324	P	305	0.00750	0.89398
325	P	314	0.00772	0.90170
326	P	270	0.00664	0.90835
327	P	326	0.00802	0.91637
328	P	258	0.00635	0.92271
329	P	339	0.00834	0.93105
330	A	201	0.00494	0.93599
331	A	220	0.00541	0.94141
332	A	209	0.00514	0.94655
333	A	184	0.00453	0.95107
334	A	193	0.00475	0.95582
335	A	170	0.00418	0.96000
336	A	163	0.00401	0.96401
337	A	138	0.00339	0.96741
338	A	144	0.00354	0.97095
339	A	125	0.00307	0.97402
340	A	125	0.00307	0.97710
341	A	110	0.00271	0.97980
342	A	101	0.00248	0.98229
343	A	90	0.00221	0.98450
344	A	71	0.00175	0.98625
345	A	61	0.00150	0.98775
346	A	61	0.00150	0.98925
347	A	46	0.00113	0.99038

Table 2.2.13 (continued)
Cumulative Scale Score Distribution
Science Grade 5

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
348	A	42	0.00103	0.99142
349	A	51	0.00125	0.99267
350	A	30	0.00074	0.99341
351	A	34	0.00084	0.99424
352	A	45	0.00111	0.99535
353	A	31	0.00076	0.99611
354	A	34	0.00084	0.99695
355	A	13	0.00032	0.99727
356	A	19	0.00047	0.99774
357	A	8	0.00020	0.99793
358	A	21	0.00052	0.99845
359	A	30	0.00074	0.99919
399	A	33	0.00081	1.00000

Table 2.2.14
Cumulative Scale Score Distribution
Science Grade 8

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
229	BB	1	0.00002	0.00002
230	BB	1	0.00002	0.00004
231	BB	3	0.00007	0.00011
232	BB	3	0.00007	0.00018
233	BB	2	0.00004	0.00022
234	BB	5	0.00011	0.00034
235	BB	9	0.00020	0.00054
236	BB	8	0.00018	0.00072
237	BB	8	0.00018	0.00089
238	BB	15	0.00034	0.00123
239	BB	17	0.00038	0.00161
240	BB	34	0.00076	0.00237
241	BB	32	0.00072	0.00308
242	BB	27	0.00060	0.00369
243	BB	48	0.00107	0.00476
244	BB	55	0.00123	0.00599
245	BB	55	0.00123	0.00722
246	BB	63	0.00141	0.00863
247	BB	98	0.00219	0.01082
248	BB	105	0.00235	0.01316
249	BB	121	0.00270	0.01587
250	BB	145	0.00324	0.01911
251	BB	157	0.00351	0.02262
252	BB	188	0.00420	0.02682
253	BB	205	0.00458	0.03140
254	BB	216	0.00483	0.03623
255	BB	234	0.00523	0.04146
256	BB	259	0.00579	0.04725
257	BB	274	0.00612	0.05337
258	BB	271	0.00606	0.05943
259	BB	306	0.00684	0.06627
260	BB	344	0.00769	0.07396
261	BB	340	0.00760	0.08156
262	BB	356	0.00796	0.08952
263	BB	369	0.00825	0.09776
264	BB	424	0.00948	0.10724
265	BB	428	0.00957	0.11681
266	BB	445	0.00995	0.12675
267	BB	447	0.00999	0.13674
268	BB	506	0.01131	0.14805

Table 2.2.14 (continued)
Cumulative Scale Score Distribution
Science Grade 8

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
269	BB	512	0.01144	0.15950
270	BB	481	0.01075	0.17025
271	BB	552	0.01234	0.18258
272	BB	528	0.01180	0.19439
273	BB	556	0.01243	0.20681
274	BB	559	0.01249	0.21931
275	BB	598	0.01337	0.23267
276	BB	589	0.01316	0.24584
277	BB	624	0.01395	0.25978
278	BB	720	0.01609	0.27588
279	B	544	0.01216	0.28804
280	B	656	0.01466	0.30270
281	B	672	0.01502	0.31772
282	B	644	0.01439	0.33211
283	B	682	0.01524	0.34735
284	B	682	0.01524	0.36260
285	B	712	0.01591	0.37851
286	B	702	0.01569	0.39420
287	B	699	0.01562	0.40983
288	B	740	0.01654	0.42637
289	B	705	0.01576	0.44212
290	B	703	0.01571	0.45784
291	B	769	0.01719	0.47502
292	B	672	0.01502	0.49004
293	B	709	0.01585	0.50589
294	B	731	0.01634	0.52223
295	B	689	0.01540	0.53763
296	B	707	0.01580	0.55343
297	B	703	0.01571	0.56914
298	B	650	0.01453	0.58367
299	B	965	0.02157	0.60524
300	P	322	0.00720	0.61244
301	P	662	0.01480	0.62723
302	P	598	0.01337	0.64060
303	P	641	0.01433	0.65493
304	P	615	0.01375	0.66867
305	P	611	0.01366	0.68233
306	P	595	0.01330	0.69563
307	P	611	0.01366	0.70928
308	P	607	0.01357	0.72285

Table 2.2.14 (continued)
Cumulative Scale Score Distribution
Science Grade 8

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
309	P	568	0.01270	0.73554
310	P	588	0.01314	0.74869
311	P	557	0.01245	0.76114
312	P	554	0.01238	0.77352
313	P	517	0.01156	0.78507
314	P	526	0.01176	0.79683
315	P	515	0.01151	0.80834
316	P	493	0.01102	0.81936
317	P	489	0.01093	0.83029
318	P	452	0.01010	0.84039
319	P	423	0.00945	0.84985
320	P	432	0.00966	0.85950
321	P	437	0.00977	0.86927
322	P	409	0.00914	0.87841
323	P	384	0.00858	0.88699
324	P	377	0.00843	0.89542
325	P	344	0.00769	0.90311
326	P	344	0.00769	0.91080
327	P	323	0.00722	0.91802
328	P	311	0.00695	0.92497
329	P	207	0.00463	0.92959
330	A	274	0.00612	0.93572
331	A	234	0.00523	0.94095
332	A	243	0.00543	0.94638
333	A	223	0.00498	0.95136
334	A	219	0.00489	0.95626
335	A	185	0.00413	0.96039
336	A	155	0.00346	0.96386
337	A	170	0.00380	0.96766
338	A	178	0.00398	0.97164
339	A	152	0.00340	0.97503
340	A	127	0.00284	0.97787
341	A	95	0.00212	0.98000
342	A	111	0.00248	0.98248
343	A	108	0.00241	0.98489
344	A	66	0.00148	0.98637
345	A	69	0.00154	0.98791
346	A	85	0.00190	0.98981
347	A	56	0.00125	0.99106
348	A	53	0.00118	0.99224

Table 2.2.14 (continued)
Cumulative Scale Score Distribution
Science Grade 8

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
349	A	40	0.00089	0.99314
350	A	53	0.00118	0.99432
351	A	38	0.00085	0.99517
352	A	38	0.00085	0.99602
353	A	27	0.00060	0.99663
354	A	18	0.00040	0.99703
355	A	16	0.00036	0.99738
356	A	21	0.00047	0.99785
357	A	28	0.00063	0.99848
358	A	18	0.00040	0.99888
359	A	6	0.00013	0.99902
360	A	7	0.00016	0.99917
361	A	17	0.00038	0.99955
362	A	6	0.00013	0.99969
399	A	14	0.00031	1.00000

Section 2.3

Tabled Delta Analysis Results

Table 2.3.1
Delta Analysis
English Language Arts Grade 3

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
147341A	0.75000	0.76000	10.30204	10.17479	1	False	0.04575
147348A	0.57000	0.68000	12.29450	11.12920	1	False	2.96932
155274A	0.76000	0.74000	10.17479	10.42662	1	False	-0.83717
155277A	0.49000	0.51000	13.10028	12.89972	1	False	-0.40905
155278A	0.74000	0.67000	10.42662	11.24035	1	False	1.07639
155279A	0.62000	0.63000	11.77808	11.67259	1	False	-0.39320
155282A	0.58000	0.59000	12.19243	12.08982	1	False	-0.50580
155283A	0.67000	0.68000	11.24035	11.12920	1	False	-0.24078
156120A	0.67000	0.68000	11.24035	11.12920	1	False	-0.24078
156121A	0.62000	0.61000	11.77808	11.88272	1	False	-0.92306
156123A	0.49000	0.46000	13.10028	13.40173	1	False	0.05423
156124A	0.74000	0.75000	10.42662	10.30204	1	False	0.00594
156126A	0.46000	0.46000	13.40173	13.40173	1	False	-0.86377
482316	0.62000	0.63000	11.77808	11.67259	1	False	-0.39320
482318	0.49000	0.54000	13.10028	12.59827	1	False	0.58396
482867	0.36000	0.39000	14.43384	14.11728	1	False	-0.35874
484541	0.85000	0.76000	8.85427	10.17479	1	False	2.35455
484543	0.24000	0.27000	15.82521	15.45125	1	False	-0.51586
484569	0.58000	0.60000	12.19243	11.98661	1	False	-0.16583
484571	0.29000	0.31000	15.21354	14.98340	1	False	-0.83741
484575	0.59000	0.57000	12.08982	12.29450	1	False	-0.51597
484577	0.44000	0.40000	13.60388	14.01339	1	False	0.53546
484579	0.46000	0.45000	13.40173	13.50265	1	False	-0.53137
484581	0.39000	0.38000	14.11728	14.22192	1	False	-0.34102
627921	0.34000	0.28500	14.64985	15.27221	2	False	1.49682
628643	0.43000	0.43000	13.70550	13.70550	1	False	-0.78819
628709	0.84000	0.72000	9.02217	10.66863	1	True	3.46998
628734	0.59000	0.60000	12.08982	11.98661	1	False	-0.47828
628835	0.34000	0.28500	14.64985	15.27221	2	False	1.49682
701185	0.59000	0.62000	12.08982	11.77808	1	False	0.20863
701219	0.26000	0.30000	15.57338	15.09760	1	False	-0.11780
701289	0.37000	0.36000	14.32741	14.43384	1	False	-0.28289
705924	0.71000	0.69000	10.78646	11.01660	1	False	-0.75643
715595	0.61000	0.60000	11.88272	11.98661	1	False	-0.89952
758779	0.62000	0.63000	11.77808	11.67259	1	False	-0.39320

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
759133	0.54000	0.56000	12.59827	12.39612	1	False	-0.27890
759149	0.51000	0.50000	12.89972	13.00000	1	False	-0.65837
759159	0.60000	0.60000	11.98661	11.98661	1	False	-0.79257
765883	0.58000	0.56000	12.19243	12.39612	1	False	-0.49369
799386	0.58000	0.62000	12.19243	11.77808	1	False	0.52109
799388	0.39000	0.49000	14.11728	13.10028	1	False	2.02729
799392	0.49000	0.51000	13.10028	12.89972	1	False	-0.40905
799395	0.37000	0.39000	14.32741	14.11728	1	False	-0.68281
799397	0.83000	0.83000	9.18334	9.18334	1	False	-0.09506
802056	0.46000	0.41000	13.40173	13.91018	1	False	0.81105
802069	0.72000	0.69000	10.66863	11.01660	1	False	-0.39762
802248	0.70000	0.69000	10.90240	11.01660	1	False	-0.89898
802262	0.53000	0.55000	12.69892	12.49735	1	False	-0.30585
802414	0.39000	0.37000	14.11728	14.32741	1	False	0.00646
802422	0.44000	0.45000	13.60388	13.50265	1	False	-0.86152

Table 2.3.2
Delta Analysis
English Language Arts Grade 4

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
146887A	0.58000	0.54000	12.19243	12.59827	1	False	0.09756
148685A	0.52000	0.44000	12.79939	13.60388	1	False	1.42367
148686A	0.53000	0.48000	12.69892	13.20061	1	False	0.44140
148719A	0.45000	0.46000	13.50265	13.40173	1	False	-0.58197
148754A	0.66000	0.69000	11.35015	11.01660	1	False	0.31649
148938A	0.81000	0.81000	9.48841	9.48841	1	False	-0.62887
149114A	0.76000	0.75000	10.17479	10.30204	1	False	-0.93956
149115A	0.44000	0.44000	13.60388	13.60388	1	False	-0.91402
155473A	0.56000	0.49000	12.39612	13.10028	1	False	1.07254
155490A	0.51000	0.52000	12.89972	12.79939	1	False	-0.54204
155569A	0.61000	0.58000	11.88272	12.19243	1	False	-0.23355
155571A	0.73000	0.70000	10.54875	10.90240	1	False	-0.18443
155572A	0.74000	0.76000	10.42662	10.17479	1	False	0.11726
155580A	0.68000	0.70000	11.12920	10.90240	1	False	-0.01201
158587A	0.57000	0.57000	12.29450	12.29450	1	False	-0.82330
158589A	0.69000	0.68000	11.01660	11.12920	1	False	-0.92841
158602A	0.51000	0.52000	12.89972	12.79939	1	False	-0.54204
158604A	0.73000	0.73000	10.54875	10.54875	1	False	-0.70234
158611A	0.63000	0.62000	11.67259	11.77808	1	False	-0.90588
158691A	0.84000	0.84000	9.02217	9.02217	1	False	-0.59657
158692A	0.48000	0.49000	13.20061	13.10028	1	False	-0.56289
186016A	0.66000	0.68000	11.35015	11.12920	1	False	-0.04621
186018A	0.27000	0.25000	15.45125	15.69796	1	False	-0.18921
483086	0.56000	0.58000	12.39612	12.19243	1	False	-0.17423
484626	0.68000	0.65000	11.12920	11.45872	1	False	-0.22195
484628	0.75000	0.75000	10.30204	10.30204	1	False	-0.68524
484632	0.62000	0.60000	11.77808	11.98661	1	False	-0.56666
484636	0.58000	0.60000	12.19243	11.98661	1	False	-0.15330
484638	0.63000	0.63000	11.67259	11.67259	1	False	-0.78020
484640	0.32000	0.43000	14.87080	13.70550	1	False	2.75162
484648	0.64000	0.49000	11.56616	13.10028	1	True	3.68832
484650	0.59000	0.58000	12.08982	12.19243	1	False	-0.88626
484722	0.64000	0.67000	11.56616	11.24035	1	False	0.27662
485159	0.71000	0.67000	10.78646	11.24035	1	False	0.15491
485165	0.51000	0.48000	12.89972	13.20061	1	False	-0.19147

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
485172	0.58000	0.64000	12.19243	11.56616	1	False	1.20096
629160	0.38500	0.37000	14.16950	14.32741	2	False	-0.56402
635510	0.81000	0.71000	9.48841	10.78646	1	False	2.78400
635527	0.65000	0.63000	11.45872	11.67259	1	False	-0.57161
635530	0.65000	0.67000	11.45872	11.24035	1	False	-0.06202
635757	0.94000	0.91000	6.78091	7.63698	1	False	1.17282
702458	0.62000	0.66000	11.77808	11.35015	1	False	0.59084
702895	0.32000	0.32000	14.87080	14.87080	1	False	-1.00180
702920	0.63000	0.62000	11.67259	11.77808	1	False	-0.90588
702924	0.77000	0.80000	10.04461	9.63352	1	False	0.65673
799478	0.67000	0.70000	11.24035	10.90240	1	False	0.33828
799480	0.43000	0.45000	13.70550	13.50265	1	False	-0.26768
799483	0.85000	0.87000	8.85427	8.49444	1	False	0.57408
799497	0.50000	0.48000	13.00000	13.20061	1	False	-0.50751
799500	0.38500	0.39000	14.16950	14.11728	2	False	-0.78500

Table 2.3.3
Delta Analysis
English Language Arts Grade 5

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
147920A	0.83000	0.83000	9.18334	9.18334	1	False	-0.39413
147921A	0.66000	0.68000	11.35015	11.12920	1	False	-0.11134
147923A	0.67000	0.67000	11.24035	11.24035	1	False	-0.31067
147924A	0.70000	0.72000	10.90240	10.66863	1	False	-0.11819
147926A	0.57000	0.57000	12.29450	12.29450	1	False	-0.26789
147969A	0.80000	0.81000	9.63352	9.48841	1	False	-0.24788
148893A	0.71000	0.68000	10.78646	11.12920	1	False	-0.31137
148900A	0.69000	0.65000	11.01660	11.45872	1	False	-0.23306
148906A	0.88000	0.89000	8.30005	8.09389	1	False	-0.24813
148961A	0.71000	0.72000	10.78646	10.66863	1	False	-0.22516
148963A	0.80000	0.78000	9.63352	9.91123	1	False	-0.32195
148967A	0.79000	0.79000	9.77432	9.77432	1	False	-0.37015
148971A	0.64000	0.65000	11.56616	11.45872	1	False	-0.20268
149152A	0.86000	0.86000	8.67872	8.67872	1	False	-0.41461
149158A	0.54000	0.53000	12.59827	12.69892	1	False	-0.34435
149196A	0.72000	0.69000	10.66863	11.01660	1	False	-0.30199
149318A	0.64000	0.65000	11.56616	11.45872	1	False	-0.20268
149321A	0.67000	0.62000	11.24035	11.77808	1	False	-0.15781
149330A	0.78000	0.78000	9.91123	9.91123	1	False	-0.36460
149339A	0.56000	0.61000	12.39612	11.88272	1	False	0.18906
158749A	0.55000	0.59000	12.49735	12.08982	1	False	0.09979
159151A	0.66000	0.61000	11.35015	11.88272	1	False	-0.16681
159165A	0.63000	0.61000	11.67259	11.88272	1	False	-0.46429
159368A	0.61000	0.55000	11.88272	12.49735	1	False	-0.11605
159475A	0.79000	0.70000	9.77432	10.90240	1	False	0.42238
159592A	0.66000	0.67000	11.35015	11.24035	1	False	-0.20936
159600A	0.87000	0.89000	8.49444	8.09389	1	False	-0.06879
160682A	0.68000	0.64000	11.12920	11.56616	1	False	-0.24218
186469A	0.37000	0.37000	14.32741	14.32741	1	False	-0.18540
186471A	0.88000	0.89000	8.30005	8.09389	1	False	-0.24813
186474A	0.52000	0.56000	12.79939	12.39612	1	False	0.10828
186476A	0.57000	0.58000	12.29450	12.19243	1	False	-0.17786
483144	0.81000	0.84000	9.48841	9.02217	1	False	0.02949
483150	0.67000	0.66000	11.24035	11.35015	1	False	-0.40751
483162	0.95000	0.95000	6.42059	6.42059	1	False	-0.43653

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
483170	0.88000	0.91000	8.30005	7.63698	1	False	0.15487
630607	0.94000	0.31000	6.78091	14.98340	1	True	6.78360
630655	0.76000	0.66000	10.17479	11.35015	1	False	0.44783
631955	0.83000	0.81000	9.18334	9.48841	1	False	-0.27955
631981	0.57000	0.59000	12.29450	12.08982	1	False	-0.08736
631995	0.61000	0.50000	11.88272	13.00000	1	False	0.32730
632263	0.86000	0.87000	8.67872	8.49444	1	False	-0.25206
632323	0.57000	0.55000	12.29450	12.49735	1	False	-0.44681
761740	0.39200	0.44200	14.09644	13.58360	5	False	0.25756
799549	0.70000	0.72000	10.90240	10.66863	1	False	-0.11819
799562	0.67000	0.68000	11.24035	11.12920	1	False	-0.21264
799574	0.60000	0.60000	11.98661	11.98661	1	False	-0.28039
799579	0.89000	0.91000	8.09389	7.63698	1	False	-0.03534
799588	0.66000	0.69000	11.35015	11.01660	1	False	-0.01201
799592	0.58000	0.62000	12.19243	11.77808	1	False	0.09343
799594	0.61000	0.71000	11.88272	10.78646	1	False	0.68232

Table 2.3.4
Delta Analysis
English Language Arts Grade 6

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
147260A	0.53000	0.47000	12.69892	13.30108	1	False	0.45950
147261A	0.87000	0.76000	8.49444	10.17479	1	False	2.94291
147283A	0.71000	0.69000	10.78646	11.01660	1	False	-0.68055
147289A	0.66000	0.67000	11.35015	11.24035	1	False	0.39404
147290A	0.67000	0.65000	11.24035	11.45872	1	False	-0.80960
149570A	0.59000	0.61000	12.08982	11.88272	1	False	0.48026
149571A	0.59000	0.58000	12.08982	12.19243	1	False	-0.69530
158723A	0.80000	0.79000	9.63352	9.77432	1	False	0.09982
158740A	0.63000	0.62000	11.67259	11.77808	1	False	-0.54656
158747A	0.69000	0.67000	11.01660	11.24035	1	False	-0.74437
158777A	0.69000	0.65000	11.01660	11.45872	1	False	-0.79184
158780A	0.49000	0.47000	13.10028	13.30108	1	False	-0.91034
158886A	0.84000	0.82000	9.02217	9.33854	1	False	-0.33263
158935A	0.59000	0.61000	12.08982	11.88272	1	False	0.48026
158943A	0.40000	0.38000	14.01339	14.22192	1	False	-0.53152
158947A	0.60000	0.60000	11.98661	11.98661	1	False	-0.26633
159272A	0.87000	0.78000	8.49444	9.91123	1	False	1.94249
159273A	0.74000	0.66000	10.42662	11.35015	1	False	0.80968
159451A	0.74000	0.76000	10.42662	10.17479	1	False	1.28661
159453A	0.69000	0.67000	11.01660	11.24035	1	False	-0.74437
159454A	0.36000	0.35000	14.43384	14.54128	1	False	-0.75431
159457A	0.75000	0.75000	10.30204	10.30204	1	False	0.37840
159458A	0.64000	0.65000	11.56616	11.45872	1	False	0.30243
181888A	0.74000	0.64000	10.42662	11.56616	1	False	1.62963
181889A	0.72000	0.67000	10.66863	11.24035	1	False	-0.43311
181893A	0.57000	0.48000	12.29450	13.20061	1	False	1.45845
181904A	0.71000	0.57000	10.78646	12.29450	1	True	3.16607
485443	0.37000	0.38000	14.32741	14.22192	1	False	-0.76180
485688	0.73000	0.72000	10.54875	10.66863	1	False	-0.17108
485986	0.28000	0.27000	15.33137	15.45125	1	False	-0.36359
486369	0.64000	0.61000	11.56616	11.88272	1	False	-1.05810
486371	0.64000	0.60000	11.56616	11.98661	1	False	-0.66377
486376	0.66000	0.67000	11.35015	11.24035	1	False	0.39404
629854	0.30000	0.28000	15.09760	15.33137	1	False	-0.02080
629856	0.59000	0.57000	12.08982	12.29450	1	False	-1.08276

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
629863	0.60000	0.62000	11.98661	11.77808	1	False	0.52522
629867	0.75000	0.74000	10.30204	10.42662	1	False	-0.09446
629869	0.54000	0.52000	12.59827	12.79939	1	False	-1.10127
629885	0.53000	0.53000	12.69892	12.69892	1	False	-0.53895
629889	0.33000	0.34000	14.75965	14.64985	1	False	-0.91087
629891	0.45000	0.44000	13.50265	13.60388	1	False	-1.13429
629895	0.62000	0.60000	11.77808	11.98661	1	False	-0.97806
629898	0.35000	0.34000	14.54128	14.64985	1	False	-0.70892
630290	0.29500	0.29000	15.15534	15.21354	2	False	-0.66512
630430	0.16000	0.21000	16.97783	16.22568	2	False	0.67837
708956	0.61000	0.60000	11.88272	11.98661	1	False	-0.62090
709888	0.65000	0.65000	11.45872	11.45872	1	False	-0.06429
709904	0.68000	0.69000	11.12920	11.01660	1	False	0.48925
710081	0.52000	0.53000	12.79939	12.69892	1	False	-0.19605
710109	0.57000	0.48000	12.29450	13.20061	1	False	1.45845

Table 2.3.5
Delta Analysis
English Language Arts Grade 7

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
148117A	0.52000	0.54000	12.79939	12.59827	1	False	0.32594
148759A	0.56000	0.57000	12.39612	12.29450	1	False	0.18152
148760A	0.62000	0.59000	11.77808	12.08982	1	False	-0.97027
148762A	0.70000	0.68000	10.90240	11.12920	1	False	-0.20110
148785A	0.32000	0.32000	14.87080	14.87080	1	False	-0.36447
148823A	0.70000	0.67000	10.90240	11.24035	1	False	-0.62302
148850A	0.74000	0.72000	10.42662	10.66863	1	False	0.01643
148859A	0.83000	0.81000	9.18334	9.48841	1	False	0.49632
148861A	0.45000	0.46000	13.50265	13.40173	1	False	-0.46135
148866A	0.66000	0.64000	11.35015	11.56616	1	False	-0.41918
154639A	0.42000	0.41000	13.80757	13.91018	1	False	-0.59007
158719A	0.47000	0.46000	13.30108	13.40173	1	False	-0.89050
158724A	0.57000	0.53000	12.29450	12.69892	1	False	-0.31968
158765A	0.61000	0.62000	11.88272	11.77808	1	False	0.49003
158766A	0.64000	0.61000	11.56616	11.88272	1	False	-0.92584
158768A	0.91000	0.81000	7.63698	9.48841	1	False	2.47901
159120A	0.65000	0.63000	11.45872	11.67259	1	False	-0.47383
159122A	0.48000	0.44000	13.20061	13.60388	1	False	0.20016
159393A	0.31000	0.30000	14.98340	15.09760	1	False	0.13422
159394A	0.50000	0.50000	13.00000	13.00000	1	False	-0.55363
159646A	0.50000	0.48000	13.00000	13.20061	1	False	-0.68522
160475A	0.47000	0.45000	13.30108	13.50265	1	False	-0.50742
160508A	0.58000	0.60000	12.19243	11.98661	1	False	0.69492
160511A	0.52000	0.58000	12.79939	12.19243	1	False	1.86662
160937A	0.71000	0.71000	10.78646	10.78646	1	False	0.72700
160940A	0.80000	0.78000	9.63352	9.91123	1	False	0.33976
161009A	0.71000	0.71000	10.78646	10.78646	1	False	0.72700
161013A	0.75000	0.65000	10.30204	11.45872	1	False	1.38337
161015A	0.88000	0.73000	8.30005	10.54875	1	True	4.37074
161017A	0.60000	0.50000	11.98661	13.00000	1	False	1.81401
486302	0.45000	0.45000	13.50265	13.50265	1	False	-0.84443
486597	0.55000	0.52000	12.49735	12.79939	1	False	-0.59101
486613	0.72000	0.66000	10.66863	11.35015	1	False	-0.20839
486661	0.68000	0.65000	11.12920	11.45872	1	False	-0.72222
486665	0.42000	0.42000	13.80757	13.80757	1	False	-0.97959

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
630545	0.28000	0.28500	15.33137	15.27221	2	False	-0.32260
630649	0.36500	0.36000	14.38050	14.43384	2	False	-0.44566
634303	0.47000	0.41000	13.30108	13.91018	1	False	1.03970
634354	0.45000	0.45000	13.50265	13.50265	1	False	-0.84443
634364	0.53000	0.54000	12.69892	12.59827	1	False	0.00267
634366	0.52000	0.52000	12.79939	12.79939	1	False	-0.43756
634374	0.41000	0.40000	13.91018	14.01339	1	False	-0.52842
634379	0.55000	0.52000	12.49735	12.79939	1	False	-0.59101
634389	0.58000	0.56000	12.19243	12.39612	1	False	-0.85970
711110	0.61000	0.60000	11.88272	11.98661	1	False	-0.30162
711120	0.71000	0.70000	10.78646	10.90240	1	False	0.28687
711137	0.59000	0.55000	12.08982	12.49735	1	False	-0.42627
711145	0.70000	0.68000	10.90240	11.12920	1	False	-0.20110
711168	0.63000	0.61000	11.67259	11.88272	1	False	-0.58340
711173	0.54000	0.53000	12.59827	12.69892	1	False	-0.70332

Table 2.3.6
Delta Analysis
English Language Arts Grade 8

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
148177A	0.75000	0.72000	10.30204	10.66863	1	False	-0.62684
148187A	0.76000	0.75000	10.17479	10.30204	1	False	-0.17489
148189A	0.54000	0.54000	12.59827	12.59827	1	False	-0.65129
149416A	0.78000	0.65000	9.91123	11.45872	1	False	0.76235
149431A	0.90000	0.77000	7.87379	10.04461	1	False	1.25788
149653A	0.58000	0.56000	12.19243	12.39612	1	False	-0.88802
149654A	0.37000	0.34000	14.32741	14.64985	1	False	-0.09303
149721A	0.85000	0.84000	8.85427	9.02217	1	False	0.13448
149731A	0.28000	0.26000	15.33137	15.57338	1	False	0.05624
149744A	0.50000	0.49000	13.00000	13.10028	1	False	-0.86046
160467A	0.70000	0.72000	10.90240	10.66863	1	False	0.24228
160742A	0.68000	0.66000	11.12920	11.35015	1	False	-0.61206
160745A	0.80000	0.74000	9.63352	10.42662	1	False	-0.62669
160747A	0.66000	0.62000	11.35015	11.77808	1	False	-0.76653
160770A	0.95000	0.93000	6.42059	7.09684	1	False	-0.04752
160771A	0.64000	0.49000	11.56616	13.10028	1	False	1.21525
160775A	0.68000	0.63000	11.12920	11.67259	1	False	-0.62974
160777A	0.56000	0.46000	12.39612	13.40173	1	False	0.53689
160784A	0.92000	0.91000	7.37971	7.63698	1	False	0.40363
160785A	0.87000	0.85000	8.49444	8.85427	1	False	-0.09506
160787A	0.58000	0.54000	12.19243	12.59827	1	False	-0.56254
160788A	0.65000	0.62000	11.45872	11.77808	1	False	-0.87765
160789A	0.43000	0.43000	13.70550	13.70550	1	False	-0.83151
160790A	0.66000	0.60000	11.35015	11.98661	1	False	-0.40464
160791A	0.93000	0.79000	7.09684	9.77432	1	False	1.91360
160872A	0.42000	0.46000	13.80757	13.40173	1	False	-0.29493
160873A	0.48000	0.50000	13.20061	13.00000	1	False	-0.47645
160875A	0.10000	0.41000	18.12621	13.91018	1	True	5.07468
160877A	0.36000	0.40000	14.43384	14.01339	1	False	-0.44975
160992A	0.73000	0.70000	10.54875	10.90240	1	False	-0.67536
160993A	0.60000	0.51000	11.98661	12.89972	1	False	0.25856
485469	0.38000	0.41000	14.22192	13.91018	1	False	-0.57743
485495	0.74000	0.58000	10.42662	12.19243	1	False	1.28949
485500	0.77000	0.58000	10.04461	12.19243	1	False	1.84250
485506	0.21000	0.22000	16.22568	16.08877	1	False	-0.34404

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
486738	0.47000	0.47000	13.30108	13.30108	1	False	-0.85349
486744	0.55000	0.54000	12.49735	12.59827	1	False	-0.79738
486763	0.82000	0.81000	9.33854	9.48841	1	False	0.02644
487006	0.81000	0.81000	9.48841	9.48841	1	False	0.24341
626597	0.55000	0.58000	12.49735	12.19243	1	False	-0.09310
626626	0.42000	0.40000	13.80757	14.01339	1	False	-0.44498
626785	0.74000	0.73000	10.42662	10.54875	1	False	-0.23845
626814	0.45000	0.41000	13.50265	13.91018	1	False	-0.18265
627061	0.81000	0.80000	9.48841	9.63352	1	False	-0.00839
760819	0.50000	0.50000	13.00000	13.00000	1	False	-0.76687
760826	0.44000	0.42000	13.60388	13.80757	1	False	-0.50725
760834	0.53000	0.45000	12.69892	13.50265	1	False	0.27366
760837	0.91000	0.90000	7.63698	7.87379	1	False	0.36511
760844	0.64000	0.63000	11.56616	11.67259	1	False	-0.53904
760851	0.89000	0.89000	8.09389	8.09389	1	False	0.64462
762233	0.52571	0.53429	12.74200	12.65581	7	False	-0.54308

Table 2.3.7
Delta Analysis
Mathematics Grade 3

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
146917A	0.77000	0.80000	10.04461	9.63352	1	False	-0.96971
146947A	0.30000	0.27000	15.09760	15.45125	1	False	0.37701
147044A	0.64000	0.68000	11.56616	11.12920	1	False	-0.77334
147064A	0.90000	0.91000	7.87379	7.63698	1	False	-0.42361
147073A	0.73000	0.69000	10.54875	11.01660	1	False	1.05371
147300A	0.65000	0.58000	11.45872	12.19243	1	False	1.61978
147330A	0.80000	0.86000	9.63352	8.67872	1	False	0.31519
147542A	0.71000	0.76000	10.78646	10.17479	1	False	-0.41728
147708A	0.60000	0.57000	11.98661	12.29450	1	False	0.53887
147712A	0.75000	0.80000	10.30204	9.63352	1	False	-0.32166
147728A	0.68000	0.62000	11.12920	11.77808	1	False	1.44258
147966A	0.41000	0.42000	13.91018	13.80757	1	False	-0.62731
152031A	0.86000	0.78000	8.67872	9.91123	1	True	3.07566
152546A	0.76000	0.80000	10.17479	9.63352	1	False	-0.64200
152598A	0.42000	0.47000	13.80757	13.30108	1	False	-0.40768
152620A	0.81000	0.69000	9.48841	11.01660	1	True	3.72299
152739A	0.77000	0.79000	10.04461	9.77432	1	False	-0.69548
152864A	0.56000	0.62000	12.39612	11.77808	1	False	-0.26052
152884A	0.50000	0.47000	13.00000	13.30108	1	False	0.43338
153168A	0.65000	0.71000	11.45872	10.78646	1	False	-0.21108
154329A	0.80000	0.85000	9.63352	8.85427	1	False	-0.11132
154533A	0.59000	0.66000	12.08982	11.35015	1	False	0.00810
154758A	0.63000	0.65000	11.67259	11.45872	1	False	-0.70125
154760A	0.59000	0.66000	12.08982	11.35015	1	False	0.00810
155260A	0.77000	0.84000	10.04461	9.02217	1	False	0.51564
155455A	0.33000	0.36000	14.75965	14.43384	1	False	-0.76310
155525A	0.70000	0.73000	10.90240	10.54875	1	False	-0.97328
161166A	0.65000	0.71000	11.45872	10.78646	1	False	-0.21108
479111	0.66000	0.70000	11.35015	10.90240	1	False	-0.76608
479113	0.85000	0.90000	8.85427	7.87379	1	False	0.30919
479117	0.62000	0.70000	11.77808	10.90240	1	False	0.31119
479125	0.94000	0.96000	6.78091	5.99726	1	False	-0.35098
479138	0.47000	0.55000	13.30108	12.49735	1	False	0.27003
488998	0.48000	0.49000	13.20061	13.10028	1	False	-0.55953
636391	0.74000	0.77000	10.42662	10.04461	1	False	-1.00042

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
636410	0.83000	0.86000	9.18334	8.67872	1	False	-0.81808
636412	0.48000	0.51000	13.20061	12.89972	1	False	-0.96049
636421	0.52000	0.44000	12.79939	13.60388	1	False	1.67410
636429	0.69000	0.74000	11.01660	10.42662	1	False	-0.44979
636439	0.63000	0.66000	11.67259	11.35015	1	False	-0.96504
636443	0.49000	0.55000	13.10028	12.49735	1	False	-0.23547
674356	0.71000	0.75000	10.78646	10.30204	1	False	-0.72646
674364	0.62000	0.71000	11.77808	10.78646	1	False	0.59287
674370	0.33000	0.44000	14.75965	13.60388	1	False	1.25340
733123	0.68000	0.71000	11.12920	10.78646	1	False	-0.96669
733127	0.83000	0.87000	9.18334	8.49444	1	False	-0.37033
733131	0.32000	0.37000	14.87080	14.32741	1	False	-0.22474
733134	0.44000	0.47000	13.60388	13.30108	1	False	-0.92046
771992	0.80000	0.84000	9.63352	9.02217	1	False	-0.51926
771996	0.31000	0.40000	14.98340	14.01339	1	False	0.82170

Table 2.3.8
Delta Analysis
Mathematics Grade 4

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
146951A	0.56000	0.60000	12.39612	11.98661	1	False	-0.95547
147525A	0.65000	0.71000	11.45872	10.78646	1	False	-0.23164
148236A	0.62000	0.60000	11.77808	11.98661	1	False	1.40693
148654A	0.36000	0.42000	14.43384	13.80757	1	False	-0.27799
148675A	0.36000	0.37000	14.43384	14.32741	1	False	0.10275
150642A	0.45000	0.48000	13.50265	13.20061	1	False	-0.59666
150722A	0.39000	0.41000	14.11728	13.91018	1	False	-0.26419
151278A	0.56000	0.56000	12.39612	12.39612	1	False	0.59229
151506A	0.48000	0.52000	13.20061	12.79939	1	False	-0.95863
151519A	0.81000	0.87000	9.48841	8.49444	1	False	0.89989
151553A	0.88000	0.83000	8.30005	9.18334	1	True	4.10620
151556A	0.65000	0.74000	11.45872	10.42662	1	False	1.12839
152166A	0.56000	0.56000	12.39612	12.39612	1	False	0.59229
152197A	0.74000	0.77000	10.42662	10.04461	1	False	-0.76711
152343A	0.47000	0.53000	13.30108	12.69892	1	False	-0.41763
152353A	0.64000	0.70000	11.56616	10.90240	1	False	-0.25912
152355A	0.79000	0.83000	9.77432	9.18334	1	False	-0.61102
152518A	0.73000	0.79000	10.54875	9.77432	1	False	0.11554
152789A	0.41000	0.41000	13.91018	13.91018	1	False	0.52741
152874A	0.36000	0.40000	14.43384	14.01339	1	False	-1.05587
152985A	0.78000	0.80000	9.91123	9.63352	1	False	-0.35085
152988A	0.64000	0.67000	11.56616	11.24035	1	False	-0.60358
153171A	0.53000	0.60000	12.69892	11.98661	1	False	-0.02712
153189A	0.47000	0.53000	13.30108	12.69892	1	False	-0.41763
153325A	0.41000	0.47000	13.91018	13.30108	1	False	-0.36529
154024A	0.51000	0.57000	12.89972	12.29450	1	False	-0.42325
154501A	0.81000	0.76000	9.48841	10.17479	1	True	3.31105
155121A	0.29000	0.33000	15.21354	14.75965	1	False	-0.89608
155220A	0.72000	0.74000	10.66863	10.42662	1	False	-0.24839
156019A	0.55000	0.59000	12.49735	12.08982	1	False	-0.95233
184241A	0.69000	0.73000	11.01660	10.54875	1	False	-1.02314
479500	0.82000	0.86000	9.33854	8.67872	1	False	-0.36951
479502	0.74000	0.76000	10.42662	10.17479	1	False	-0.27511
479507	0.79000	0.81000	9.77432	9.48841	1	False	-0.37593
479930	0.68000	0.72000	11.12920	10.66863	1	False	-1.04583

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
636619	0.72000	0.78000	10.66863	9.91123	1	False	0.05633
636627	0.29000	0.34000	15.21354	14.64985	1	False	-0.48108
636649	0.77000	0.85000	10.04461	8.85427	1	False	1.66589
636655	0.82000	0.83000	9.33854	9.18334	1	False	0.13673
636657	0.45000	0.51000	13.50265	12.89972	1	False	-0.40611
636666	0.69000	0.76000	11.01660	10.17479	1	False	0.39024
636668	0.61000	0.67000	11.88272	11.24035	1	False	-0.32640
733078	0.58000	0.65000	12.19243	11.45872	1	False	0.03206
733086	0.79000	0.83000	9.77432	9.18334	1	False	-0.61102
733088	0.43000	0.52000	13.70550	12.79939	1	False	0.74849
733092	0.80000	0.86000	9.63352	8.67872	1	False	0.75800
733094	0.26000	0.26000	15.57338	15.57338	1	False	0.45614
733096	0.64000	0.67000	11.56616	11.24035	1	False	-0.60358
733100	0.56000	0.61000	12.39612	11.88272	1	False	-0.79187
733102	0.47000	0.54000	13.30108	12.59827	1	False	-0.03720

Table 2.3.9
Delta Analysis
Mathematics Grade 5

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
146915A	0.65000	0.70000	11.45872	10.90240	1	False	-0.58898
146959A	0.55000	0.61000	12.49735	11.88272	1	False	-0.50589
147747A	0.59000	0.62000	12.08982	11.77808	1	False	0.13276
147990A	0.40000	0.43000	14.01339	13.70550	1	False	-0.30688
148011A	0.63000	0.68000	11.67259	11.12920	1	False	-0.59333
148173A	0.40000	0.48000	14.01339	13.20061	1	False	0.55663
148659A	0.54000	0.58000	12.59827	12.19243	1	False	-0.32197
149230A	0.51000	0.56000	12.89972	12.39612	1	False	-0.74097
149246A	0.59000	0.63000	12.08982	11.67259	1	False	-0.24269
149261A	0.39000	0.45000	14.11728	13.50265	1	False	-0.12410
149384A	0.62000	0.68000	11.77808	11.12920	1	False	-0.55355
149559A	0.32000	0.37000	14.87080	14.32741	1	False	-0.20010
149640A	0.30000	0.33000	15.09760	14.75965	1	False	-0.66939
150273A	0.44000	0.51000	13.60388	12.89972	1	False	0.07351
150689A	0.53000	0.57000	12.69892	12.29450	1	False	-0.34063
151248A	0.76000	0.80000	10.17479	9.63352	1	False	-0.23283
152946A	0.65000	0.70000	11.45872	10.90240	1	False	-0.58898
153107A	0.55000	0.58000	12.49735	12.19243	1	False	0.06097
153162A	0.85000	0.88000	8.85427	8.30005	1	False	0.03235
153165A	0.51000	0.57000	12.89972	12.29450	1	False	-0.44455
153950A	0.74000	0.78000	10.42662	9.91123	1	False	-0.20006
153972A	0.64000	0.67000	11.56616	11.24035	1	False	0.20609
155232A	0.81000	0.81000	9.48841	9.48841	1	False	1.85540
155234A	0.18000	0.21000	16.66146	16.22568	1	False	-0.16105
155329A	0.63000	0.59000	11.67259	12.08982	1	False	2.82561
155426A	0.84000	0.88000	9.02217	8.30005	1	False	-0.60481
155434A	0.51000	0.54000	12.89972	12.59827	1	False	-0.02152
155474A	0.61000	0.67000	11.88272	11.24035	1	False	-0.55200
155479A	0.31000	0.38000	14.98340	14.22192	1	False	0.60267
155489A	0.46000	0.51000	13.40173	12.89972	1	False	-0.69357
161469A	0.64000	0.71000	11.56616	10.78646	1	False	-0.13784
184261A	0.54000	0.57000	12.59827	12.29450	1	False	0.04134
484706	0.62000	0.66000	11.77808	11.35015	1	False	-0.20729
489954	0.85000	0.89000	8.85427	8.09389	1	False	-0.70142
636705	0.88000	0.92000	8.30005	7.37971	1	False	-0.40707

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
636718	0.74000	0.83000	10.42662	9.18334	1	False	1.24351
636726	0.51000	0.56000	12.89972	12.39612	1	False	-0.74097
636730	0.27000	0.31000	15.45125	14.98340	1	False	-0.33212
636735	0.71000	0.76000	10.78646	10.17479	1	False	-0.62754
636740	0.45000	0.50000	13.50265	13.00000	1	False	-0.66753
636748	0.47000	0.51000	13.30108	12.89972	1	False	-0.47165
674572	0.75000	0.81000	10.30204	9.48841	1	False	-0.31504
674574	0.78000	0.88000	9.91123	8.30005	1	False	2.43142
674588	0.20000	0.22000	16.36648	16.08877	1	False	-0.75406
733174	0.52000	0.55000	12.79939	12.49735	1	False	0.00010
733176	0.54000	0.57000	12.59827	12.29450	1	False	0.04134
733184	0.75000	0.78000	10.30204	9.91123	1	False	0.27269
733188	0.65000	0.82000	11.45872	9.33854	1	True	4.60775
733196	0.51000	0.55000	12.89972	12.49735	1	False	-0.38067
773934	0.63000	0.69000	11.67259	11.01660	1	False	-0.55308

Table 2.3.10

Delta Analysis

Mathematics Grade 6

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
147326A	0.59000	0.65000	12.08982	11.45872	1	False	0.05399
148159A	0.66000	0.71000	11.35015	10.78646	1	False	-0.24910
149234A	0.70000	0.77000	10.90240	10.04461	1	False	0.66106
149259A	0.76000	0.84000	10.17479	9.02217	1	False	1.54225
149350A	0.56000	0.55000	12.39612	12.49735	1	False	0.45669
150723A	0.72000	0.76000	10.66863	10.17479	1	False	-0.55359
151145A	0.60000	0.63000	11.98661	11.67259	1	False	-0.85340
151782A	0.22000	0.23000	16.08877	15.95539	1	False	-0.72353
152379A	0.44000	0.48000	13.60388	13.20061	1	False	-0.52023
152633A	0.78000	0.73000	9.91123	10.54875	1	False	2.48657
152754A	0.33000	0.35000	14.75965	14.54128	1	False	-0.85200
152840A	0.66000	0.70000	11.35015	10.90240	1	False	-0.62769
153512A	0.55000	0.56000	12.49735	12.39612	1	False	-0.21580
153601A	0.66000	0.71000	11.35015	10.78646	1	False	-0.24910
154011A	0.64000	0.67000	11.56616	11.24035	1	False	-0.84476
155138A	0.48000	0.38000	13.20061	14.22192	1	True	3.37096
155184A	0.60000	0.62000	11.98661	11.77808	1	False	-0.50892
155300A	0.86000	0.90000	8.67872	7.87379	1	False	0.23910
155465A	0.79000	0.79000	9.77432	9.77432	1	False	0.42012
181455A	0.44000	0.48000	13.60388	13.20061	1	False	-0.52023
479039	0.45000	0.50000	13.50265	13.00000	1	False	-0.20705
479041	0.73000	0.75000	10.54875	10.30204	1	False	-0.47234
479043	0.29000	0.31000	15.21354	14.98340	1	False	-0.90506
479047	0.37000	0.41000	14.32741	13.91018	1	False	-0.39347
479049	0.33000	0.34000	14.75965	14.64985	1	False	-0.49747
479051	0.48000	0.47000	13.20061	13.30108	1	False	0.36397
479057	0.72000	0.78000	10.66863	9.91123	1	False	0.30707
479069	0.78000	0.82000	9.91123	9.33854	1	False	-0.38106
479077	0.36000	0.38000	14.43384	14.22192	1	False	-0.79438
479081	0.76000	0.69000	10.17479	11.01660	1	True	3.12411
479083	0.53000	0.55000	12.69892	12.49735	1	False	-0.56604
479087	0.44000	0.46000	13.60388	13.40173	1	False	-0.66940
479095	0.16000	0.16000	16.97783	16.97783	1	False	-0.38766
479097	0.30000	0.35000	15.09760	14.54128	1	False	0.14708
479148	0.18000	0.22000	16.66146	16.08877	1	False	0.37589

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
636459	0.63000	0.66000	11.67259	11.35015	1	False	-0.84566
636463	0.41000	0.43000	13.91018	13.70550	1	False	-0.71205
636465	0.63000	0.71000	11.67259	10.78646	1	False	0.83997
636479	0.48000	0.51000	13.20061	12.89972	1	False	-0.89975
636483	0.44000	0.47000	13.60388	13.30108	1	False	-0.84830
636485	0.54000	0.53000	12.59827	12.69892	1	False	0.43214
636493	0.69000	0.73000	11.01660	10.54875	1	False	-0.59945
636499	0.63000	0.67000	11.67259	11.24035	1	False	-0.64218
674628	0.25000	0.26000	15.69796	15.57338	1	False	-0.65094
674630	0.37000	0.40000	14.32741	14.01339	1	False	-0.73050
674634	0.64000	0.68000	11.56616	11.12920	1	False	-0.63870
674638	0.41000	0.52000	13.91018	12.79939	1	False	1.82454
733232	0.19000	0.23000	16.51159	15.95539	1	False	0.30524
733240	0.56000	0.54000	12.39612	12.59827	1	False	0.78621
773992	0.42000	0.50000	13.80757	13.00000	1	False	0.82288

Table 2.3.11
Delta Analysis
Mathematics Grade 7

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
148154A	0.75000	0.80000	10.30204	9.63352	1	False	1.92197
148171A	0.41000	0.46000	13.91018	13.40173	1	False	0.20295
148193A	0.28000	0.29000	15.33137	15.21354	1	False	-0.19523
148478A	0.28000	0.30000	15.33137	15.09760	1	False	-0.68448
148527A	0.59000	0.63000	12.08982	11.67259	1	False	0.34450
148530A	0.49000	0.52000	13.10028	12.79939	1	False	-0.43869
148912A	0.50000	0.50000	13.00000	13.00000	1	False	-0.37224
149064A	0.57000	0.61000	12.29450	11.88272	1	False	0.26229
149204A	0.48000	0.50000	13.20061	13.00000	1	False	-0.89087
149247A	0.74000	0.65000	10.42662	11.45872	1	True	3.23895
150199A	0.47000	0.51000	13.30108	12.89972	1	False	-0.07281
150232A	0.20000	0.21000	16.36648	16.22568	1	False	0.00719
150629A	0.72000	0.70000	10.66863	10.90240	1	False	-0.06000
150891A	0.32000	0.33000	14.87080	14.75965	1	False	-0.30022
151987A	0.69000	0.65000	11.01660	11.45872	1	False	0.91988
152009A	0.35000	0.38000	14.54128	14.22192	1	False	-0.77750
152051A	0.26000	0.30000	15.57338	15.09760	1	False	-0.41590
152056A	0.62000	0.51000	11.77808	12.89972	1	True	4.00768
153291A	0.44000	0.50000	13.60388	13.00000	1	False	0.69425
153299A	0.29000	0.32000	15.21354	14.87080	1	False	-0.87323
153504A	0.32000	0.34000	14.87080	14.64985	1	False	-0.76357
155126A	0.22000	0.26000	16.08877	15.57338	1	False	-0.39779
155443A	0.42000	0.45000	13.80757	13.50265	1	False	-0.62620
182015A	0.32000	0.33000	14.87080	14.75965	1	False	-0.30022
182026A	0.60000	0.63000	11.98661	11.67259	1	False	-0.06119
182027A	0.45000	0.47000	13.50265	13.30108	1	False	-0.97420
480274	0.34000	0.35000	14.64985	14.54128	1	False	-0.35326
480287	0.41000	0.44000	13.91018	13.60388	1	False	-0.65008
480295	0.33000	0.33000	14.75965	14.75965	1	False	0.13666
480307	0.26000	0.25000	15.57338	15.69796	1	False	0.89770
480350	0.40000	0.46000	14.01339	13.40173	1	False	0.60864
480360	0.14000	0.16000	17.32128	16.97783	1	False	-0.57184
480373	0.18000	0.22000	16.66146	16.08877	1	False	-0.32162
480380	0.12000	0.15000	17.69995	17.14573	1	False	-0.69992
489119	0.27000	0.30000	15.45125	15.09760	1	False	-0.89596

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
489176	0.48000	0.50000	13.20061	13.00000	1	False	-0.89087
490454	0.29000	0.30000	15.21354	15.09760	1	False	-0.22133
636508	0.47000	0.50000	13.30108	13.00000	1	False	-0.49597
636512	0.28000	0.32000	15.33137	14.87080	1	False	-0.41009
636537	0.42000	0.50000	13.80757	13.00000	1	False	1.49494
636539	0.29000	0.32000	15.21354	14.87080	1	False	-0.87323
636547	0.42000	0.43000	13.80757	13.70550	1	False	-0.56945
636551	0.53000	0.55000	12.69892	12.49735	1	False	-0.74176
636555	0.29000	0.29000	15.21354	15.21354	1	False	0.26792
674704	0.45000	0.50000	13.50265	13.00000	1	False	0.29634
674708	0.46000	0.52000	13.40173	12.79939	1	False	0.74627
674723	0.54000	0.55000	12.59827	12.49735	1	False	-0.91426
733277	0.62000	0.66000	11.77808	11.35015	1	False	0.47979
733285	0.81000	0.77000	9.48841	10.04461	1	False	0.95933
774055	0.40000	0.43000	14.01339	13.70550	1	False	-0.67322

Table 2.3.12
Delta Analysis
Mathematics Grade 8

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
148061A	0.31000	0.36000	14.98340	14.43384	1	False	-0.02814
148303A	0.37000	0.41000	14.32741	13.91018	1	False	-0.26805
148327A	0.40000	0.46000	14.01339	13.40173	1	False	0.41262
148379A	0.59000	0.65000	12.08982	11.45872	1	False	0.96672
148531A	0.86000	0.72000	8.67872	10.66863	1	True	4.15196
148689A	0.33000	0.38000	14.75965	14.22192	1	False	-0.00720
150198A	0.32000	0.36000	14.87080	14.43384	1	False	-0.34674
150215A	0.43000	0.48000	13.70550	13.20061	1	False	0.16219
151253A	0.39000	0.42000	14.11728	13.80757	1	False	-0.54593
151260A	0.71000	0.68000	10.78646	11.12920	1	False	-0.39007
151283A	0.45000	0.49000	13.50265	13.10028	1	False	-0.10207
152296A	0.67000	0.70000	11.24035	10.90240	1	False	0.28020
152944A	0.52000	0.50000	12.79939	13.00000	1	False	-0.31167
153437A	0.49000	0.42000	13.10028	13.80757	1	False	1.32932
153448A	0.68000	0.54000	11.12920	12.59827	1	True	3.17396
164493A	0.41000	0.39000	13.91018	14.11728	1	False	-0.00635
181901A	0.35000	0.33000	14.54128	14.75965	1	False	0.19054
181934A	0.28000	0.28000	15.33137	15.33137	1	False	-0.28045
183795A	0.31000	0.34000	14.98340	14.64985	1	False	-0.69480
484750	0.20000	0.21000	16.36648	16.22568	1	False	-0.44910
484766	0.55000	0.58000	12.49735	12.19243	1	False	-0.14458
484783	0.20000	0.20000	16.36648	16.36648	1	False	-0.01457
484815	0.32000	0.34000	14.87080	14.64985	1	False	-1.01340
484821	0.55000	0.58000	12.49735	12.19243	1	False	-0.14458
484823	0.65000	0.68000	11.45872	11.12920	1	False	0.19807
484828	0.67000	0.63000	11.24035	11.67259	1	False	0.00271
484841	0.22000	0.22000	16.08877	16.08877	1	False	-0.08590
484847	0.63000	0.65000	11.67259	11.45872	1	False	-0.21376
484853	0.43000	0.54000	13.70550	12.59827	1	False	2.02114
484860	0.34000	0.35000	14.64985	14.54128	1	False	-0.79056
484866	0.29000	0.31000	15.21354	14.98340	1	False	-1.02095
484873	0.32000	0.34000	14.87080	14.64985	1	False	-1.01340
484877	0.64000	0.66000	11.56616	11.35015	1	False	-0.17979
484881	0.64000	0.65000	11.56616	11.45872	1	False	-0.51486
484977	0.40000	0.43000	14.01339	13.70550	1	False	-0.52483

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
490116	0.54000	0.55000	12.59827	12.49735	1	False	-0.80013
636559	0.44000	0.44000	13.60388	13.60388	1	False	-0.72416
636567	0.47000	0.46000	13.30108	13.40173	1	False	-0.49130
636578	0.40000	0.42000	14.01339	13.80757	1	False	-0.83986
636590	0.24000	0.25000	15.82521	15.69796	1	False	-0.54632
636594	0.53000	0.56000	12.69892	12.39612	1	False	-0.20293
636602	0.21000	0.21000	16.22568	16.22568	1	False	-0.05074
636610	0.67000	0.66000	11.24035	11.35015	1	False	-0.99238
674821	0.41000	0.46000	13.91018	13.40173	1	False	0.12061
674875	0.33000	0.33000	14.75965	14.75965	1	False	-0.42729
674877	0.47000	0.53000	13.30108	12.69892	1	False	0.56628
733318	0.29000	0.31000	15.21354	14.98340	1	False	-1.02095
733322	0.52000	0.55000	12.79939	12.49735	1	False	-0.23110
733332	0.24000	0.29000	15.82521	15.21354	1	False	-0.05270
774106	0.36000	0.29000	14.43384	15.21354	1	False	1.89530

Table 2.3.13
Delta Analysis
Science Grade 5

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
184387A	0.53000	0.59000	12.69892	12.08982	1	False	0.30673
184423A	0.46000	0.49000	13.40173	13.10028	1	False	-0.55488
185413A	0.31000	0.33000	14.98340	14.75965	1	False	-0.46834
186483A	0.51000	0.53000	12.89972	12.69892	1	False	-0.33993
186489A	0.53000	0.54000	12.69892	12.59827	1	False	-0.04654
186490A	0.44000	0.47000	13.60388	13.30108	1	False	-0.54497
186754A	0.73000	0.78000	10.54875	9.91123	1	False	0.32370
186756A	0.78000	0.80000	9.91123	9.63352	1	False	-0.47084
186759A	0.79000	0.82000	9.77432	9.33854	1	False	-0.27843
187503A	0.49000	0.52000	13.10028	12.79939	1	False	-0.56557
187505A	0.77000	0.80000	10.04461	9.63352	1	False	-0.34112
187510A	0.83000	0.86000	9.18334	8.67872	1	False	-0.09865
188717A	0.69000	0.73000	11.01660	10.54875	1	False	-0.14909
188718A	0.83000	0.85000	9.18334	8.85427	1	False	-0.59635
188720A	0.74000	0.76000	10.42662	10.17479	1	False	-0.41206
189235A	0.71000	0.73000	10.78646	10.54875	1	False	-0.38236
189237A	0.51000	0.54000	12.89972	12.59827	1	False	-0.56996
189238A	0.43000	0.46000	13.70550	13.40173	1	False	-0.53915
189340A	0.62000	0.65000	11.77808	11.45872	1	False	-0.55228
189341A	0.52000	0.56000	12.79939	12.39612	1	False	-0.28086
189345A	0.34000	0.35000	14.64985	14.54128	1	False	-0.12785
189356A	0.40000	0.44000	14.01339	13.60388	1	False	-0.22647
189358A	0.45000	0.48000	13.50265	13.20061	1	False	-0.55021
189361A	0.73000	0.77000	10.54875	10.04461	1	False	-0.05903
437241	0.45000	0.48000	13.50265	13.20061	1	False	-0.55021
437243	0.39000	0.41000	14.11728	13.91018	1	False	-0.39455
437245	0.37000	0.40000	14.32741	14.01339	1	False	-0.49102
437494	0.48000	0.46000	13.20061	13.40173	1	False	0.80428
437506	0.39000	0.38000	14.11728	14.22192	1	False	0.49994
465317	0.82000	0.70000	9.33854	10.90240	1	True	4.83039
638751	0.41000	0.43000	13.91018	13.70550	1	False	-0.38141
638753	0.45000	0.47000	13.50265	13.30108	1	False	-0.36022
638755	0.46000	0.47000	13.40173	13.30108	1	False	-0.06765
638808	0.40000	0.46000	14.01339	13.40173	1	False	0.35353
638810	0.42000	0.47000	13.80757	13.30108	1	False	0.04562

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
638812	0.38000	0.40000	14.22192	14.01339	1	False	-0.40182
701741	0.38000	0.44000	14.22192	13.60388	1	False	0.37814
701743	0.37000	0.39000	14.32741	14.11728	1	False	-0.40959
701751	0.52000	0.68000	12.79939	11.12920	1	True	3.35431
760514	0.71000	0.74000	10.78646	10.42662	1	False	-0.46591
760544	0.60000	0.63000	11.98661	11.67259	1	False	-0.56133
760546	0.82000	0.86000	9.33854	8.67872	1	False	0.35133
760557	0.58000	0.54000	12.19243	12.59827	1	False	1.42196
760561	0.36000	0.41000	14.43384	13.91018	1	False	0.11367
760567	0.44000	0.47000	13.60388	13.30108	1	False	-0.54497

Section 2.4

Tabled B/B Analysis Results

Table 2.4.1
b/b Analysis
English Language Arts Grade 3

Item Id	Old b	New b	Std Dist	Flag
147341A	-1.95925	-1.11768	-0.13600	False
147348A	-0.05403	-0.27850	-0.03393	False
155274A	-1.09448	-0.67202	-0.24807	False
155277A	0.48121	0.66781	-0.26325	False
155278A	-1.42399	-0.84684	-0.19312	False
155279A	-0.42776	-0.16271	-0.73979	False
155282A	0.42241	0.60945	-0.33949	False
155283A	-0.67121	-0.66628	0.21657	False
156120A	-0.63443	-0.35925	-0.49280	False
156121A	-0.52606	-0.09652	-0.99359	False
156123A	0.34324	0.70285	-0.02151	False
156124A	-1.52691	-1.10335	0.31788	False
156126A	0.28111	0.56524	-0.28783	False
482316	-1.03242	-1.33997	1.45585	False
482318	0.20338	0.12963	-0.74107	False
482867	1.02610	0.84205	-0.45329	False
484541	-1.57031	-0.80370	-0.46411	False
484543	1.27033	1.68640	1.33570	False
484569	-0.78393	-0.40915	-0.53982	False
484571	8.51997	1.66758	4.90254	True
484575	-0.39021	-0.14909	-0.73064	False
484577	0.75040	1.16220	0.64155	False
484579	0.35415	0.67317	-0.10645	False
484581	1.02760	1.94967	2.25413	False
627921	0.66289	1.06942	0.51359	False
628643	1.12145	1.30938	0.58191	False
628709	-1.20913	-0.68113	-0.35545	False
628734	-0.39828	-0.18599	-0.64951	False
628835	0.75490	1.26549	0.88910	False
701185	-0.39948	-0.15755	-0.72043	False
701219	5.09805	2.28247	-0.47128	False
701289	1.54305	1.74457	1.16955	False
705924	-1.01699	-0.55218	-0.45355	False
715595	-0.76598	-0.40972	-0.51813	False
758779	-0.43263	-0.23305	-0.57326	False
759133	0.06901	0.21445	-0.90596	False
759149	0.37316	0.70113	-0.05956	False
759159	-1.03636	0.20925	0.33139	False
765883	-0.60848	-0.22837	-0.78357	False
799386	-0.32676	-0.33404	-0.20652	False
799388	0.48318	0.34282	-0.94608	False
799392	0.20313	0.11350	-0.70190	False
799395	0.79277	0.84011	-0.19416	False
799397	-1.99982	-1.83411	1.57043	False
802056	0.29808	0.64791	-0.10482	False
802069	-1.09142	-0.52404	-0.60655	False
802248	-0.66757	-0.50763	-0.16736	False
802262	0.10035	0.26566	-0.81615	False
802414	0.51048	0.80549	0.04040	False
802422	0.68957	0.78936	-0.20158	False

Table 2.4.2
b/b Analysis
English Language Arts Grade 4

Item Id	Old b	New b	Std Dist	Flag
146887A	-0.39712	0.22959	0.01887	False
148685A	-0.02298	0.55441	0.04672	False
148686A	-0.44968	0.92319	3.25099	True
148719A	1.55734	0.77843	3.09729	True
148754A	-0.96130	-0.87897	0.96806	False
148938A	-1.33986	-0.80046	-0.78616	False
149114A	-1.58769	-0.97218	-0.80582	False
149115A	0.39821	0.79722	-0.45974	False
155473A	0.17480	0.49393	-0.80873	False
155490A	0.03434	0.39675	-0.85702	False
155569A	-0.56099	0.07722	-0.03755	False
155571A	-1.47321	-0.89234	-0.88082	False
155572A	-1.34732	-1.16374	0.77632	False
155580A	-0.93567	-0.49681	-0.60938	False
158587A	-0.33886	0.04498	-0.75735	False
158589A	-0.77556	-0.24532	-0.64999	False
158602A	0.21086	0.47034	-0.57110	False
158604A	-1.82289	-1.25199	-0.60936	False
158611A	-0.87941	-0.36701	-0.79574	False
158691A	-2.02376	-1.43077	-0.57519	False
158692A	0.18389	0.62816	-0.40124	False
186016A	-1.97745	-1.12309	-0.01417	False
186018A	1.21275	1.89060	1.29158	False
483086	-0.02237	0.26696	-0.54982	False
484626	-0.78233	-0.07620	0.11557	False
484628	-1.03018	-0.50069	-0.81916	False
484632	-0.29794	0.22161	-0.38561	False
484636	-0.89157	-0.20887	-0.05817	False
484638	-0.63286	-0.22462	-0.67262	False
484640	1.06069	0.58530	2.09218	False
484648	0.22379	0.71215	-0.18224	False
484650	-0.52547	0.01083	-0.46053	False
484722	-0.22072	-0.26137	1.02392	False
485159	-0.65393	-0.28774	-0.47481	False
485165	0.48747	0.51376	0.26950	False
485172	-0.06961	-0.12155	0.97489	False
629160	0.27221	0.70572	-0.39080	False
635510	-2.61272	-1.02611	2.77742	False
635527	-1.08473	-0.46959	-0.47976	False
635530	-1.33071	-0.94710	-0.11014	False
635757	-2.69990	-2.14615	0.03709	False
702458	-0.55319	-0.21999	-0.39603	False
702895	1.14471	1.66683	0.56553	False
702920	-0.36269	0.03988	-0.82381	False
702924	-1.48869	-1.13016	0.10257	False
799478	-0.52456	-0.21985	-0.28996	False
799480	0.77154	0.91455	-0.42653	False
799483	-2.10850	-1.41114	-0.78683	False
799497	0.45112	0.88156	-0.28768	False
799500	0.27313	0.75132	-0.19462	False

Table 2.4.3
b/b Analysis
English Language Arts Grade 5

Item Id	Old b	New b	Std Dist	Flag
147920A	-0.86373	-0.84343	-0.27207	False
147921A	-0.45210	-0.36941	-0.16328	False
147923A	-0.55069	-0.48181	-0.19096	False
147924A	-0.93025	-0.96294	-0.22849	False
147926A	0.13174	0.25666	0.05697	False
147969A	-1.22979	-1.14573	-0.40495	False
148893A	-0.90203	-0.67650	-0.36072	False
148900A	-0.61686	-0.37457	-0.46995	False
148906A	-1.61984	-1.64323	-0.37076	False
148961A	-0.82565	-0.71737	-0.37920	False
148963A	-0.96306	-0.70713	-0.28806	False
148967A	-0.86246	-0.79608	-0.33715	False
148971A	-0.55973	-0.56196	-0.09393	False
149152A	-1.40581	-1.50247	-0.36573	False
149158A	-0.17191	0.05867	-0.23952	False
149196A	-1.09671	-0.51103	0.24622	False
149318A	-0.35086	-0.19694	-0.21620	False
149321A	-1.21447	-0.88645	-0.06452	False
149330A	-1.09411	-0.89667	-0.30849	False
149339A	-0.77335	-0.70490	-0.29730	False
158749A	0.02928	0.07301	0.12349	False
159151A	-0.18772	0.02117	-0.21620	False
159165A	-0.70869	-0.22476	-0.08522	False
159368A	0.12617	0.55097	-0.37321	False
159475A	-0.96458	-0.32529	0.25918	False
159592A	-0.15413	-0.03724	-0.06891	False
159600A	-1.62736	-1.81530	-0.34203	False
160682A	-0.73293	-0.41245	-0.30659	False
186469A	0.56381	0.74341	0.18657	False
186471A	-1.45124	-1.41764	-0.37051	False
186474A	-0.05258	0.38000	-0.47017	False
186476A	-0.01845	0.07691	0.02696	False
483144	-1.26304	-1.52161	-0.06634	False
483150	-0.24686	-0.31857	0.15541	False
483162	-2.16862	-2.16944	-0.07497	False
483170	-1.81667	-1.87932	-0.33218	False
630607	-2.41197	2.32595	6.79738	True
630655	-0.92841	-0.37872	0.11407	False
631955	-1.40419	-1.27973	-0.26358	False
631981	-0.11112	-0.05326	0.03591	False
631995	-0.23911	0.27318	-0.27036	False
632263	-1.71686	-1.77721	-0.37685	False
632323	0.10176	0.37387	-0.16727	False
761740	0.38735	0.45473	0.26178	False
799549	-0.47163	-0.45098	-0.08422	False
799562	-0.64231	-0.68193	-0.08029	False
799574	-0.03451	0.05511	0.02743	False
799579	-1.55589	-1.69487	-0.37749	False
799588	-0.36334	-0.42292	0.08217	False
799592	0.27001	0.20325	0.39664	False
799594	0.05716	-0.22922	0.60748	False

Table 2.4.4

b/b Analysis

English Language Arts Grade 6

Item Id	Old b	New b	Std Dist	Flag
147260A	0.59276	0.77545	0.12883	False
147261A	-1.73817	-0.81827	1.59924	False
147283A	-0.98475	-0.38703	-0.20032	False
147289A	-0.56674	-0.05767	-0.50668	False
147290A	-0.63741	-0.23013	-0.49393	False
149570A	-0.25683	0.10301	-0.47057	False
149571A	-0.51538	-0.07892	-0.82741	False
158723A	-1.61800	-1.10554	-0.42314	False
158740A	-1.36883	-0.82844	-0.86095	False
158747A	-1.25665	-0.57224	0.22191	False
158777A	-1.04671	-0.40768	0.06146	False
158780A	0.25042	0.59456	-0.80451	False
158886A	-1.90084	-1.33921	-0.54737	False
158935A	-0.48400	-0.18684	0.21444	False
158943A	0.93009	1.40073	0.53941	False
158947A	-0.02256	0.40196	-0.66848	False
159272A	-1.28453	-0.80970	-0.43292	False
159273A	-0.88411	-0.46668	-0.35083	False
159451A	-1.46778	-1.14890	0.92915	False
159453A	-1.25225	-0.50903	0.67757	False
159454A	0.81923	1.18135	-0.39347	False
159457A	-1.19277	-0.66370	-0.91402	False
159458A	-0.47153	-0.06800	-0.61377	False
181888A	-0.58122	-0.30564	0.46731	False
181889A	-1.14574	-0.74631	0.02187	False
181893A	0.07731	0.64145	0.49343	False
181904A	-0.65686	0.07236	1.10355	False
485443	0.59469	0.89031	-0.74032	False
485688	-0.91201	-0.32550	-0.22124	False
485986	1.33218	1.61537	-0.54010	False
486369	-0.80204	-0.20002	-0.00357	False
486371	-0.36510	0.23377	0.36377	False
486376	-0.52981	-0.14502	-0.41760	False
629854	1.36243	1.60335	-0.83767	False
629856	-0.42022	0.12784	-0.07590	False
629863	0.06244	-0.29662	4.76524	True
629867	-0.87573	-0.46035	-0.34259	False
629869	-0.06317	0.41408	-0.29985	False
629885	0.06260	0.45328	-0.85210	False
629889	1.42359	1.60651	-0.61742	False
629891	0.51479	1.03097	0.51707	False
629895	-0.79570	-0.40242	-0.24456	False
629898	0.81547	1.17076	-0.44930	False
630290	0.93419	1.20515	-0.85512	False
630430	1.95411	1.72185	2.09621	False
708956	-0.99797	-0.50122	-0.85806	False
709888	-1.11190	-0.72355	0.07665	False
709904	-0.67783	-0.31553	-0.11222	False
710081	-0.24976	0.11728	-0.53221	False
710109	-0.09314	0.71711	2.23108	False

Table 2.4.5
b/b Analysis
English Language Arts Grade 7

Item Id	Old b	New b	Std Dist	Flag
148117A	0.15741	0.39166	-0.00713	False
148759A	-0.27475	0.08867	-0.48535	False
148760A	-0.80526	-0.17604	-0.21295	False
148762A	-0.98642	-0.36681	-0.42200	False
148785A	1.31277	1.57150	-0.87016	False
148823A	-1.10168	-0.26152	0.90088	False
148850A	-1.38143	-0.76110	-0.73862	False
148859A	-1.74363	-1.22987	-0.25643	False
148861A	0.20361	0.46350	-0.20939	False
148866A	-0.42207	0.03038	-0.93739	False
154639A	0.65442	1.01696	-0.73878	False
158719A	0.26313	0.72410	-0.42477	False
158724A	-0.03335	0.49829	-0.21196	False
158765A	-0.30964	-0.02499	0.04898	False
158766A	-0.59210	0.17176	0.82522	False
158768A	-1.91964	-0.86315	1.62519	False
159120A	-0.73089	-0.26649	-0.76300	False
159122A	0.52728	0.98703	-0.21778	False
159393A	2.70688	3.14097	1.38997	False
159394A	0.66487	0.93522	-0.65170	False
159646A	-0.14750	0.30416	-0.81851	False
160475A	-0.27382	0.30105	-0.12985	False
160508A	-0.63731	-0.22869	-0.48082	False
160511A	-0.47561	-0.47684	2.02020	False
160937A	-1.17963	-0.67818	-0.63603	False
160940A	-1.47913	-0.94308	-0.61470	False
161009A	-0.39038	-0.45517	2.35915	False
161013A	-0.76595	-0.37096	-0.28865	False
161015A	-1.46361	-0.63003	0.56428	False
161017A	-0.30756	0.36949	0.49903	False
486302	0.63650	0.48771	2.06357	False
486597	0.27591	-0.01732	3.28458	True
486613	-0.91494	-0.12727	0.71560	False
486661	-0.27737	0.03975	-0.18582	False
486665	1.36190	1.61551	-0.86309	False
630545	1.23306	1.41961	-0.57552	False
630649	0.45678	0.82680	-0.85147	False
634303	1.13978	0.94091	1.97595	False
634354	1.18257	1.48504	-0.69510	False
634364	0.23179	0.58238	-0.81488	False
634366	0.74299	1.24032	0.19903	False
634374	1.04218	1.44561	-0.16079	False
634379	-0.35893	0.17148	-0.48464	False
634389	-0.62562	0.04732	0.21396	False
711110	-0.39407	0.05739	-0.95380	False
711120	-0.63584	-0.05371	-0.37763	False
711137	-0.52243	0.12325	0.12279	False
711145	-0.72661	-0.20061	-0.81198	False
711168	-0.34907	0.09980	-0.97376	False
711173	0.15923	0.53910	-0.94394	False

Table 2.4.6
b/b Analysis
English Language Arts Grade 8

Item Id	Old b	New b	Std Dist	Flag
148177A	-1.11556	-0.92886	-0.66587	False
148187A	-1.62161	-1.55727	-0.29505	False
148189A	-0.24296	-0.15544	-0.30802	False
149416A	-1.83925	-0.82783	1.50823	False
149431A	-1.60009	-0.82860	0.72613	False
149653A	-0.15102	0.02234	-0.57991	False
149654A	1.18563	1.64759	-0.39344	False
149721A	-1.74141	-1.90805	0.44225	False
149731A	1.60836	1.88296	-0.82687	False
149744A	0.22814	0.44587	-0.70564	False
160467A	-1.52620	-1.94029	1.24745	False
160742A	-0.68740	-0.59074	-0.35725	False
160745A	-1.46492	-1.12195	-0.65768	False
160747A	-0.63213	-0.22791	-0.49793	False
160770A	-1.94451	-1.88174	-0.30442	False
160771A	-0.40108	0.36525	0.65601	False
160775A	-0.60198	-0.38985	-0.72470	False
160777A	0.44867	1.13996	0.37680	False
160784A	-1.91854	-1.88157	-0.22031	False
160785A	-1.70222	-1.52647	-0.65685	False
160787A	-0.37694	-0.08183	-0.86013	False
160788A	-1.21001	-0.94018	-0.90422	False
160789A	0.65296	0.79494	-0.44312	False
160790A	-1.51643	-0.93952	0.09679	False
160791A	-1.75242	-0.68557	1.68257	False
160872A	0.56664	0.50686	0.20172	False
160873A	0.34634	0.52501	-0.57478	False
160875A	2.84339	2.35843	1.67040	False
160877A	0.63531	0.75364	-0.36787	False
160992A	-1.63637	-1.47224	-0.61655	False
160993A	-1.15262	-0.18332	1.34215	False
485469	0.59164	0.87160	-0.88949	False
485495	-0.88258	-0.17123	0.50074	False
485500	-1.38005	-0.25347	1.85799	False
485506	1.83435	2.12242	-0.86009	False
486738	1.19939	0.21629	3.19862	True
486744	0.02275	0.25811	-0.77150	False
486763	-2.10708	-2.19162	0.16195	False
487006	-1.56953	-1.51407	-0.26417	False
626597	0.60405	0.94361	-0.76101	False
626626	0.37640	0.62160	-0.78734	False
626785	-0.70007	-0.51121	-0.65426	False
626814	0.83904	2.46078	3.35095	True
627061	-1.32923	-1.17952	-0.55648	False
760819	0.27443	0.41477	-0.45475	False
760826	0.84342	0.98763	-0.44179	False
760834	0.11348	0.62157	-0.19725	False
760837	-1.75532	-1.74762	-0.11891	False
760844	-0.69261	-0.62055	-0.27839	False
760851	-2.39220	-2.16824	-0.84266	False
762233	-0.28265	-0.23486	-0.18206	False

Table 2.4.7
b/b Analysis
Mathematics Grade 3

Item Id	Old b	New b	Std Dist	Flag
146917A	-1.55184	-1.22621	-0.54126	False
146947A	1.21815	1.52403	0.89068	False
147044A	-0.67701	-0.44074	-0.77870	False
147064A	-2.19489	-1.77390	-0.12050	False
147073A	-0.43156	-0.19808	-0.66045	False
147300A	0.20622	0.32176	-0.79737	False
147330A	-1.37026	-1.26951	0.23356	False
147542A	-0.84266	-0.68521	-0.54084	False
147708A	0.01579	0.11729	-0.57117	False
147712A	-1.02011	-0.86967	-0.38045	False
147728A	-0.61628	-0.00344	2.38076	False
147966A	1.76535	2.05282	1.05317	False
152031A	-1.20982	-0.83107	0.09653	False
152546A	-1.40681	-1.25744	-0.14879	False
152598A	0.30324	0.40255	-0.71860	False
152620A	-1.47995	-0.79068	2.51734	False
152739A	-1.52376	-1.37022	-0.11601	False
152864A	0.07730	0.14584	-0.33313	False
152884A	0.30686	0.38112	-0.51284	False
153168A	-0.64666	-0.49966	-0.56705	False
154329A	-1.71116	-1.43910	-0.99143	False
154533A	-0.30420	-0.25325	0.03260	False
154758A	-0.60630	-0.38033	-0.82343	False
154760A	-0.38826	-0.35738	0.24755	False
155260A	-1.34402	-1.22115	0.03491	False
155455A	0.96979	1.02875	-0.76781	False
155525A	-0.89451	-0.65588	-0.88442	False
161166A	-1.39250	-0.81597	1.63230	False
479111	-0.87968	-0.52831	0.05955	False
479113	-1.85920	-1.75052	0.44945	False
479117	-0.11071	-0.09857	0.24314	False
479125	-2.46779	-2.33323	0.58533	False
479138	0.11774	0.09020	0.44077	False
488998	0.85354	0.98411	-0.77396	False
636391	-0.98589	-0.70257	-0.56627	False
636410	-2.01905	-1.78288	-0.51627	False
636412	0.62715	0.76110	-0.87634	False
636421	0.27759	0.55695	0.12877	False
636429	-0.40165	-0.46136	1.00691	False
636439	-0.62494	-0.46265	-0.70643	False
636443	-0.03206	-0.02067	0.20406	False
674356	-1.08299	-0.86198	-0.92975	False
674364	-0.82944	-0.56107	-0.60018	False
674370	0.49644	0.28870	1.71775	False
733123	-0.83818	-0.58779	-0.75440	False
733127	-1.31237	-1.23452	0.39022	False
733131	0.82320	0.82397	-0.20055	False
733134	0.55687	0.68051	-1.00237	False
771992	-2.34395	-1.44479	3.76109	True
771996	0.23421	0.36327	-0.92567	False

Table 2.4.8
b/b Analysis
Mathematics Grade 4

Item Id	Old b	New b	Std Dist	Flag
146951A	0.39179	-0.33196	4.72822	True
147525A	-0.58482	-0.67059	-0.31929	False
148236A	-0.16546	-0.37376	0.56543	False
148654A	0.65381	0.57097	-0.79673	False
148675A	1.30760	1.33809	0.30338	False
150642A	0.80646	0.45876	1.39114	False
150722A	1.57497	1.45248	-0.79746	False
151278A	0.34896	0.44845	0.53758	False
151506A	0.20779	0.21188	-0.32215	False
151519A	-1.48776	-1.47953	-0.78562	False
151553A	-0.95332	-0.95751	-0.81658	False
151556A	-0.52685	-0.64801	-0.04068	False
152166A	0.13420	0.10827	-0.60334	False
152197A	-1.77075	-1.79394	-0.41605	False
152343A	0.30331	0.24255	-0.83659	False
152353A	-0.47155	-0.56651	-0.28283	False
152355A	-1.09002	-1.12174	-0.59254	False
152518A	-1.07692	-1.20828	0.24673	False
152789A	0.48830	0.68109	1.37885	False
152874A	0.83827	0.72255	-0.58561	False
152985A	-1.10871	-1.18950	-0.17004	False
152988A	-0.28697	-0.27515	-0.43746	False
153171A	0.05640	-0.02768	-0.56792	False
153189A	0.16930	0.12322	-0.76121	False
153325A	0.62588	0.53408	-0.71062	False
154024A	-0.13857	-0.13604	-0.46193	False
154501A	-0.78305	-0.68794	0.08682	False
155121A	1.16444	1.23162	0.56187	False
155220A	-0.76679	-0.49333	1.60358	False
156019A	-0.06403	-0.09476	-0.71644	False
184241A	-1.11322	-1.05441	-0.34133	False
479500	-1.02300	-0.96361	-0.30345	False
479502	-0.51711	-0.68389	0.34221	False
479507	-0.29310	-0.27341	-0.37303	False
479930	-0.99277	-0.63827	2.20750	False
636619	-0.71774	-0.72820	-0.78361	False
636627	1.20056	1.04532	-0.38322	False
636649	-1.13814	-1.29308	0.46885	False
636655	-1.61737	-1.47995	0.14035	False
636657	0.76939	0.69258	-0.80224	False
636666	-0.69985	-0.70304	-0.71549	False
636668	-0.49851	-0.56717	-0.49577	False
733078	-0.37847	-0.42602	-0.71846	False
733086	-0.80480	-0.60370	0.97672	False
733088	0.67667	0.36624	1.12285	False
733092	-1.50019	-1.40872	-0.20607	False
733094	1.28707	1.33600	0.45209	False
733096	-1.07654	-1.06281	-0.70981	False
733100	0.34966	0.12808	0.48969	False
733102	-0.16204	-0.19254	-0.75031	False

Table 2.4.9
b/b Analysis
Mathematics Grade 5

Item Id	Old b	New b	Std Dist	Flag
146915A	-0.73817	-0.62286	-0.28365	False
146959A	-0.54272	-0.48610	-0.56629	False
147747A	-0.13826	-0.09552	-0.58804	False
147990A	0.37181	0.49383	-0.10880	False
148011A	-0.50469	-0.44475	-0.54412	False
148173A	0.90677	0.57083	0.74965	False
148659A	-0.16060	-0.05065	-0.23901	False
149230A	0.02324	0.10320	-0.37286	False
149246A	-0.23555	-0.16881	-0.47464	False
149261A	0.43031	0.44495	-0.66357	False
149384A	-0.60712	-0.33283	0.56510	False
149559A	1.49076	1.09863	0.97029	False
149640A	1.22681	1.17321	-0.76867	False
150273A	0.25715	0.48998	0.45685	False
150689A	0.35315	0.47171	-0.12927	False
151248A	-0.09178	-0.85495	3.11188	True
152946A	-0.67609	-0.56814	-0.31436	False
153107A	0.26198	0.39464	-0.06693	False
153162A	-1.28087	-1.07915	0.10039	False
153165A	0.16804	0.24934	-0.34762	False
153950A	-1.58225	-1.43454	-0.22029	False
153972A	-0.47739	-0.12277	1.00196	False
155232A	-0.93870	-0.94814	-0.72727	False
155234A	1.17869	1.19745	-0.54780	False
155329A	0.00501	0.25280	0.50343	False
155426A	-1.93439	-1.67359	0.32741	False
155434A	0.17565	0.21315	-0.57595	False
155474A	-0.37342	-0.35142	-0.72621	False
155479A	0.92592	0.81632	-0.43764	False
155489A	0.45722	0.43273	-0.82419	False
161469A	-0.88608	-0.84885	-0.71101	False
184261A	-0.02053	-0.10126	-0.46964	False
484706	-0.19789	-0.20282	-0.84412	False
489954	-1.96865	-1.90957	-0.73290	False
636705	-2.69854	-2.92905	0.65155	False
636718	-0.89429	-1.45328	2.14402	False
636726	0.03701	0.11131	-0.40076	False
636730	0.93387	0.88270	-0.74452	False
636735	-1.62114	-1.42171	0.04557	False
636740	0.50468	0.50483	-0.73006	False
636748	0.63299	0.62145	-0.77511	False
674572	-1.22289	-0.99888	0.22438	False
674574	-1.27516	-1.55913	0.75224	False
674588	2.01737	1.74866	0.25791	False
733174	0.03641	0.11787	-0.36335	False
733176	0.21023	0.27525	-0.42754	False
733184	-1.03226	-0.88405	-0.14844	False
733188	-0.12379	-1.14887	4.48700	True
733196	0.30061	0.25750	-0.70700	False
773934	-1.39051	-1.16101	0.23202	False

Table 2.4.10
b/b Analysis
Mathematics Grade 6

Item Id	Old b	New b	Std Dist	Flag
147326A	-0.18043	-0.11849	-0.18154	False
148159A	-2.05882	-1.86930	-0.66355	False
149234A	-1.18526	-1.05750	-0.41507	False
149259A	-1.09268	-1.33346	3.23613	True
149350A	-0.14172	0.22256	1.05811	False
150723A	-0.65900	-0.45406	-0.75654	False
151145A	-0.15091	0.01506	-0.93158	False
151782A	1.67241	1.74162	-1.03905	False
152379A	0.10091	0.26429	-0.85087	False
152633A	-0.77119	-0.75567	0.53349	False
152754A	1.16064	1.24119	-0.93586	False
152840A	-0.48278	-0.24947	-0.39782	False
153512A	-0.25662	0.00403	-0.02826	False
153601A	-0.48633	-0.34708	-0.82614	False
154011A	-0.37503	-0.10840	-0.01853	False
155138A	0.74245	1.23466	2.71361	False
155184A	-0.68057	-0.17887	2.20597	False
155300A	-1.96900	-1.74215	-1.07539	False
155465A	-1.32195	-1.08155	-0.68222	False
181455A	0.38443	0.58387	-0.36970	False
479039	0.82991	0.76339	0.67691	False
479041	-0.97992	-0.64758	0.38328	False
479043	1.29952	1.44527	-0.51977	False
479047	1.23141	1.23429	-0.18808	False
479049	2.09635	2.01732	0.26582	False
479051	0.66997	0.68187	-0.04062	False
479057	-1.12130	-1.18154	1.44039	False
479069	-1.10068	-1.02758	0.09645	False
479077	1.24036	1.37224	-0.68372	False
479081	-0.67186	-0.34137	0.49523	False
479083	0.22467	0.35137	-1.00159	False
479087	1.07858	1.11180	-0.42716	False
479095	1.25414	1.47584	0.22154	False
479097	0.48864	0.56630	-0.62232	False
479148	0.98267	1.03922	-0.62016	False
636459	-0.33377	-0.14470	-0.77771	False
636463	0.76911	0.99237	0.03174	False
636465	-0.80844	-0.76610	0.28070	False
636479	0.37854	0.55644	-0.58789	False
636483	0.41794	0.51541	-0.79075	False
636485	1.20043	1.13151	0.54402	False
636493	-1.03185	-0.80828	-0.72789	False
636499	-0.46762	-0.21575	-0.20554	False
674628	1.67211	1.77421	-0.79907	False
674630	1.16792	1.25968	-1.05120	False
674634	-1.53393	-1.01188	2.04833	False
674638	0.70862	0.54539	1.69669	False
733232	1.13393	1.16153	-0.39433	False
733240	-0.10618	0.17719	0.26296	False
773992	0.52539	0.49755	0.41855	False

Table 2.4.11
b/b Analysis
Mathematics Grade 7

Item Id	Old b	New b	Std Dist	Flag
148154A	-0.48316	-0.79366	2.80350	False
148171A	0.17361	0.49410	0.47271	False
148193A	1.39443	1.62404	-0.06909	False
148478A	1.37579	1.53210	-0.68066	False
148527A	0.11272	0.11408	0.11167	False
148530A	0.70337	0.67640	0.24401	False
148912A	0.51151	0.77081	0.02368	False
149064A	0.07351	0.21512	-1.02924	False
149204A	0.06378	0.07717	0.02035	False
149247A	-0.63036	-0.18622	1.35900	False
150199A	0.14960	0.30472	-0.90388	False
150232A	1.20726	1.36930	-0.66243	False
150629A	-0.54310	-0.32382	-0.49195	False
150891A	1.45371	1.68208	-0.06907	False
151987A	0.51163	0.18850	2.73522	False
152009A	0.91471	1.04425	-0.98305	False
152051A	1.00767	0.98957	0.11745	False
152056A	-0.41227	0.04918	1.54060	False
153291A	0.59093	0.60479	-0.07527	False
153299A	0.95990	1.01235	-0.45973	False
153504A	0.61200	0.86997	0.03013	False
155126A	1.49199	1.48877	-0.09031	False
155443A	0.46145	0.56407	-0.78937	False
182015A	1.06990	1.23880	-0.62939	False
182026A	1.04716	1.13603	-0.77717	False
182027A	0.95162	1.19082	-0.06655	False
480274	1.65275	1.47218	1.35356	False
480287	0.67561	0.86986	-0.48762	False
480295	1.23598	1.50206	0.20601	False
480307	2.24922	2.43496	-0.28444	False
480350	0.64313	0.64122	0.04652	False
480360	1.45579	1.58106	-0.92434	False
480373	0.92358	1.05548	-0.96192	False
480380	1.27412	1.33487	-0.58329	False
489119	1.22640	1.39301	-0.62117	False
489176	0.74340	0.92079	-0.61575	False
490454	1.63682	1.81308	-0.46967	False
636508	0.25842	0.21253	0.47845	False
636512	1.00984	1.20912	-0.38772	False
636537	0.46738	0.15235	2.67570	False
636539	1.25983	1.52892	0.23514	False
636547	0.24224	0.42613	-0.64900	False
636551	0.61910	0.76782	-0.87531	False
636555	1.33597	1.51373	-0.50957	False
674704	0.38502	0.47471	-0.66876	False
674708	-0.07009	-0.05737	0.04920	False
674723	0.47649	0.63360	-0.83049	False
733277	-0.71051	-0.36216	0.55008	False
733285	-1.37049	-0.76601	2.56088	False
774055	0.28948	0.41719	-0.96767	False

Table 2.4.12

b/b Analysis

Mathematics Grade 8

Item Id	Old b	New b	Std Dist	Flag
148061A	0.67101	0.79576	-0.75990	False
148303A	0.43009	0.60312	-0.84991	False
148327A	0.18894	0.24464	-0.12021	False
148379A	-0.26082	-0.33567	0.84847	False
148531A	-1.72399	-0.93448	1.49345	False
148689A	0.61824	0.74256	-0.72996	False
150198A	0.50470	0.63392	-0.69831	False
150215A	0.91410	0.92295	-0.23492	False
151253A	0.59459	0.73672	-0.81778	False
151260A	-0.88266	-0.85254	0.58248	False
151283A	0.08445	0.32873	-0.62950	False
152296A	-1.21723	-1.50763	2.55936	False
152944A	0.14486	0.21143	-0.15835	False
153437A	0.44543	0.73482	-0.18757	False
153448A	-0.24501	0.16984	0.15787	False
164493A	0.55130	0.88596	0.12221	False
181901A	1.26363	1.32450	-0.70973	False
181934A	1.10528	1.42743	0.34076	False
183795A	1.09805	1.28319	-0.43347	False
484750	2.25135	2.34149	-0.36625	False
484766	-0.71904	-0.58465	-0.08920	False
484783	3.37664	2.40803	3.97751	True
484815	1.37782	1.56845	-0.25670	False
484821	0.12010	0.27430	-0.63821	False
484823	-0.57919	-0.20732	-0.25809	False
484828	-0.34598	0.28516	1.32150	False
484841	1.74877	1.91934	-0.17606	False
484847	-1.06271	-1.08214	0.95501	False
484853	-0.00022	-0.15889	1.18392	False
484860	1.29755	1.39394	-0.82851	False
484866	1.03172	1.19222	-0.60662	False
484873	1.46309	1.62521	-0.37256	False
484877	-0.12672	0.02683	-0.50584	False
484881	-1.38462	-0.71742	0.98263	False
484977	0.99305	1.04737	-0.53179	False
490116	0.58546	0.81328	-0.46078	False
636559	0.59355	0.82401	-0.44172	False
636567	0.94813	1.16571	-0.32923	False
636578	0.31080	0.47542	-0.79626	False
636590	1.18289	1.32750	-0.61714	False
636594	0.68070	0.85287	-0.72406	False
636602	1.64390	1.76744	-0.49521	False
636610	-0.77465	-0.25933	0.44665	False
674821	1.18970	1.15439	-0.13032	False
674875	1.12198	1.26043	-0.68355	False
674877	-0.07923	0.02066	-0.22886	False
733318	1.45901	1.48930	-0.63966	False
733322	0.39814	0.61547	-0.61746	False
733332	0.67195	0.76138	-0.56177	False
774106	0.81737	1.58819	2.71366	False

Table 2.4.13
b/b Analysis
Science Grade 5

Item Id	Old b	New b	Std Dist	Flag
184387A	0.08144	0.07757	0.01566	False
184423A	0.89002	0.93291	-0.45288	False
185413A	1.13054	1.18046	-0.54281	False
186483A	1.38589	1.57390	0.14651	False
186489A	0.08404	0.24629	-0.25193	False
186490A	0.97995	0.99685	-0.28083	False
186754A	-1.05526	-1.08111	0.35988	False
186756A	-0.90552	-0.77075	-0.61157	False
186759A	-0.96470	-0.79500	-0.37023	False
187503A	0.69929	0.79305	-0.64333	False
187505A	-1.40025	-1.29447	-0.52957	False
187510A	-1.19711	-1.10570	-0.45959	False
188717A	-0.78917	-0.62179	-0.35814	False
188718A	-1.21086	-1.03638	-0.37621	False
188720A	-1.30212	-1.12781	-0.39239	False
189235A	-1.23513	-1.00674	0.00724	False
189237A	0.06230	0.14963	-0.63663	False
189238A	1.29882	1.08735	1.30813	False
189340A	-0.45001	-0.30084	-0.43344	False
189341A	0.42226	0.53600	-0.54514	False
189345A	1.32025	1.40825	-0.58298	False
189356A	0.66546	0.61075	0.28533	False
189358A	0.99602	1.08914	-0.59931	False
189361A	-0.99580	-0.89287	-0.57536	False
437241	0.41838	0.49897	-0.64654	False
437243	1.00688	1.09882	-0.60601	False
437245	0.95264	0.97175	-0.29224	False
437494	0.62949	0.83649	0.15905	False
437506	0.82385	1.11922	0.82598	False
465317	-1.17308	-0.44741	3.59119	True
638751	0.52902	0.64766	-0.49243	False
638753	0.50021	0.80434	0.83590	False
638755	0.92062	1.21133	0.80834	False
638808	0.40993	0.35312	0.34230	False
638810	0.33757	0.31116	0.13568	False
638812	0.77483	0.78672	-0.21122	False
701741	0.90891	0.83014	0.41835	False
701743	0.89451	1.01341	-0.43067	False
701751	-0.17408	-0.79091	4.46266	True
760514	-0.24223	-0.16943	-0.48231	False
760544	-0.15481	-0.04048	-0.63545	False
760546	-1.42039	-1.32803	-0.42983	False
760557	-0.30863	-0.11186	-0.06819	False
760561	1.13494	1.24558	-0.45064	False
760567	0.78968	0.92716	-0.31432	False

Section 2.5

Final Item Parameters

Table 2.5.1

IRT Parameters for Dichotomous Items

English Language Arts Grade 3

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
147341A	0.76356	0.00907	-1.59360	0.01784	0.01626	0.00686
147348A	1.20922	0.01967	-0.63805	0.01489	0.23910	0.00652
155274A	1.10058	0.01661	-1.08614	0.01759	0.15316	0.00853
155277A	0.79958	0.01992	0.43948	0.02007	0.27826	0.00610
155278A	0.46941	0.00899	-1.28521	0.05162	0.04488	0.01663
155279A	0.88401	0.01556	-0.50621	0.02022	0.19036	0.00782
155282A	0.77515	0.02228	0.37303	0.02551	0.38523	0.00676
155283A	0.68579	0.01184	-1.07961	0.03171	0.07787	0.01264
156120A	1.23402	0.01841	-0.73000	0.01342	0.17384	0.00627
156121A	0.83893	0.01539	-0.43084	0.02141	0.19252	0.00799
156123A	0.95208	0.02020	0.47938	0.01444	0.22381	0.00475
156124A	0.67651	0.00852	-1.57729	0.02165	0.01936	0.00818
156126A	1.22272	0.02180	0.32269	0.01068	0.20017	0.00393
482316	0.25412	0.00000	-1.84672	0.03483	0.00000	0.00000
482318	0.48933	0.01374	-0.17333	0.04869	0.13411	0.01419
482867	0.87276	0.01870	0.63788	0.01432	0.16789	0.00455
484541	1.27137	0.01777	-1.23608	0.01420	0.10943	0.00762
484543	0.71173	0.02381	1.59932	0.02567	0.14805	0.00417
484569	0.54763	0.01005	-0.78682	0.03479	0.04168	0.01188
484571	1.69185	0.06207	1.57789	0.01550	0.26282	0.00249
484575	0.57110	0.01218	-0.49070	0.03583	0.08892	0.01203
484577	1.21483	0.03177	1.00243	0.01340	0.28324	0.00347
484579	1.11548	0.02190	0.44558	0.01210	0.22275	0.00416
484581	0.28742	0.02203	1.89910	0.08014	0.15951	0.02019
628643	0.80354	0.02674	1.17002	0.02127	0.29787	0.00484
628709	1.12326	0.01521	-1.09652	0.01459	0.08163	0.00719
628734	0.62816	0.01309	-0.53272	0.03329	0.12895	0.01146
701185	0.62577	0.01424	-0.50033	0.03712	0.18715	0.01206
701219	0.84321	0.04947	2.27805	0.05569	0.25471	0.00346
701289	0.61976	0.02722	1.66555	0.03389	0.24885	0.00570
705924	1.00420	0.01476	-0.94969	0.01734	0.11405	0.00796
715595	0.62315	0.00970	-0.78747	0.02475	0.02982	0.00893
758779	0.84405	0.01478	-0.58630	0.02167	0.16948	0.00843
759133	0.60882	0.01525	-0.07675	0.03351	0.20164	0.01030
759149	0.97139	0.02219	0.47742	0.01566	0.28574	0.00493

Item ID	a	SE(a)	b	SE(b)	c	SE(c)
	Parameters and Measures of Standard Error					
759159	0.55399	0.01675	-0.08267	0.04630	0.27497	0.01238
765883	0.58583	0.01049	-0.58097	0.02861	0.04129	0.00996
799386	0.52931	0.01275	-0.70130	0.05041	0.12283	0.01598
799392	0.41144	0.01222	-0.19170	0.06090	0.07493	0.01673
799395	0.99221	0.02002	0.63567	0.01245	0.16877	0.00399
799397	0.64105	0.01289	-2.40938	0.07406	0.00000	0.03904
802056	0.60800	0.01403	0.41682	0.02166	0.09561	0.00713
802069	1.05072	0.01535	-0.91764	0.01629	0.12223	0.00755
802248	1.18447	0.01678	-0.89896	0.01382	0.12632	0.00667
802262	0.79769	0.01648	-0.01844	0.02063	0.21502	0.00705
802414	0.77286	0.01606	0.59625	0.01498	0.11547	0.00484
802422	0.76887	0.01872	0.57789	0.01849	0.21534	0.00575

Table 2.5.2

IRT Parameters for Polytomous Items

English Language Arts Grade 3

	Parameters and Measures of Standard Error									
Item ID	a	SE(a)	b	SE(b)	d0	SE(d0)	d1	SE(d1)	d2	SE(d2)
627921	1.05894	0.00686	0.89678	0.00611	1.33672	0.00654	-1.33672	0.01398	0.00000	0.00000
628835	0.85614	0.00552	1.12004	0.00725	1.63202	0.00761	-1.63202	0.01892	0.00000	0.00000

Table 2.5.3
IRT Parameters for Dichotomous Items
English Language Arts Grade 4

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
146887A	0.83608	0.01653	-0.13938	0.01852	0.18556	0.00687
148685A	1.34155	0.02281	0.22241	0.00916	0.17135	0.00369
148686A	0.87938	0.02445	0.63316	0.01817	0.30783	0.00532
148719A	0.22591	0.01279	0.47192	0.17288	0.07825	0.03001
148754A	0.55469	0.00886	-1.37409	0.03422	0.03101	0.01217
148938A	1.38432	0.02333	-1.28665	0.01735	0.26409	0.00895
149114A	0.87531	0.01109	-1.47791	0.01805	0.02406	0.00800
149115A	0.84786	0.02009	0.49285	0.01626	0.21372	0.00536
155473A	0.74394	0.01691	0.15505	0.02010	0.18513	0.00695
155490A	1.15115	0.02113	0.04681	0.01217	0.22550	0.00482
155569A	0.66876	0.01555	-0.30909	0.03009	0.19540	0.01006
155571A	0.60376	0.00933	-1.38898	0.03128	0.03157	0.01178
155572A	0.63127	0.01128	-1.69127	0.04486	0.06450	0.01864
155580A	1.11482	0.01646	-0.94844	0.01536	0.12960	0.00728
158587A	1.04147	0.01712	-0.34499	0.01387	0.16415	0.00581
158589A	1.37155	0.02134	-0.66833	0.01218	0.21311	0.00583
158602A	0.58249	0.01665	0.12877	0.03300	0.20129	0.01013
158604A	0.47109	0.00785	-1.78956	0.04485	0.03333	0.01460
158611A	0.50007	0.01341	-0.80387	0.05998	0.12371	0.01848
158691A	0.91051	0.01174	-1.98869	0.02066	0.02616	0.01011
158692A	0.71490	0.01806	0.30455	0.02165	0.21406	0.00710
186016A	0.44580	0.00000	-1.64599	0.01905	0.00000	0.00000
186018A	1.38104	0.05742	1.71066	0.02360	0.21620	0.00253
483086	0.64821	0.01714	-0.09775	0.03203	0.24791	0.00988
484626	0.90426	0.01813	-0.47996	0.02193	0.27269	0.00804
484628	1.13687	0.01961	-0.95276	0.01896	0.26129	0.00839
484632	1.61781	0.02878	-0.14826	0.00999	0.30099	0.00446
484636	0.36961	0.01502	-0.62773	0.11703	0.15179	0.02779
484638	1.00614	0.01590	-0.64528	0.01584	0.14303	0.00686
484640	0.88111	0.01698	0.25682	0.01368	0.13607	0.00500
484648	1.00192	0.02321	0.39810	0.01499	0.28157	0.00499
484650	0.89216	0.01584	-0.38303	0.01763	0.16267	0.00698
484722	1.23140	0.01933	-0.68621	0.01364	0.19918	0.00630

Item ID	a	SE(a)	b	SE(b)	c	SE(c)
	Parameters and Measures of Standard Error					
485159	0.85510	0.01607	-0.71558	0.02389	0.20828	0.00928
485165	0.70741	0.01661	0.17713	0.02138	0.17760	0.00729
485172	1.19325	0.01932	-0.53048	0.01354	0.20868	0.00601
635510	0.53091	0.00777	-1.53798	0.03027	0.02290	0.01004
635527	0.51520	0.01270	-0.91812	0.05571	0.10084	0.01802
635530	0.51735	0.00000	-1.44997	0.01527	0.00000	0.00000
635757	0.69850	0.01281	-2.78548	0.06284	0.08979	0.03376
702458	1.10641	0.01805	-0.64012	0.01538	0.19840	0.00674
702895	1.23375	0.04512	1.46143	0.02028	0.26124	0.00304
702920	0.95559	0.01841	-0.35067	0.01851	0.25299	0.00702
702924	0.97252	0.01408	-1.65387	0.02254	0.06202	0.01177
799478	1.23513	0.02142	-0.63996	0.01529	0.28112	0.00662
799480	0.64833	0.01945	0.62353	0.02380	0.22168	0.00725
799483	1.18209	0.01729	-1.96682	0.02024	0.06133	0.01241
799497	0.48373	0.01889	0.58679	0.04208	0.22253	0.01167

Table 2.5.4

IRT Parameters for Polytomous Items

English Language Arts Grade 4

Item ID	a	SE(a)	b	SE(b)	d0	SE(d0)	d1	SE(d1)	d2	SE(d2)
	Parameters and Measures of Standard Error									
629160	0.71082	0.00408	0.39094	0.00791	1.40085	0.00898	-1.40085	0.01283	0.00000	0.00000
799500	0.67108	0.00375	0.44173	0.00872	1.82408	0.00988	-1.82408	0.01572	0.00000	0.00000

Table 2.5.5
IRT Parameters for Dichotomous Items
English Language Arts Grade 5

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
147920A	1.13357	0.02565	-0.92475	0.03100	0.36084	0.01462
147921A	1.07431	0.02039	-0.47997	0.02001	0.18968	0.01013
147923A	0.78598	0.01756	-0.58544	0.03414	0.15028	0.01509
147924A	0.68614	0.01299	-1.03689	0.03703	0.04957	0.01678
147926A	0.83074	0.02170	0.10747	0.02584	0.24572	0.00998
147969A	1.08538	0.01828	-1.20840	0.02394	0.07997	0.01472
148893A	0.62456	0.01612	-0.76812	0.05456	0.11532	0.02176
148900A	0.95609	0.01765	-0.48482	0.02097	0.11750	0.01047
148906A	1.17445	0.02001	-1.67521	0.02649	0.06340	0.01862
148961A	0.88368	0.01767	-0.80647	0.03031	0.13651	0.01505
148963A	1.25138	0.02398	-0.79686	0.02113	0.25490	0.01165
148967A	1.85753	0.02981	-0.88032	0.01117	0.15167	0.00808
148971A	0.68699	0.01479	-0.66065	0.03696	0.07170	0.01600
149152A	1.04559	0.01814	-1.54313	0.02968	0.07084	0.01922
149158A	0.49438	0.01625	-0.07830	0.05913	0.08870	0.01951
149196A	0.71859	0.01834	-0.61286	0.04460	0.19114	0.01795
149318A	1.13564	0.02145	-0.31814	0.01728	0.20185	0.00868
149321A	0.45694	0.00000	-0.96512	0.01772	0.00000	0.00000
149330A	0.95550	0.01973	-0.97471	0.03275	0.19594	0.01676
149339A	0.49684	0.00000	-0.79477	0.01500	0.00000	0.00000
158749A	0.88238	0.02019	-0.06485	0.02323	0.20315	0.00985
159151A	1.13988	0.02284	-0.11349	0.01650	0.23102	0.00782
159165A	0.63566	0.01737	-0.34425	0.04526	0.14188	0.01712
159368A	0.85827	0.02471	0.38363	0.02360	0.29035	0.00853
159475A	1.05718	0.02225	-0.43858	0.02293	0.26590	0.01064
159592A	1.10739	0.02483	-0.16830	0.02039	0.31657	0.00878
159600A	0.96272	0.01573	-1.83666	0.02963	0.04465	0.01813
160682A	0.63505	0.01690	-0.52036	0.04871	0.13308	0.01885
186469A	1.18250	0.02334	0.56419	0.01057	0.12043	0.00437
186471A	1.26823	0.02516	-1.46354	0.02956	0.19651	0.01990
186474A	0.73981	0.02174	0.22320	0.03034	0.24363	0.01094
186476A	0.86745	0.01992	-0.06119	0.02357	0.19577	0.00998
483144	0.85838	0.01454	-1.56109	0.03315	0.05131	0.01875

Item ID	a	SE(a)	b	SE(b)	c	SE(c)
	Parameters and Measures of Standard Error					
483150	0.71416	0.01884	-0.43227	0.04200	0.20453	0.01626
483162	1.24088	0.02721	-2.16895	0.04385	0.12871	0.03643
483170	1.10497	0.01812	-1.89673	0.02624	0.04325	0.01733
630607	0.27443	0.00000	2.04910	0.06008	0.00000	0.00000
630655	1.19838	0.01923	-0.48871	0.01424	0.10683	0.00793
631955	0.96443	0.01419	-1.33413	0.02116	0.03077	0.01158
631981	1.12540	0.02013	-0.18333	0.01474	0.14764	0.00746
631995	0.87126	0.01826	0.12297	0.01801	0.11611	0.00795
632263	0.87977	0.01287	-1.80092	0.02197	0.02027	0.00932
632323	1.21889	0.02621	0.21745	0.01400	0.25816	0.00621
799549	1.30265	0.02386	-0.55651	0.01689	0.23475	0.00927
799562	0.55293	0.01689	-0.77321	0.07471	0.14111	0.02656
799574	0.93169	0.02116	-0.08164	0.02237	0.22952	0.00953
799579	1.21277	0.02325	-1.72366	0.03226	0.11572	0.02369
799588	0.96326	0.01949	-0.53018	0.02465	0.18986	0.01183
799592	1.03133	0.02515	0.05736	0.02081	0.31886	0.00829
799594	1.55848	0.02994	-0.34843	0.01372	0.31366	0.00736

Table 2.5.6

IRT Parameters for Polytomous Items

English Language Arts Grade 5

Item ID	a	SE(a)	b	SE(b)	d0	SE(d0)	d1	SE(d1)	d2	SE(d2)
	Parameters and Measures of Standard Error									
761740	0.73969	0.00410	0.29332	0.00793	4.84260	0.04442	0.60406	0.00872	-1.50598	0.01271

Item ID	d3	SE(d3)	d4	SE(d4)
	Parameters and Measures of Standard Error			
761740	-3.94068	0.04540	0.00000	0.00000

Table 2.5.7
IRT Parameters for Dichotomous Items
English Language Arts Grade 6

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
147260A	0.32267	0.01717	0.40715	0.10831	0.13380	0.02452
147261A	0.84858	0.01580	-1.34536	0.03264	0.19036	0.01454
147283A	0.89075	0.01639	-0.87115	0.02440	0.20842	0.01010
147289A	0.57250	0.01793	-0.50898	0.05704	0.32235	0.01516
147290A	0.78878	0.01575	-0.69862	0.02746	0.20280	0.01043
149570A	1.06353	0.01996	-0.33229	0.01634	0.26485	0.00641
149571A	1.24055	0.01756	-0.53235	0.01068	0.11139	0.00497
158723A	0.94109	0.01396	-1.66125	0.02384	0.06129	0.01283
158740A	0.42245	0.00000	-1.35654	0.01719	0.00000	0.00000
158747A	0.73758	0.01265	-1.07482	0.02818	0.07614	0.01194
158777A	0.75053	0.01365	-0.89386	0.02767	0.11372	0.01129
158780A	0.97542	0.01988	0.20824	0.01441	0.21128	0.00515
158886A	0.83420	0.01225	-1.91820	0.02812	0.04463	0.01470
158935A	0.56836	0.01428	-0.65102	0.04661	0.15376	0.01522
158943A	1.64303	0.05069	1.09473	0.01277	0.31075	0.00288
158947A	0.98945	0.02271	-0.00355	0.01873	0.34849	0.00613
159272A	1.22706	0.01864	-1.33594	0.01693	0.14480	0.00942
159273A	0.73085	0.01360	-0.95874	0.03022	0.11653	0.01225
159451A	0.62280	0.01199	-1.70893	0.05112	0.08087	0.02155
159453A	0.53485	0.01415	-1.00531	0.06322	0.16099	0.02030
159454A	0.83720	0.02148	0.85349	0.01630	0.17218	0.00452
159457A	0.67600	0.01664	-1.17539	0.05271	0.29051	0.01762
159458A	0.70288	0.01717	-0.52034	0.03561	0.27956	0.01141
181888A	0.69307	0.01458	-0.78166	0.03404	0.16736	0.01255
181889A	0.58429	0.00985	-1.26623	0.03497	0.03792	0.01323
181893A	0.44776	0.01666	0.25980	0.05389	0.16437	0.01488
181904A	1.17113	0.01873	-0.36599	0.01235	0.17362	0.00540
485443	0.92664	0.01992	0.53345	0.01369	0.16506	0.00447
485688	1.23982	0.02207	-0.80349	0.01684	0.30072	0.00747
485986	1.02320	0.03122	1.33075	0.01877	0.18328	0.00321
486369	0.91185	0.01468	-0.66551	0.01763	0.11341	0.00760
486371	1.02811	0.02103	-0.18850	0.01740	0.30261	0.00631
486376	1.19977	0.02096	-0.60503	0.01542	0.26856	0.00669

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
629854	0.67910	0.02213	1.31754	0.02387	0.14147	0.00487
629856	0.89103	0.01700	-0.30499	0.01876	0.20028	0.00719
629863	0.64296	0.01340	-0.77174	0.03521	0.11516	0.01298
629867	1.18260	0.02066	-0.95178	0.01836	0.27345	0.00842
629869	0.62162	0.01655	0.00977	0.03144	0.20183	0.00995
629885	0.70690	0.01761	0.05288	0.02551	0.22973	0.00829
629889	0.70561	0.02567	1.32101	0.02563	0.21500	0.00514
629891	1.43556	0.03520	0.68813	0.01156	0.30585	0.00345
629895	0.49657	0.01139	-0.88808	0.05143	0.06273	0.01687
629898	0.92788	0.02283	0.84184	0.01482	0.17856	0.00408
708956	0.40361	0.00869	-0.99672	0.05536	0.03853	0.01573
709888	0.51262	0.00840	-1.24120	0.03454	0.02827	0.01166
709904	0.83747	0.01678	-0.79253	0.02770	0.24398	0.01058
710081	0.66925	0.01378	-0.31660	0.02560	0.10666	0.00931
710109	1.62795	0.03305	0.34300	0.00957	0.28636	0.00355

Table 2.5.8

IRT Parameters for Polytomous Items

English Language Arts Grade 6

Item ID	Parameters and Measures of Standard Error									
	a	SE(a)	b	SE(b)	d0	SE(d0)	d1	SE(d1)	d2	SE(d2)
630290	0.67904	0.00427	0.87966	0.00859	1.34215	0.00896	-1.34215	0.01568	0.00000	0.00000
630430	0.65043	0.00462	1.44784	0.01006	1.30126	0.00950	-1.30126	0.01967	0.00000	0.00000

Table 2.5.9
IRT Parameters for Dichotomous Items
English Language Arts Grade 7

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
148117A	0.87792	0.01857	0.00520	0.01849	0.24477	0.00646
148759A	0.76159	0.01530	-0.33143	0.02334	0.17553	0.00851
148760A	0.81135	0.01356	-0.62552	0.02023	0.10126	0.00826
148762A	0.59823	0.01537	-0.83747	0.05210	0.23829	0.01628
148785A	0.78330	0.02584	1.31602	0.02244	0.20226	0.00437
148823A	0.77768	0.01599	-0.72049	0.02975	0.23523	0.01084
148850A	0.64898	0.01369	-1.27553	0.04711	0.15417	0.01798
148859A	0.87034	0.01314	-1.79634	0.02801	0.06107	0.01483
148861A	0.74527	0.01500	0.08501	0.01823	0.12263	0.00656
148866A	0.74877	0.01740	-0.39619	0.03001	0.28495	0.00974
154639A	0.81550	0.02103	0.69991	0.01722	0.21660	0.00516
158719A	0.91409	0.02025	0.37454	0.01549	0.22751	0.00519
158724A	1.25396	0.02419	0.12367	0.01201	0.27630	0.00450
158765A	0.83971	0.01655	-0.45771	0.02285	0.22566	0.00846
158766A	0.75643	0.01766	-0.23911	0.02726	0.27684	0.00885
158768A	1.03632	0.01859	-1.38891	0.02661	0.25744	0.01260
159120A	1.03831	0.01510	-0.72601	0.01440	0.10436	0.00656
159122A	0.65539	0.01968	0.66666	0.02370	0.22646	0.00706
159393A	0.33443	0.03273	3.05972	0.13865	0.18581	0.01215
159394A	0.51715	0.01995	0.60910	0.03987	0.26568	0.01070
159646A	0.66861	0.01363	-0.09202	0.02228	0.09627	0.00797
160475A	0.48422	0.00822	-0.09547	0.02174	0.01527	0.00622
160508A	0.75511	0.01308	-0.68402	0.02321	0.09429	0.00928
160511A	0.49142	0.00000	-0.95972	0.01283	0.00000	0.00000
160937A	0.97949	0.01372	-1.18341	0.01755	0.06554	0.00859
160940A	1.02489	0.01540	-1.47772	0.02133	0.10324	0.01141
161009A	0.88028	0.01643	-0.93564	0.02645	0.23277	0.01070
161013A	1.11094	0.01552	-0.84208	0.01352	0.09695	0.00646
161015A	1.02749	0.01624	-1.12991	0.01999	0.15960	0.00965
161017A	0.63889	0.01486	-0.01943	0.02651	0.14423	0.00896
486302	0.54685	0.01378	0.11191	0.03023	0.09242	0.00992
486597	0.62993	0.01103	-0.44918	0.02320	0.03786	0.00842
486613	0.58872	0.01639	-0.57134	0.05052	0.27282	0.01463

Item ID	a	SE(a)	b	SE(b)	c	SE(c)
	Parameters and Measures of Standard Error					
486661	1.13487	0.02126	-0.38578	0.01620	0.30562	0.00631
486665	0.94354	0.03695	1.36491	0.02401	0.33978	0.00398
634303	0.71220	0.01856	0.61542	0.01944	0.18350	0.00611
634354	0.43369	0.02301	1.21996	0.04672	0.25792	0.01190
634364	0.94021	0.02179	0.21709	0.01757	0.30594	0.00570
634366	0.63081	0.02598	0.94807	0.03089	0.36591	0.00728
634374	0.85778	0.02921	1.17615	0.02123	0.28936	0.00447
634379	0.81791	0.01468	-0.23942	0.01785	0.12572	0.00686
634389	0.47864	0.01424	-0.37737	0.05757	0.14035	0.01674
711110	0.88575	0.01696	-0.36618	0.02001	0.22095	0.00754
711120	0.74272	0.01908	-0.48961	0.03627	0.37211	0.01055
711137	0.62992	0.01454	-0.29301	0.03162	0.15620	0.01065
711145	1.05680	0.01902	-0.65282	0.01868	0.26988	0.00764
711168	0.93686	0.01842	-0.31906	0.01936	0.26304	0.00714
711173	0.90797	0.02025	0.16901	0.01760	0.27160	0.00591

Table 2.5.10

IRT Parameters for Polytomous Items

English Language Arts Grade 7

	Parameters and Measures of Standard Error									
Item ID	a	SE(a)	b	SE(b)	d0	SE(d0)	d1	SE(d1)	d2	SE(d2)
630545	0.67800	0.00428	1.14726	0.00859	1.70662	0.00893	-1.70662	0.02028	0.00000	0.00000
630649	0.62644	0.00368	0.48864	0.00870	1.35887	0.00963	-1.35887	0.01370	0.00000	0.00000

Table 2.5.11

IRT Parameters for Dichotomous Items

English Language Arts Grade 8

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
148177A	0.77518	0.01270	-1.19523	0.02718	0.05083	0.01249
148187A	0.50716	0.00729	-1.83127	0.02109	0.00000	0.00000
148189A	0.46341	0.01283	-0.41241	0.05411	0.06225	0.01694
149416A	0.46422	0.01071	-1.09297	0.05970	0.05276	0.01936
149431A	1.12636	0.01897	-1.09375	0.02027	0.18596	0.01060
149653A	0.93492	0.01765	-0.23247	0.01723	0.16682	0.00732
149654A	0.72827	0.03038	1.41252	0.02899	0.22959	0.00557
149721A	0.74352	0.01502	-2.18631	0.06138	0.00000	0.03593
149731A	0.55818	0.02441	1.65075	0.03640	0.11928	0.00665
149744A	1.55384	0.02889	0.19620	0.00924	0.23157	0.00411
160467A	0.39051	0.01606	-2.21894	0.23580	0.00000	0.08089
160742A	0.83679	0.01406	-0.85300	0.02251	0.07733	0.01025
160745A	0.68858	0.01256	-1.39066	0.03848	0.06286	0.01704
160747A	0.67653	0.01638	-0.48576	0.03599	0.18730	0.01298
160770A	1.51812	0.02708	-2.15968	0.02109	0.07551	0.01626
160771A	0.91800	0.01921	0.11460	0.01610	0.18266	0.00641
160775A	0.96778	0.01560	-0.64967	0.01705	0.10299	0.00802
160777A	0.97956	0.03227	0.89872	0.01849	0.32840	0.00495
160784A	1.19173	0.01836	-2.15951	0.02215	0.04039	0.01423
160785A	0.86079	0.01640	-1.80010	0.04214	0.13355	0.02247
160787A	0.62044	0.01405	-0.33791	0.03143	0.08409	0.01166
160788A	0.43664	0.00000	-1.20669	0.01738	0.00000	0.00000
160789A	1.10041	0.02604	0.54951	0.01325	0.23714	0.00469
160790A	0.35985	0.00000	-1.20602	0.02072	0.00000	0.00000
160791A	1.31476	0.02453	-0.94898	0.01897	0.32393	0.00930
160872A	1.36845	0.02577	0.25793	0.00996	0.20412	0.00422
160873A	1.13159	0.02465	0.27630	0.01347	0.25749	0.00521
160875A	0.65921	0.05094	2.13200	0.07647	0.35659	0.00581
160877A	1.31507	0.02744	0.50771	0.01042	0.20348	0.00392
160992A	0.46604	0.00000	-1.74521	0.02167	0.00000	0.00000
160993A	0.38779	0.00000	-0.44063	0.01487	0.00000	0.00000
485469	1.21447	0.02846	0.62710	0.01201	0.23253	0.00414
485495	0.63829	0.01515	-0.42839	0.03505	0.13019	0.01282

Item ID	a	SE(a)	b	SE(b)	c	SE(c)
	Parameters and Measures of Standard Error					
485500	0.77908	0.01419	-0.51163	0.02187	0.08335	0.00923
485506	1.34323	0.06730	1.89312	0.03273	0.19175	0.00250
486738	0.22293	0.00573	-0.03617	0.02607	0.00000	0.00000
486744	0.57474	0.01768	0.00616	0.04059	0.19319	0.01295
486763	0.39623	0.01029	-2.47333	0.12828	0.09543	0.04039
487006	0.68010	0.01292	-1.78755	0.04939	0.07640	0.02303
626597	0.48421	0.02703	0.69999	0.06117	0.38636	0.01396
626626	1.25451	0.02314	0.37407	0.00977	0.14668	0.00390
626785	1.34238	0.02252	-0.77250	0.01482	0.23803	0.00772
626814	0.22711	0.02833	2.23559	0.16765	0.18804	0.03550
627061	1.05973	0.01540	-1.44893	0.01948	0.05304	0.01082
760819	0.60605	0.01788	0.16472	0.03295	0.18173	0.01099
760826	0.56705	0.02039	0.74454	0.02983	0.17949	0.00962
760834	0.90672	0.02096	0.37404	0.01578	0.19663	0.00589
760837	0.98891	0.02004	-2.02393	0.04430	0.19610	0.02586
760844	0.52777	0.01281	-0.88317	0.05369	0.07458	0.01868
760851	0.75810	0.00000	-2.44966	0.02212	0.00000	0.00000

Table 2.5.12

IRT Parameters for Polytomous Items

English Language Arts Grade 8

Item ID	Parameters and Measures of Standard Error									
	a	SE(a)	b	SE(b)	d0	SE(d0)	d1	SE(d1)	d2	SE(d2)
762233	0.67396	0.00334	-0.49280	0.00780	4.43118	0.04011	0.81014	0.00987	-1.00575	0.00955

Item ID	Parameters and Measures of Standard Error			
	d3	SE(d3)	d4	SE(d4)
762233	-4.23559	0.03277	0.00000	0.00000

Table 2.5.13
IRT Parameters for Dichotomous Items
Mathematics Grade 3

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
146917A	0.87804	0.01162	-1.44630	0.01805	0.01818	0.00778
146947A	0.99866	0.02934	1.40155	0.01801	0.15092	0.00367
147044A	0.77651	0.01722	-0.63295	0.03443	0.18882	0.01384
147064A	0.97497	0.02238	-2.01343	0.05638	0.22604	0.03351
147073A	1.33834	0.02538	-0.38168	0.01543	0.28389	0.00729
147300A	1.02296	0.02361	0.15661	0.01847	0.29298	0.00695
147330A	1.31965	0.02239	-1.49114	0.02083	0.10908	0.01384
147542A	0.94031	0.01908	-0.88610	0.02988	0.22332	0.01356
147708A	1.34892	0.02326	-0.05512	0.01135	0.18135	0.00541
147712A	1.21256	0.02168	-1.07711	0.02151	0.19522	0.01193
147728A	0.73107	0.01884	-0.18013	0.03390	0.24222	0.01185
147966A	0.69873	0.04130	1.94911	0.04727	0.34078	0.00588
152031A	1.16567	0.02009	-1.03714	0.02081	0.15839	0.01147
152546A	0.75490	0.01528	-1.47864	0.04717	0.10505	0.02299
152598A	1.43094	0.02467	0.24027	0.00936	0.15291	0.00422
152620A	0.75564	0.01000	-0.99531	0.01703	0.01489	0.00637
152739A	0.66254	0.01102	-1.59542	0.03710	0.04034	0.01643
152864A	0.72208	0.02021	-0.02555	0.03466	0.28321	0.01132
152884A	0.69595	0.01602	0.21808	0.02291	0.09828	0.00864
153168A	1.60514	0.02409	-0.69397	0.01063	0.12124	0.00622
154329A	0.86361	0.01668	-1.66675	0.04262	0.10925	0.02356
154533A	1.06529	0.01940	-0.43881	0.01821	0.18304	0.00845
154758A	1.19023	0.01797	-0.57040	0.01338	0.08679	0.00681
154760A	1.29971	0.02002	-0.54664	0.01268	0.11727	0.00667
155260A	1.34109	0.01898	-1.44106	0.01439	0.03089	0.00851
155455A	0.93524	0.02324	0.88869	0.01505	0.16395	0.00485
155525A	1.33736	0.01986	-0.85573	0.01334	0.08884	0.00752
161166A	0.78819	0.01173	-1.02150	0.02195	0.02761	0.00972
479111	0.90937	0.01751	-0.72363	0.02618	0.16540	0.01190
479113	1.07117	0.01682	-1.98922	0.02430	0.03771	0.01482
479117	0.89987	0.02270	-0.27864	0.02973	0.36186	0.01021
479125	1.10279	0.02744	-2.59261	0.06373	0.18083	0.04922
479138	0.95084	0.01794	-0.08317	0.01695	0.14105	0.00727

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
488998	1.19812	0.03408	0.84247	0.01529	0.33921	0.00464
636391	1.19391	0.02130	-0.90408	0.02021	0.20235	0.01066
636410	0.69293	0.01377	-2.02273	0.05952	0.08475	0.03029
636412	1.12499	0.02905	0.61154	0.01554	0.31631	0.00527
636421	0.81365	0.01807	0.40015	0.01754	0.12836	0.00669
636429	0.58218	0.02057	-0.65431	0.07955	0.35965	0.02139
636439	0.44012	0.01753	-0.65564	0.11400	0.19945	0.03043
636443	0.46346	0.01512	-0.19797	0.06627	0.09905	0.02004
674356	0.78097	0.01627	-1.06915	0.03955	0.14471	0.01774
674364	0.87618	0.01737	-0.75756	0.02866	0.17039	0.01279
674370	0.72277	0.01173	0.12238	0.01437	0.01652	0.00503
733123	0.87969	0.01681	-0.78522	0.02745	0.14404	0.01257
733127	1.02651	0.02319	-1.45491	0.04155	0.31682	0.02023
733131	0.66734	0.01654	0.67664	0.01951	0.07593	0.00693
733134	0.94694	0.02257	0.52809	0.01636	0.21649	0.00596
771992	0.51196	0.02044	-1.67264	0.16522	0.37115	0.04488
771996	1.08927	0.01131	0.19959	0.00693	0.00000	0.00000

Table 2.5.14
IRT Parameters for Dichotomous Items
Mathematics Grade 4

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
146951A	0.42934	0.01531	-0.30721	0.09279	0.11981	0.02617
147525A	0.90947	0.01709	-0.66090	0.02653	0.14345	0.01248
148236A	0.80324	0.01380	-0.35087	0.02135	0.05089	0.00924
148654A	1.22220	0.02349	0.63587	0.01102	0.15388	0.00434
148675A	0.84385	0.02822	1.43711	0.02122	0.23470	0.00522
150642A	0.66573	0.01774	0.51867	0.02716	0.15210	0.00949
150722A	1.21867	0.04412	1.55658	0.01887	0.32492	0.00381
151278A	0.80515	0.02239	0.50790	0.02544	0.29333	0.00831
151506A	0.87415	0.01812	0.26081	0.01868	0.15175	0.00745
151519A	1.22886	0.01918	-1.50582	0.01960	0.04378	0.01251
151553A	1.08990	0.02305	-0.96058	0.03063	0.30274	0.01469
151556A	1.10859	0.02006	-0.63732	0.02090	0.18899	0.01053
152166A	0.85831	0.01849	0.15259	0.02138	0.18154	0.00841
152197A	0.48209	0.00000	-1.83421	0.02754	0.00000	0.00000
152343A	1.82142	0.03216	0.29285	0.00847	0.20406	0.00417
152353A	0.90923	0.01743	-0.55219	0.02587	0.15931	0.01181
152355A	0.97903	0.02112	-1.13211	0.03779	0.26738	0.01828
152518A	0.79032	0.01484	-1.22250	0.03847	0.08292	0.01917
152789A	0.93580	0.02055	0.75089	0.01467	0.14767	0.00535
152874A	1.28535	0.02671	0.79419	0.01106	0.18369	0.00410
152985A	0.83726	0.01698	-1.20289	0.04115	0.14394	0.02048
152988A	1.18924	0.02194	-0.24788	0.01670	0.22372	0.00786
153171A	1.01236	0.01984	0.01060	0.01802	0.19755	0.00768
153189A	1.16036	0.02011	0.16821	0.01248	0.13841	0.00559
153325A	1.80102	0.03559	0.59734	0.00875	0.23072	0.00380
154024A	0.95864	0.01610	-0.10258	0.01583	0.08225	0.00707
154501A	1.52854	0.02617	-0.67902	0.01422	0.20196	0.00835
155121A	0.70604	0.02138	1.32590	0.02096	0.13703	0.00600
155220A	0.72048	0.02039	-0.47576	0.05089	0.34407	0.01628
156019A	0.97581	0.01836	-0.05946	0.01816	0.15826	0.00792
184241A	0.74112	0.01006	-1.06179	0.01913	0.01667	0.00729
479500	1.04582	0.02604	-0.96695	0.03952	0.43395	0.01548
479502	0.91963	0.01979	-0.67479	0.03217	0.26013	0.01379

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
479507	0.81702	0.02827	-0.24606	0.05128	0.56596	0.01176
479930	0.46352	0.01906	-0.62714	0.12291	0.28493	0.03109
636619	1.09809	0.02209	-0.72107	0.02551	0.27450	0.01206
636627	0.99298	0.02421	1.13132	0.01435	0.15490	0.00433
636649	1.04515	0.02092	-1.31107	0.03432	0.20138	0.01919
636655	0.80121	0.01379	-1.50625	0.03620	0.05647	0.01902
636657	0.79695	0.02337	0.76289	0.02348	0.28032	0.00747
636666	1.24746	0.02216	-0.69479	0.01866	0.20329	0.00999
636668	0.72674	0.01559	-0.55288	0.03616	0.12803	0.01489
733078	1.03742	0.01697	-0.40546	0.01688	0.09689	0.00820
733086	1.14760	0.02960	-0.59104	0.03154	0.50237	0.01084
733088	0.95206	0.02131	0.42204	0.01781	0.22172	0.00677
733092	1.10500	0.01950	-1.43186	0.02763	0.10030	0.01737
733094	0.91377	0.02372	1.43492	0.01645	0.10737	0.00380
733096	0.58502	0.01360	-1.07056	0.06119	0.00000	0.02612
733100	0.70732	0.02034	0.17329	0.03619	0.28912	0.01149
733102	1.03435	0.01060	-0.16159	0.00722	0.00000	0.00000

Table 2.5.15
IRT Parameters for Dichotomous Items
Mathematics Grade 5

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
146915A	0.97413	0.01638	-0.72361	0.02117	0.09160	0.01072
146959A	0.53939	0.00995	-0.57922	0.03374	0.02976	0.01179
147747A	1.09391	0.02053	-0.16684	0.01719	0.20219	0.00776
147990A	1.20366	0.02141	0.45540	0.01078	0.12361	0.00438
148011A	1.08638	0.01870	-0.53556	0.01833	0.14382	0.00922
148173A	0.91617	0.02121	0.53669	0.01763	0.20507	0.00645
148659A	1.35902	0.02193	-0.11947	0.01122	0.14047	0.00560
149230A	1.26882	0.02195	0.04297	0.01215	0.16483	0.00566
149246A	0.87724	0.01792	-0.24422	0.02415	0.18028	0.01012
149261A	0.99278	0.01873	0.40379	0.01359	0.11757	0.00545
149384A	1.04788	0.01989	-0.41739	0.02064	0.20698	0.00956
149559A	0.80488	0.02229	1.09395	0.01858	0.17001	0.00568
149640A	1.24826	0.03096	1.17269	0.01278	0.18743	0.00356
150273A	0.82295	0.02016	0.45133	0.02155	0.21208	0.00771
150689A	1.18690	0.02797	0.43204	0.01591	0.32975	0.00575
151248A	0.61494	0.02056	-0.96865	0.08970	0.37825	0.02601
152946A	0.99789	0.01742	-0.66583	0.02145	0.12485	0.01074
153107A	1.51106	0.03255	0.35067	0.01225	0.32530	0.00497
153162A	0.83893	0.02531	-1.20536	0.06767	0.49007	0.02163
153165A	1.21715	0.02453	0.19726	0.01437	0.25333	0.00601
153950A	0.56256	0.01088	-1.58058	0.05471	0.05499	0.02234
153972A	0.96128	0.02167	-0.19561	0.02506	0.30172	0.00968
155232A	1.02624	0.02098	-1.06704	0.03178	0.24292	0.01606
155234A	1.59883	0.03103	1.19828	0.00895	0.06422	0.00200
155329A	1.49650	0.03007	0.20092	0.01208	0.29354	0.00527
155426A	0.74993	0.01841	-1.83297	0.07613	0.19993	0.03785
155434A	0.79161	0.01801	0.15905	0.02392	0.17564	0.00906
155474A	1.01167	0.01902	-0.43702	0.02118	0.18618	0.00983
155479A	1.09880	0.02308	0.79588	0.01234	0.14943	0.00433
155489A	1.06656	0.02272	0.39089	0.01541	0.22523	0.00600
161469A	0.75651	0.01126	-0.96221	0.02258	0.02609	0.00986
184261A	0.50187	0.01514	-0.17290	0.06056	0.11140	0.01920
484706	0.73448	0.01864	-0.28013	0.03830	0.25227	0.01358

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
489954	0.75590	0.01571	-2.08212	0.06228	0.10291	0.03499
636705	0.49156	0.01258	-3.15849	0.12801	0.12136	0.05368
636718	0.80405	0.01377	-1.60037	0.03588	0.05460	0.01914
636726	1.29582	0.02259	0.05153	0.01204	0.17415	0.00561
636730	0.82729	0.01640	0.86597	0.01344	0.04680	0.00425
636735	0.48039	0.01110	-1.56704	0.08039	0.07318	0.02889
636740	0.91492	0.02100	0.46701	0.01816	0.20991	0.00671
636748	0.70717	0.02070	0.59014	0.02788	0.23852	0.00902
674572	0.97966	0.01984	-1.12061	0.03359	0.21264	0.01717
674574	1.00774	0.01971	-1.71212	0.03871	0.12357	0.02452
733174	0.90473	0.01805	0.05846	0.01914	0.15605	0.00790
733176	1.28194	0.02577	0.22462	0.01357	0.26048	0.00570
733184	1.07680	0.01882	-0.99937	0.02329	0.13264	0.01297
733188	0.86767	0.01789	-1.27897	0.04132	0.16614	0.02104
733196	0.57653	0.01765	0.20588	0.04428	0.18439	0.01405
773934	0.34401	0.01138	-1.29179	0.14453	0.09323	0.03700
674588	0.46239	0.00802	1.78025	0.02984	0.00000	0.00000

Table 2.5.16
IRT Parameters for Dichotomous Items
Mathematics Grade 6

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
147326A	1.10818	0.02162	-0.28994	0.01810	0.24869	0.00798
148159A	0.32990	0.00000	-2.14716	0.04048	0.00000	0.00000
149234A	0.91551	0.01170	-1.28602	0.01499	0.01441	0.00614
149259A	1.06736	0.01467	-1.57876	0.01671	0.02134	0.00848
149350A	0.79064	0.01827	0.07184	0.02447	0.19813	0.00906
150723A	1.59793	0.03071	-0.64591	0.01461	0.31975	0.00781
151145A	0.65969	0.01897	-0.14828	0.04315	0.27575	0.01358
151782A	1.38037	0.04518	1.68322	0.01718	0.16635	0.00260
152379A	1.54078	0.02431	0.11610	0.00849	0.12111	0.00393
152633A	1.10394	0.01724	-0.96585	0.01773	0.07851	0.00979
152754A	0.69272	0.02126	1.15238	0.02209	0.15678	0.00636
152840A	1.29983	0.02521	-0.42888	0.01661	0.29621	0.00780
153512A	0.90426	0.01699	-0.15998	0.01878	0.13380	0.00803
153601A	0.88964	0.02024	-0.53243	0.03065	0.29653	0.01189
154011A	0.72331	0.01955	-0.27924	0.03986	0.30172	0.01304
155138A	1.10536	0.03155	1.14545	0.01594	0.25313	0.00412
155184A	0.63807	0.01642	-0.35399	0.04283	0.17872	0.01503
155300A	0.97259	0.01725	-2.01229	0.03483	0.06670	0.02215
155465A	0.92770	0.01667	-1.31154	0.03029	0.10312	0.01646
181455A	1.21030	0.02562	0.45511	0.01308	0.23797	0.00493
479039	0.71270	0.02186	0.64554	0.02726	0.26644	0.00835
479041	0.83823	0.01870	-0.85119	0.03694	0.25103	0.01533
479043	1.20415	0.03513	1.36886	0.01564	0.20621	0.00337
479047	0.92311	0.02895	1.14506	0.01947	0.27574	0.00503
479049	0.82062	0.03998	1.97568	0.03677	0.27406	0.00447
479051	1.08707	0.02475	0.55906	0.01474	0.24221	0.00521
479057	0.70567	0.01456	-1.41760	0.04923	0.09915	0.02296
479069	0.92476	0.02017	-1.25429	0.03962	0.26088	0.01870
479077	1.46275	0.04566	1.29139	0.01444	0.29440	0.00332
479081	1.01558	0.02013	-0.52637	0.02251	0.24016	0.01001
479083	0.69165	0.01893	0.20847	0.03139	0.23076	0.01038
479087	0.82237	0.02708	1.01512	0.02265	0.30577	0.00614
636459	1.09798	0.02193	-0.31775	0.01913	0.26703	0.00830

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
636463	1.11257	0.02885	0.88843	0.01502	0.26256	0.00454
636465	0.83857	0.01470	-0.97691	0.02729	0.07523	0.01325
636479	0.76671	0.02019	0.42601	0.02420	0.23175	0.00815
636483	0.78896	0.01831	0.38248	0.02046	0.16302	0.00745
636485	0.93196	0.03351	1.03603	0.02307	0.41086	0.00548
636493	0.65080	0.01611	-1.02166	0.05680	0.17803	0.02196
636499	0.65694	0.01835	-0.39311	0.04785	0.26742	0.01555
674628	0.74158	0.02628	1.71779	0.02675	0.14170	0.00461
674630	1.22040	0.03605	1.17199	0.01549	0.28494	0.00387
674634	0.40751	0.01054	-1.23763	0.08748	0.06599	0.02618
674638	0.67659	0.01975	0.41429	0.03056	0.23706	0.00975
733232	1.32990	0.02590	1.06787	0.01017	0.07309	0.00240
733240	1.11282	0.02033	0.02371	0.01400	0.17233	0.00610
773992	1.03500	0.02242	0.36354	0.01569	0.22764	0.00590
479095	0.82603	0.01104	1.40129	0.01589	0.00000	0.00000
479097	0.86032	0.00949	0.43647	0.00909	0.00000	0.00000
479148	1.03953	0.01199	0.93813	0.00998	0.00000	0.00000

Table 2.5.17
IRT Parameters for Dichotomous Items
Mathematics Grade 7

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
148154A	0.97296	0.02194	-0.89470	0.03590	0.30591	0.01648
148171A	1.19443	0.02265	0.36202	0.01190	0.16766	0.00510
148193A	0.89964	0.02946	1.46472	0.02014	0.17147	0.00436
148478A	0.89647	0.02801	1.37500	0.01889	0.16817	0.00450
148527A	1.28323	0.02619	-0.00884	0.01522	0.30157	0.00673
148530A	0.85704	0.02369	0.53992	0.02207	0.27556	0.00760
148912A	1.08698	0.02792	0.63206	0.01623	0.30266	0.00562
149064A	1.05790	0.02394	0.08976	0.01934	0.30169	0.00766
149204A	0.61918	0.01132	-0.04486	0.02263	0.02418	0.00848
149247A	1.43684	0.02440	-0.30190	0.01238	0.20153	0.00679
150199A	1.56618	0.02693	0.17720	0.00934	0.18361	0.00455
150232A	1.47014	0.03203	1.21612	0.01031	0.08872	0.00232
150629A	1.07021	0.02188	-0.43619	0.02261	0.26885	0.01044
150891A	1.37191	0.04895	1.52136	0.01710	0.26119	0.00319
151987A	0.73012	0.02280	0.06378	0.04009	0.35112	0.01231
152009A	1.30787	0.03096	0.89891	0.01178	0.21585	0.00388
152051A	1.02341	0.02010	0.84555	0.01140	0.07239	0.00371
152056A	1.03402	0.01585	-0.07218	0.01220	0.04918	0.00571
153291A	1.06628	0.02473	0.47004	0.01581	0.25600	0.00601
153299A	1.31842	0.02734	0.86778	0.01029	0.14075	0.00343
153504A	1.00448	0.01989	0.72883	0.01189	0.08818	0.00428
155126A	0.66801	0.01997	1.33271	0.02073	0.07189	0.00571
155443A	0.99314	0.02065	0.43030	0.01466	0.15850	0.00595
182015A	1.15486	0.02918	1.08877	0.01321	0.17850	0.00382
182026A	0.89041	0.03898	0.98848	0.02860	0.51676	0.00618
182027A	0.74646	0.02757	1.04194	0.02561	0.29866	0.00744
480274	0.58226	0.02280	1.31652	0.02829	0.14943	0.00872
480287	1.08768	0.02651	0.72872	0.01449	0.23893	0.00512
480295	1.43153	0.04444	1.34568	0.01412	0.24733	0.00321
480307	1.09364	0.06211	2.25610	0.04396	0.21537	0.00301
480350	1.24637	0.02605	0.50559	0.01222	0.22093	0.00488
489119	1.37878	0.03731	1.23926	0.01268	0.19647	0.00319
489176	1.40519	0.03696	0.77842	0.01316	0.34606	0.00429

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
490454	2.15763	0.08870	1.64921	0.01410	0.26154	0.00250
636508	0.69137	0.01594	0.08723	0.02708	0.09377	0.01073
636512	1.20257	0.02949	1.05980	0.01256	0.17586	0.00370
636537	0.51836	0.01434	0.02850	0.04541	0.06371	0.01558
636539	1.18301	0.03697	1.37190	0.01618	0.22335	0.00360
636547	1.03281	0.01800	0.29569	0.01206	0.08450	0.00519
636551	1.34761	0.03514	0.62914	0.01431	0.37755	0.00478
636555	1.36916	0.03981	1.35707	0.01384	0.19700	0.00309
674704	1.36070	0.02649	0.34310	0.01135	0.22335	0.00491
674708	0.72653	0.00991	-0.17616	0.01325	0.01103	0.00461
674723	1.30615	0.03191	0.49816	0.01442	0.35501	0.00517
733277	0.98138	0.01824	-0.47360	0.02167	0.15372	0.01068
733285	1.16196	0.02148	-0.86772	0.02263	0.20359	0.01284
774055	1.22616	0.02017	0.28696	0.01000	0.09619	0.00442
480360	0.85772	0.01158	1.42278	0.01570	0.00000	0.00000
480373	1.14825	0.01290	0.90987	0.00884	0.00000	0.00000
480380	1.23115	0.01498	1.18252	0.01005	0.00000	0.00000

Table 2.5.18

IRT Parameters for Dichotomous Items

Mathematics Grade 8

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
148061A	1.64086	0.03072	0.64164	0.00819	0.15419	0.00310
148303A	0.88280	0.01830	0.45337	0.01480	0.11267	0.00580
148327A	1.10807	0.01742	0.10304	0.01063	0.07147	0.00468
148379A	1.08473	0.01906	-0.46408	0.01773	0.16988	0.00875
148531A	0.79304	0.01402	-1.04929	0.03126	0.06438	0.01554
148689A	1.71079	0.03202	0.58965	0.00804	0.16987	0.00319
150198A	1.18296	0.02022	0.48348	0.00957	0.08689	0.00368
150215A	0.83104	0.02549	0.76594	0.02133	0.28973	0.00669
151253A	1.53031	0.03090	0.58394	0.00951	0.21441	0.00370
151260A	0.81407	0.01341	-0.96921	0.02599	0.00000	0.01329
151283A	0.97837	0.01926	0.18522	0.01522	0.15575	0.00637
152296A	0.48699	0.01558	-1.60941	0.13271	0.00000	0.05422
152944A	1.30182	0.02158	0.07058	0.01045	0.14307	0.00488
153437A	1.83576	0.03712	0.58208	0.00837	0.23117	0.00338
153448A	1.21740	0.02181	0.02994	0.01253	0.18552	0.00572
164493A	1.35744	0.02940	0.72979	0.01066	0.20610	0.00376
181901A	0.89586	0.02570	1.15836	0.01715	0.17451	0.00463
181934A	1.68881	0.04614	1.25895	0.01135	0.19295	0.00266
183795A	0.93891	0.02636	1.11799	0.01638	0.18508	0.00451
484783	0.50867	0.02457	2.21727	0.04991	0.07037	0.00646
484815	0.95860	0.03268	1.39677	0.02024	0.23065	0.00424
484821	1.40091	0.02841	0.13203	0.01255	0.30397	0.00534
484823	1.10913	0.02270	-0.33865	0.02008	0.29660	0.00869
484828	0.84977	0.02398	0.14264	0.02818	0.36637	0.00897
484841	1.65578	0.06297	1.73969	0.01797	0.17866	0.00232
484847	0.47117	0.01506	-1.19359	0.11079	0.00000	0.04139
484853	1.01332	0.01302	-0.29132	0.01030	0.01584	0.00432
484860	1.76098	0.05316	1.22623	0.01191	0.27509	0.00293
484866	1.05927	0.02568	1.02909	0.01337	0.14973	0.00383
484873	0.83133	0.03062	1.45224	0.02348	0.22617	0.00491
484877	0.90739	0.02293	-0.10982	0.02731	0.35113	0.00951
484881	0.38615	0.01544	-0.83716	0.14149	0.13217	0.03756
484977	1.07288	0.02945	0.88753	0.01532	0.27452	0.00470

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
490116	1.57766	0.04212	0.65876	0.01253	0.40912	0.00404
636559	1.63539	0.03665	0.66925	0.00996	0.27440	0.00366
636567	2.12521	0.06349	1.00318	0.01038	0.36815	0.00307
636578	1.34053	0.02272	0.32858	0.00928	0.12795	0.00397
636590	1.25782	0.02967	1.16130	0.01209	0.12701	0.00292
636594	1.03116	0.03173	0.69745	0.01936	0.40277	0.00559
636602	1.36145	0.04241	1.59124	0.01682	0.14206	0.00249
636610	0.83590	0.01909	-0.38948	0.03036	0.24538	0.01201
674821	1.09800	0.03357	0.99212	0.01656	0.32629	0.00457
674875	2.35180	0.06377	1.09575	0.00864	0.24190	0.00260
674877	1.54075	0.02232	-0.11585	0.00829	0.10162	0.00423
733318	1.38392	0.04174	1.31942	0.01435	0.22896	0.00311
733322	1.45095	0.03462	0.46544	0.01267	0.36666	0.00456
774106	0.61615	0.02202	1.41606	0.02528	0.11470	0.00666
484750	0.35764	0.00762	2.15225	0.04769	0.00000	0.00000
484766	0.38785	0.00648	-0.70741	0.01687	0.00000	0.00000
733332	1.00047	0.01075	0.60804	0.00843	0.00000	0.00000

Table 2.5.19

IRT Parameters for Dichotomous Items

Science Grade 5

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
184387A	1.08611	0.02114	-0.01134	0.01662	0.20581	0.00736
184423A	1.29390	0.03524	0.85799	0.01416	0.33379	0.00453
185413A	1.22487	0.03047	1.10959	0.01255	0.17845	0.00368
186483A	0.57884	0.03494	1.50947	0.04384	0.40455	0.00949
186489A	0.70789	0.01836	0.16014	0.03046	0.18121	0.01107
186490A	0.72155	0.02467	0.92298	0.02589	0.26376	0.00803
186754A	0.85098	0.01492	-1.18898	0.03151	0.06566	0.01674
186756A	1.00243	0.02253	-0.87354	0.03429	0.32011	0.01534
186759A	1.45272	0.02860	-0.89819	0.01970	0.30001	0.01132
187503A	0.64296	0.02339	0.71584	0.03487	0.28196	0.01046
187505A	0.76063	0.01503	-1.40583	0.04594	0.08782	0.02358
187510A	1.30618	0.02641	-1.21397	0.02611	0.26481	0.01581
188717A	1.15551	0.01960	-0.72214	0.01865	0.13943	0.01032
188718A	1.60479	0.03056	-1.14352	0.01820	0.23501	0.01243
188720A	0.77058	0.01054	-1.23644	0.01916	0.01724	0.00767
189235A	0.62588	0.01263	-1.11339	0.04731	0.06145	0.02021
189237A	0.92378	0.01837	0.06190	0.01845	0.14782	0.00786
189238A	0.60539	0.02416	1.01496	0.03341	0.25186	0.01001
189340A	1.14152	0.01961	-0.39594	0.01640	0.15036	0.00834
189341A	0.81772	0.02339	0.45459	0.02567	0.29854	0.00850
189345A	1.22539	0.03820	1.34111	0.01562	0.24846	0.00374
189356A	0.81267	0.01898	0.53056	0.01864	0.13884	0.00709
189358A	1.27678	0.03835	1.01678	0.01507	0.35011	0.00435
189361A	1.04388	0.01772	-0.99766	0.02314	0.09716	0.01318
437241	1.02620	0.02167	0.41695	0.01502	0.18514	0.00602
437243	0.94403	0.02724	1.02662	0.01726	0.23677	0.00534
437245	1.15737	0.02811	0.89747	0.01315	0.21254	0.00443
437494	1.45151	0.03428	0.76000	0.01157	0.27774	0.00416
437506	1.96741	0.05065	1.04735	0.00947	0.25831	0.00310
465317	1.02292	0.01942	-0.54491	0.02259	0.18983	0.01095
638751	0.34039	0.00000	0.56808	0.02104	0.00000	0.00000
638753	0.54795	0.02060	0.72732	0.04089	0.19301	0.01272
638755	0.73314	0.02834	1.14097	0.02656	0.30707	0.00739

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
638808	0.52644	0.01314	0.26872	0.03343	0.04046	0.01143
638810	0.90486	0.01705	0.22607	0.01554	0.09190	0.00653
638812	0.53082	0.01637	0.70941	0.03246	0.07160	0.01114
701741	1.06313	0.02606	0.75354	0.01483	0.23308	0.00523
701743	0.35796	0.01369	0.93981	0.05721	0.04350	0.01544
701751	0.46890	0.01437	-0.89403	0.09369	0.10804	0.03026
760514	0.80224	0.02416	-0.26238	0.04367	0.42946	0.01295
760544	0.67112	0.01902	-0.13132	0.04316	0.23990	0.01462
760546	0.90251	0.02109	-1.43994	0.05201	0.25824	0.02629
760557	0.67775	0.01244	-0.20387	0.02372	0.03334	0.00944
760561	1.19939	0.03659	1.17578	0.01544	0.29162	0.00418
760567	0.77805	0.02459	0.85215	0.02334	0.26286	0.00744

Section 2.6

Decision Accuracy and Consistency (DAC)

Table 2.6.1
DAC Results
English Language Arts Grade 3

N	Reliability	Kappa		Accuracy	Consistency	F Pos	F Neg
49618	0.91	0.64	Overall	0.82	0.75	0.09	0.08
			Cut 1	0.93	0.90	0.03	0.04
			Cut 2	0.92	0.89	0.04	0.04
			Cut 3	0.97	0.96	0.02	0.01
			Cut 4	1.00	1.00	0.00	0.00
			Perf 1	0.92	0.88		
			Perf 2	0.75	0.66		
			Perf 3	0.77	0.69		
			Perf 4	0.74	0.57		

Table 2.6.2
DAC Results
English Language Arts Grade 4

N	Reliability	Kappa		Accuracy	Consistency	F Pos	F Neg
49054	0.91	0.64	Overall	0.83	0.76	0.08	0.09
			Cut 1	0.93	0.90	0.03	0.04
			Cut 2	0.92	0.89	0.04	0.04
			Cut 3	0.98	0.97	0.01	0.01
			Cut 4	1.00	1.00	0.00	0.00
			Perf 1	0.92	0.88		
			Perf 2	0.77	0.69		
			Perf 3	0.76	0.68		
			Perf 4	0.69	0.46		

Table 2.6.3
DAC Results
English Language Arts Grade 5

N	Reliability	Kappa		Accuracy	Consistency	F Pos	F Neg
41941	0.91	0.64	Overall	0.83	0.76	0.09	0.08
			Cut 1	0.94	0.92	0.03	0.03
			Cut 2	0.92	0.89	0.04	0.04
			Cut 3	0.96	0.94	0.02	0.02
			Cut 4	1.00	1.00	0.00	0.00
			Perf 1	0.91	0.87		
			Perf 2	0.83	0.77		
			Perf 3	0.72	0.62		
			Perf 4	0.73	0.58		

Table 2.6.4
DAC Results
English Language Arts Grade 6

N	Reliability	Kappa		Accuracy	Consistency	F Pos	F Neg
48748	0.91	0.65	Overall	0.83	0.76	0.09	0.08
			Cut 1	0.93	0.9	0.03	0.04
			Cut 2	0.93	0.9	0.04	0.03
			Cut 3	0.98	0.97	0.02	0.01
			Cut 4	1.00	1.00	0.00	0.00
			Perf 1	0.89	0.84		
			Perf 2	0.82	0.76		
			Perf 3	0.78	0.70		
			Perf 4	0.72	0.54		

Table 2.6.5
DAC Results
English Language Arts Grade 7

N	Reliability	Kappa		Accuracy	Consistency	F Pos	F Neg
49849	0.90	0.61	Overall	0.82	0.75	0.10	0.09
			Cut 1	0.92	0.89	0.04	0.04
			Cut 2	0.93	0.9	0.04	0.03
			Cut 3	0.97	0.95	0.02	0.01
			Cut 4	1.00	1.00	0.00	0.00
			Perf 1	0.92	0.88		
			Perf 2	0.77	0.68		
			Perf 3	0.68	0.57		
			Perf 4	0.73	0.56		

Table 2.6.6
DAC Results
English Language Arts Grade 8

N	Reliability	Kappa		Accuracy	Consistency	F Pos	F Neg
46294	0.89	0.61	Overall	0.82	0.75	0.10	0.08
			Cut 1	0.92	0.89	0.04	0.04
			Cut 2	0.93	0.90	0.04	0.03
			Cut 3	0.97	0.96	0.02	0.01
			Cut 4	1.00	1.00	0.00	0.00
			Perf 1	0.90	0.85		
			Perf 2	0.80	0.74		
			Perf 3	0.67	0.56		
			Perf 4	0.73	0.55		

Table 2.6.7
DAC Results
Mathematics Grade 3

N	Reliability	Kappa		Accuracy	Consistency	F Pos	F Neg
41307	0.92	0.65	Overall	0.82	0.75	0.10	0.09
			Cut 1	0.95	0.92	0.03	0.03
			Cut 2	0.93	0.9	0.04	0.04
			Cut 3	0.95	0.93	0.03	0.02
			Cut 4	1.00	1.00	0.00	0.00
			Perf 1	0.92	0.88		
			Perf 2	0.81	0.74		
			Perf 3	0.72	0.62		
			Perf 4	0.78	0.67		

Table 2.6.8
DAC Results
Mathematics Grade 4

N	Reliability	Kappa		Accuracy	Consistency	F Pos	F Neg
40334	0.92	0.65	Overall	0.82	0.75	0.09	0.08
			Cut 1	0.94	0.91	0.03	0.03
			Cut 2	0.93	0.9	0.03	0.03
			Cut 3	0.95	0.93	0.03	0.02
			Cut 4	1.00	1.00	0.00	0.00
			Perf 1	0.90	0.86		
			Perf 2	0.81	0.73		
			Perf 3	0.74	0.64		
			Perf 4	0.81	0.72		

Table 2.6.9
DAC Results
Mathematics Grade 5

N	Reliability	Kappa		Accuracy	Consistency	F Pos	F Neg
40330	0.92	0.65	Overall	0.83	0.76	0.09	0.08
			Cut 1	0.93	0.90	0.04	0.03
			Cut 2	0.94	0.91	0.03	0.03
			Cut 3	0.96	0.94	0.02	0.02
			Cut 4	1.00	1.00	0.00	0.00
			Perf 1	0.88	0.83		
			Perf 2	0.84	0.77		
			Perf 3	0.72	0.62		
			Perf 4	0.81	0.71		

Table 2.6.10
DAC Results
Mathematics Grade 6

N	Reliability	Kappa		Accuracy	Consistency	F Pos	F Neg
41302	0.91	0.66	Overall	0.84	0.77	0.08	0.08
			Cut 1	0.92	0.89	0.04	0.04
			Cut 2	0.94	0.91	0.03	0.03
			Cut 3	0.98	0.97	0.01	0.01
			Cut 4	1.00	1.00	0.00	0.00
			Perf 1	0.89	0.84		
			Perf 2	0.82	0.75		
			Perf 3	0.80	0.70		
			Perf 4	0.79	0.66		

Table 2.6.11
DAC Results
Mathematics Grade 7

N	Reliability	Kappa		Accuracy	Consistency	F Pos	F Neg
42742	0.89	0.63	Overall	0.83	0.75	0.09	0.08
			Cut 1	0.90	0.86	0.06	0.04
			Cut 2	0.94	0.92	0.03	0.02
			Cut 3	0.98	0.98	0.01	0.01
			Cut 4	1.00	1.00	0.00	0.00
			Perf 1	0.88	0.85		
			Perf 2	0.74	0.61		
			Perf 3	0.84	0.75		
			Perf 4	0.82	0.71		

Table 2.6.12
DAC Results
Mathematics Grade 8

N	Reliability	Kappa		Accuracy	Consistency	F Pos	F Neg
44323	0.91	0.65	Overall	0.86	0.80	0.08	0.07
			Cut 1	0.92	0.89	0.05	0.03
			Cut 2	0.96	0.94	0.02	0.02
			Cut 3	0.98	0.97	0.01	0.01
			Cut 4	1.00	1.00	0.00	0.00
			Perf 1	0.92	0.91		
			Perf 2	0.77	0.66		
			Perf 3	0.69	0.56		
			Perf 4	0.84	0.75		

Table 2.6.13
DAC Results
Science Grade 5

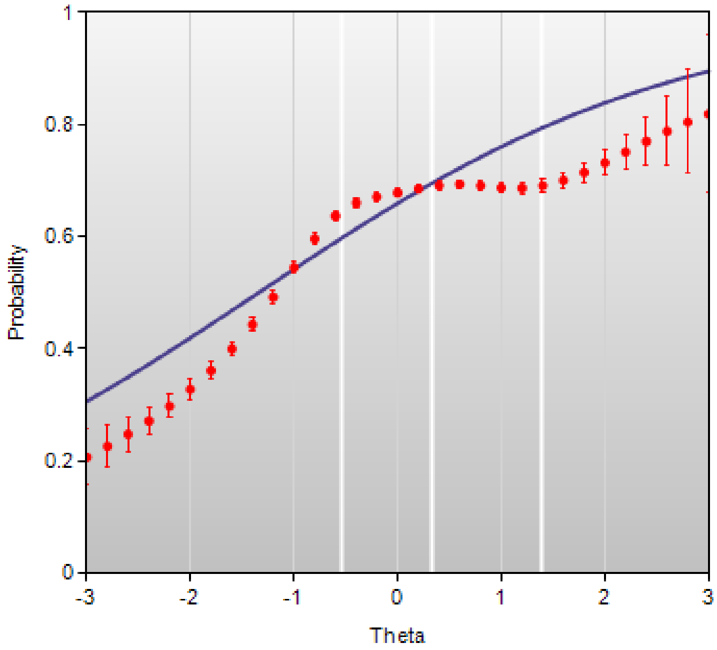
N	Reliability	Kappa		Accuracy	Consistency	F Pos	F Neg
40653	0.89	0.61	Overall	0.80	0.72	0.10	0.09
			Cut 1	0.92	0.89	0.04	0.04
			Cut 2	0.92	0.88	0.05	0.04
			Cut 3	0.97	0.95	0.02	0.01
			Cut 4	1.00	1.00	0.00	0.00
			Perf 1	0.85	0.79		
			Perf 2	0.78	0.69		
			Perf 3	0.80	0.72		
			Perf 4	0.78	0.65		

Section 2.7

Fit Plots of Watchlist Items

Initial Calibration

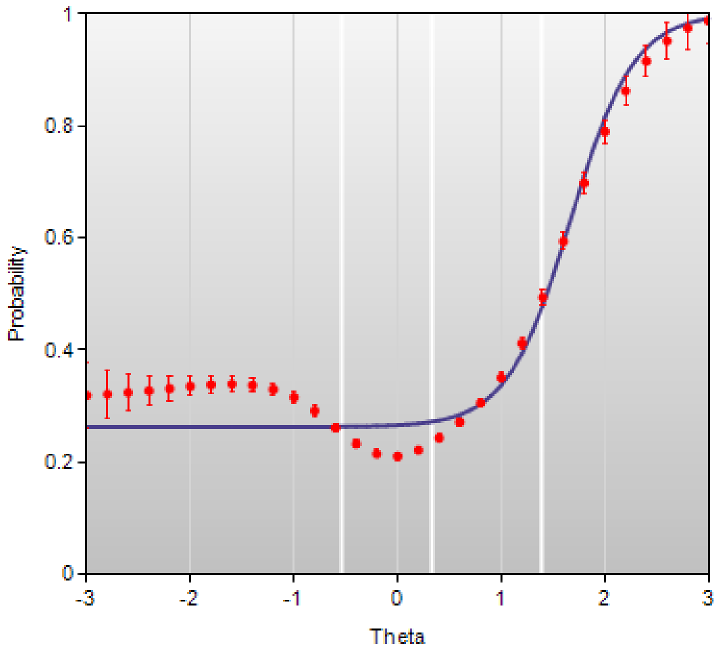
English Language Arts Grade 3: 482316



Beta Chart

Initial Calibration

English Language Arts Grade 3: 484571



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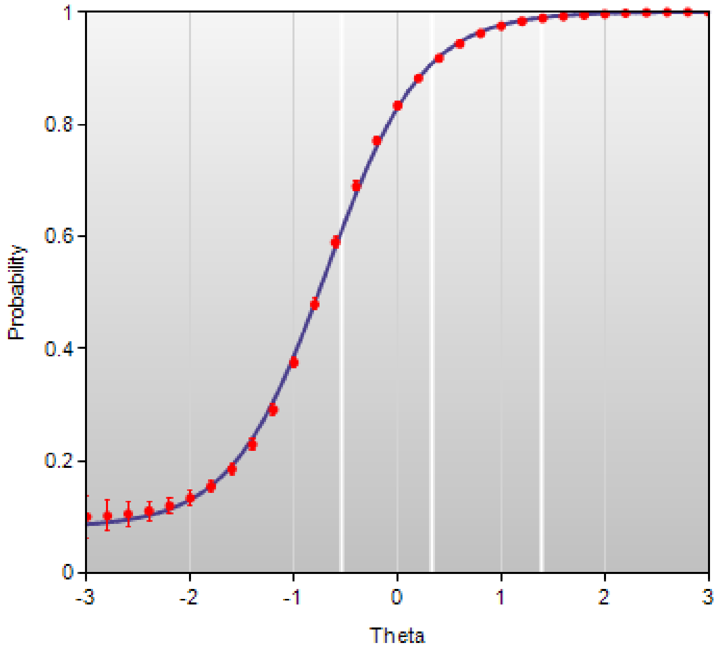
Initial Calibration

English Language Arts Grade 3: 628709



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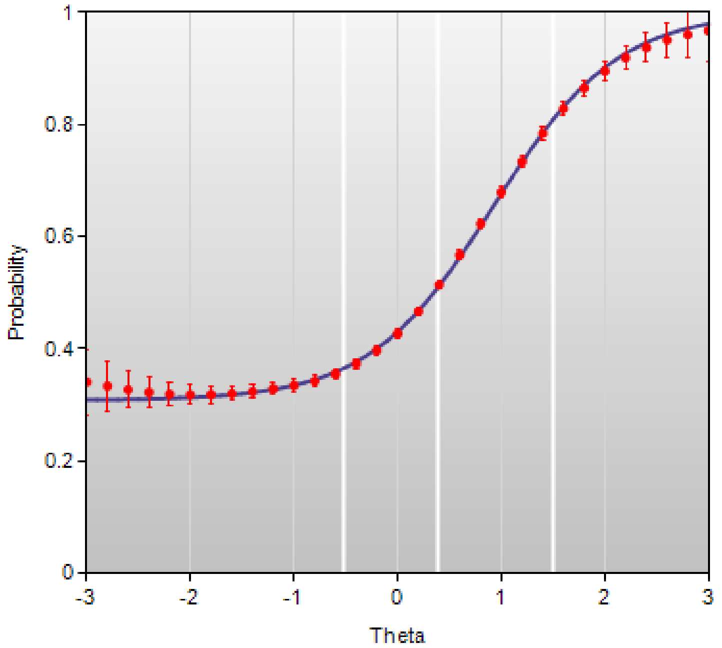
Initial Calibration

English Language Arts Grade 4: 148686A



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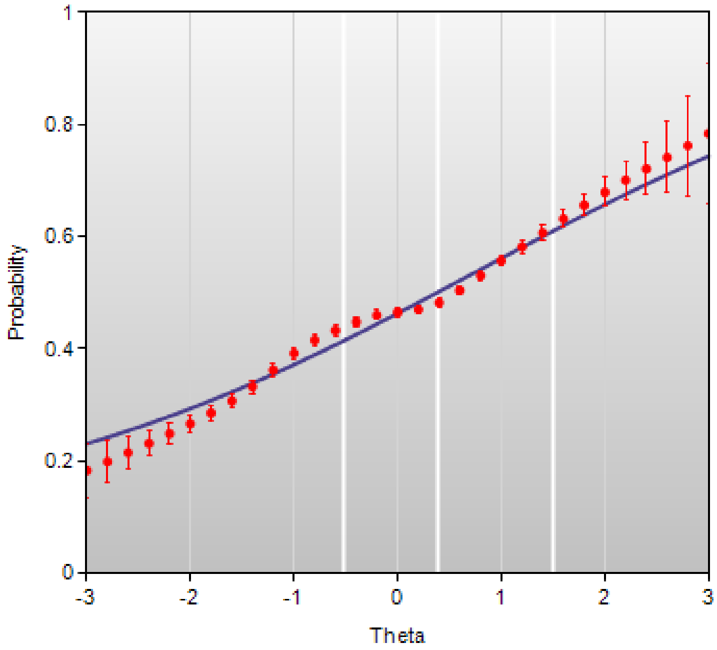
Initial Calibration

English Language Arts Grade 4: 148719A



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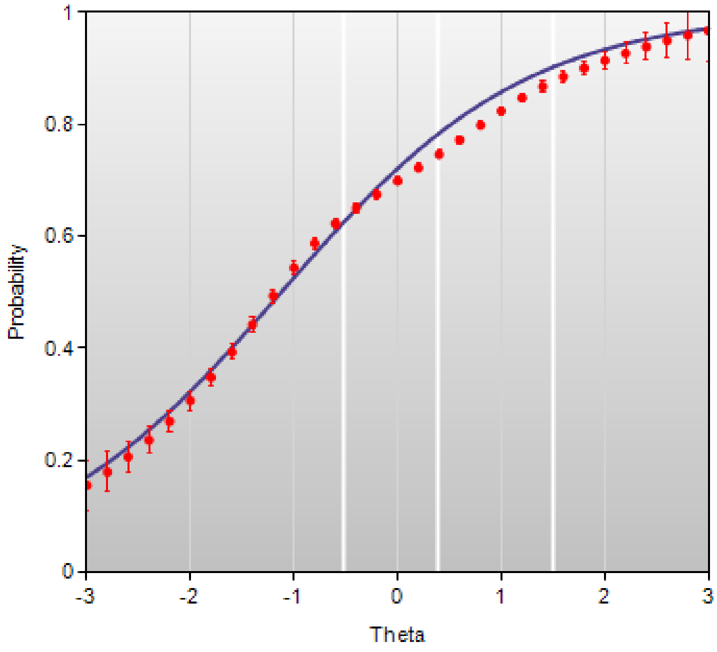
Initial Calibration

English Language Arts Grade 4: 186016A



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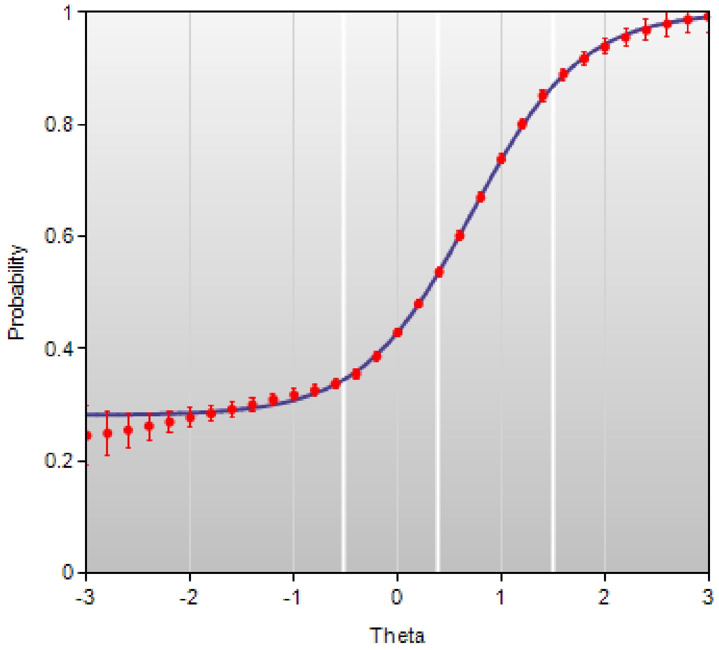
Initial Calibration

English Language Arts Grade 4: 484648



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Initial Calibration

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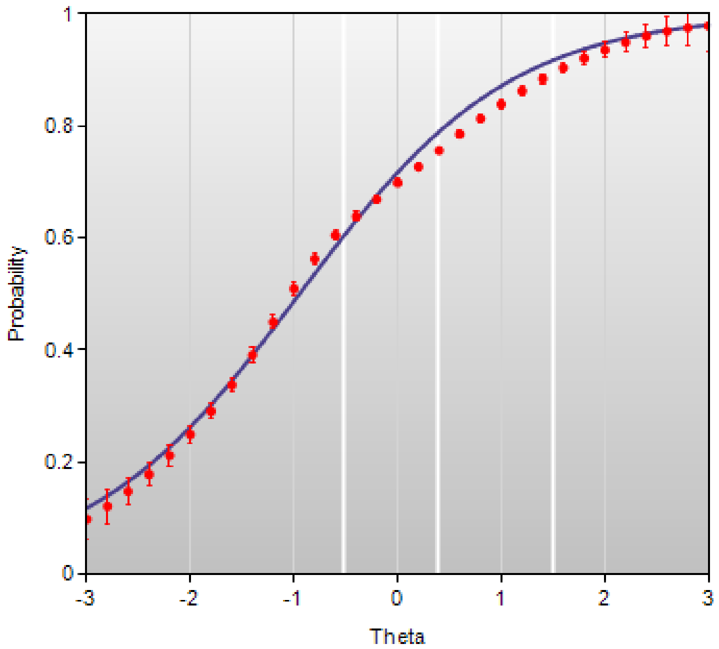

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Initial Calibration

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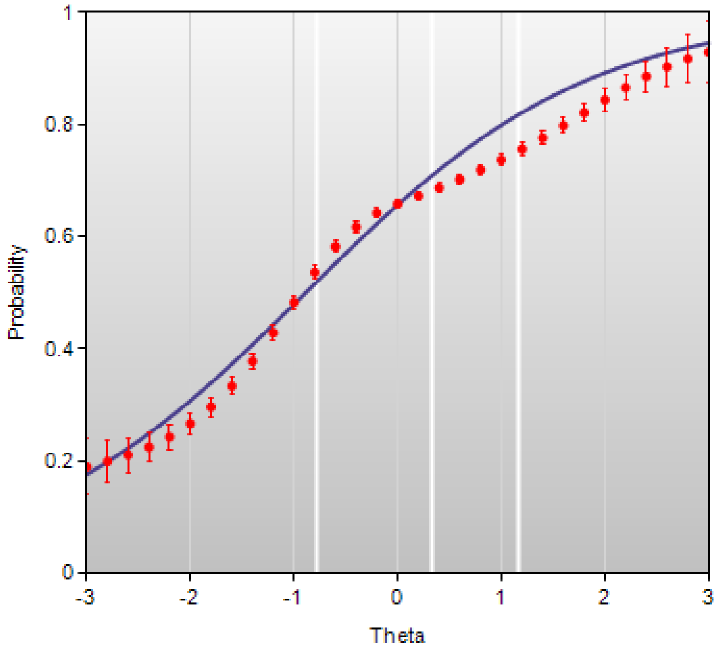

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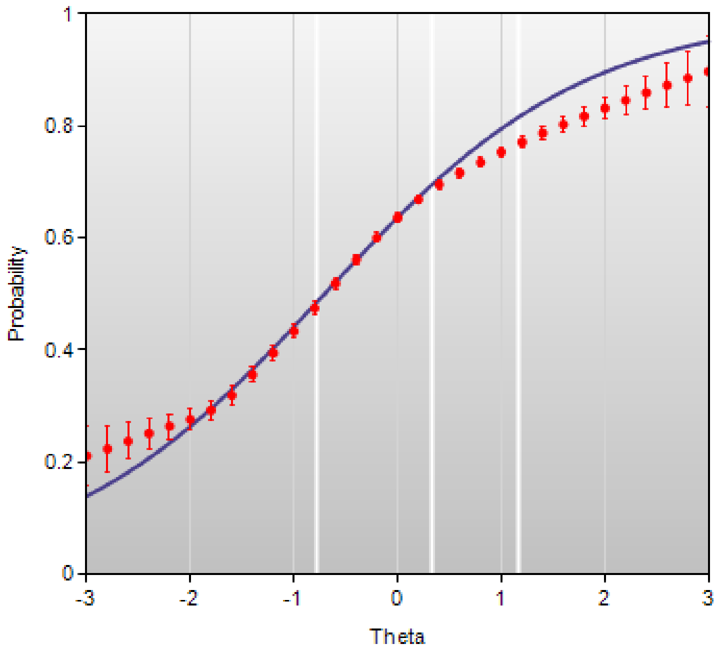
Initial Calibration

English Language Arts Grade 5: 149339A



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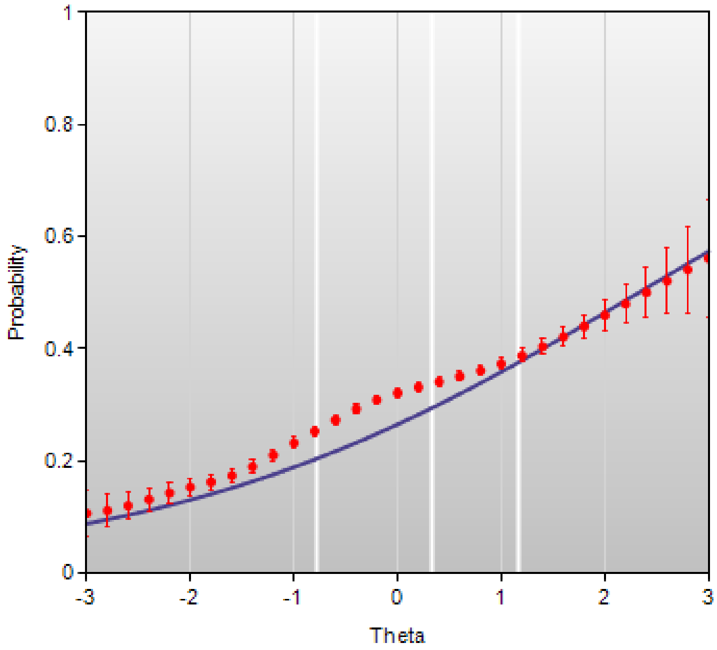
Initial Calibration

English Language Arts Grade 5: 630607



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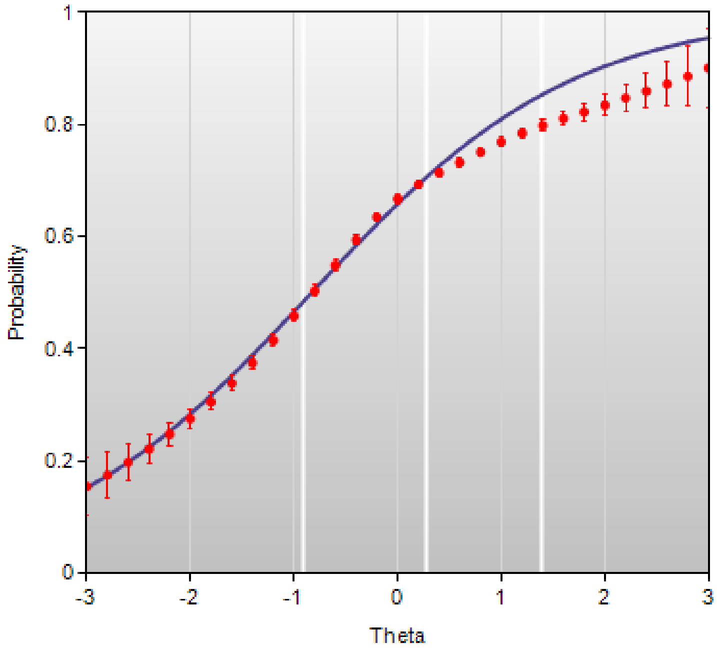
Initial Calibration

English Language Arts Grade 6: 158740A



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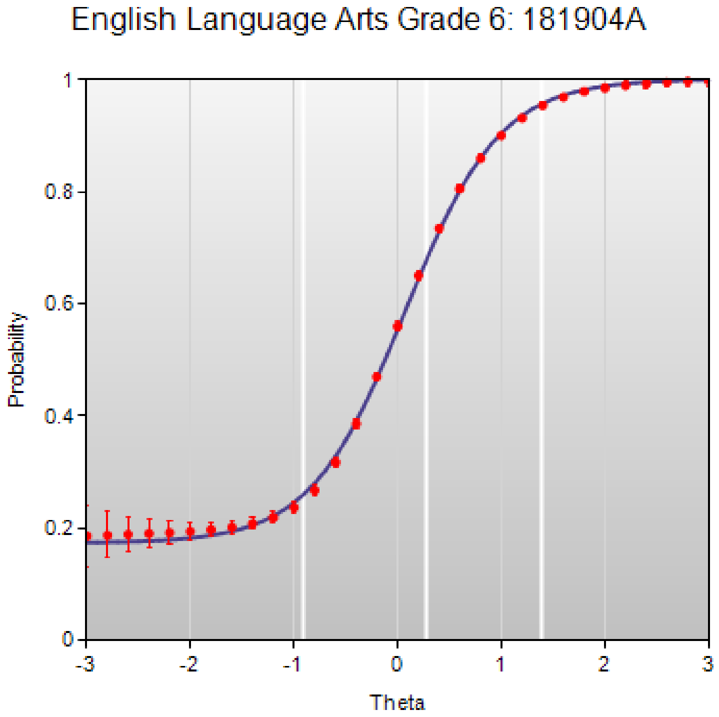

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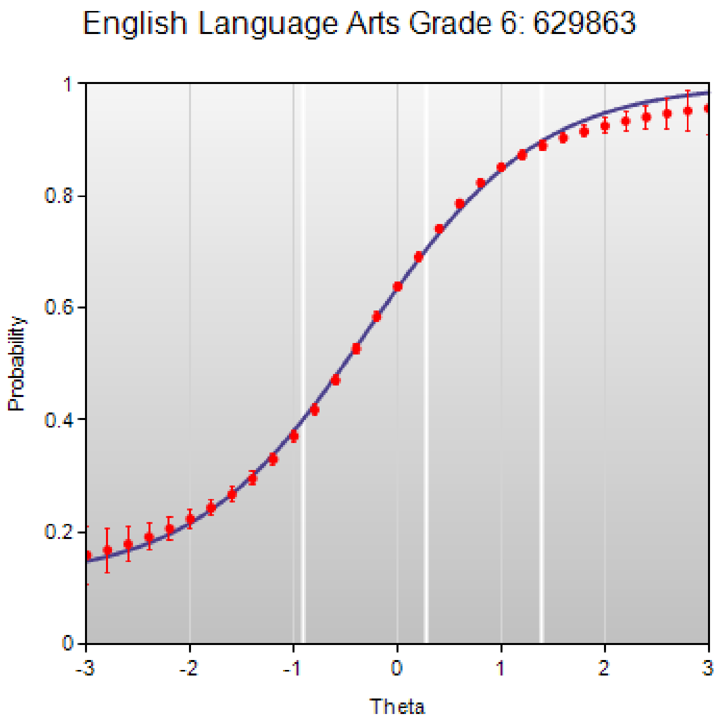

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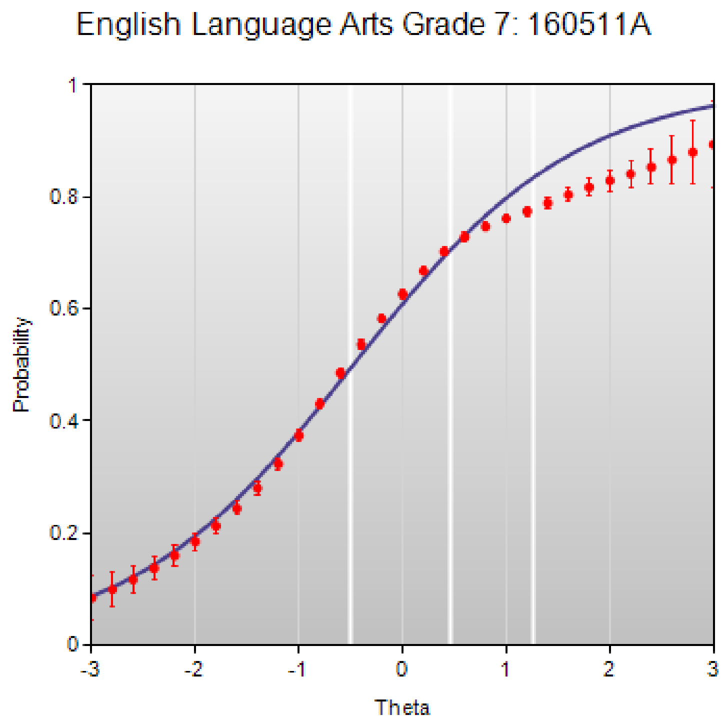

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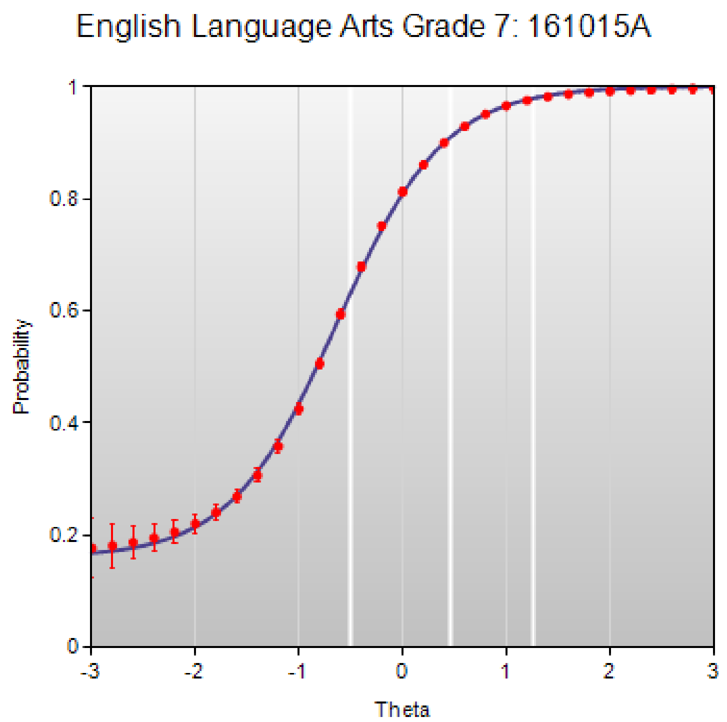

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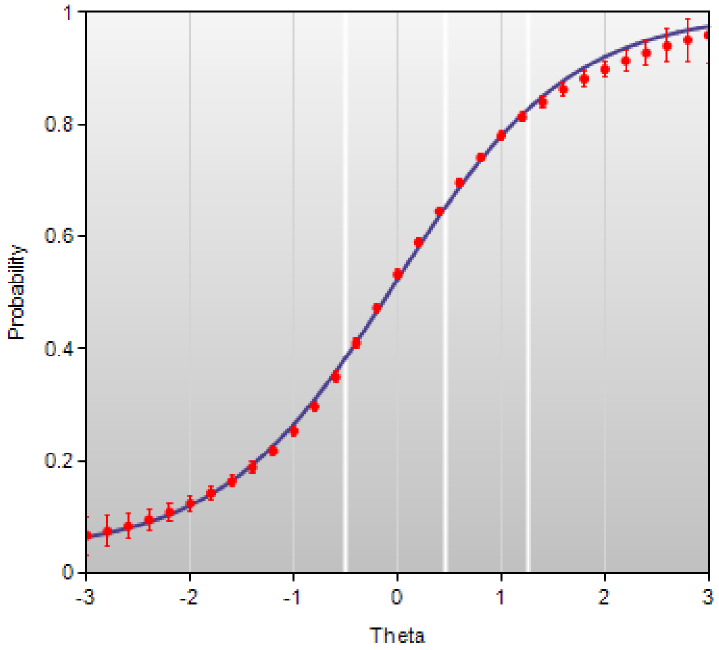
Initial Calibration

English Language Arts Grade 7: 486597



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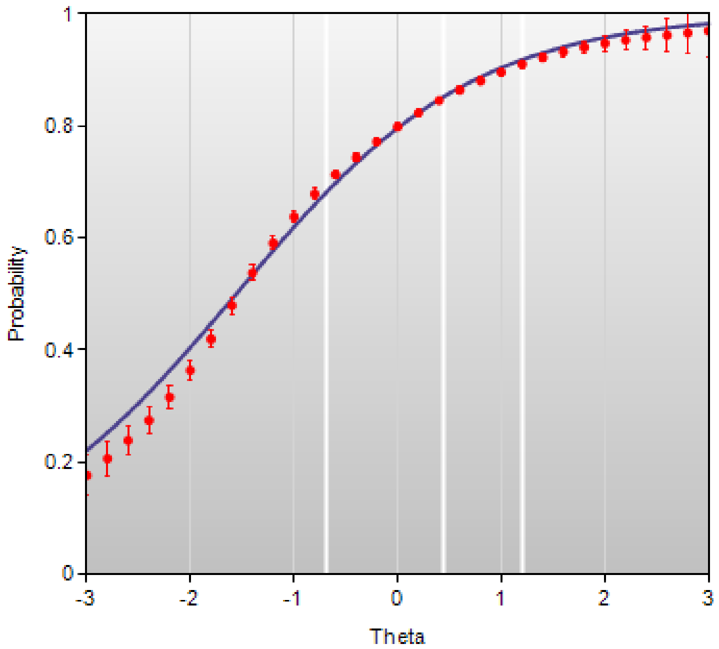
Initial Calibration

English Language Arts Grade 8: 148187A



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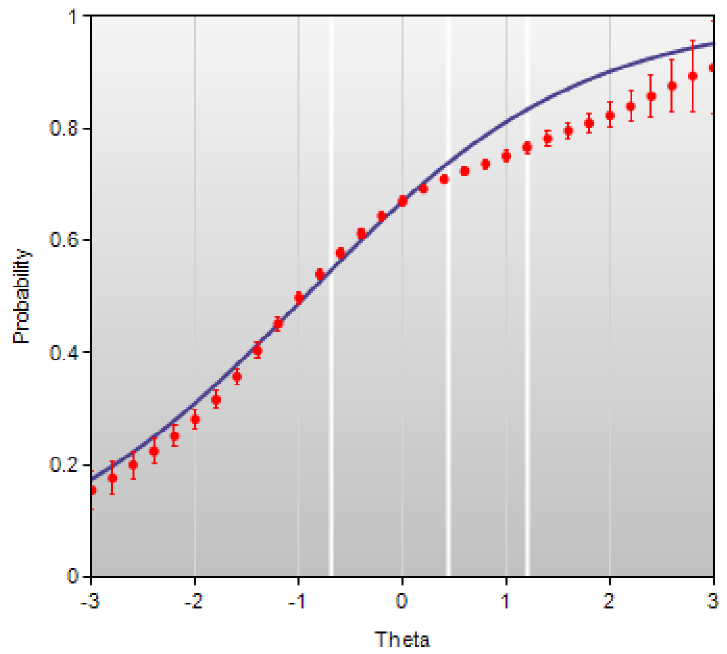
Initial Calibration

English Language Arts Grade 8: 160788A



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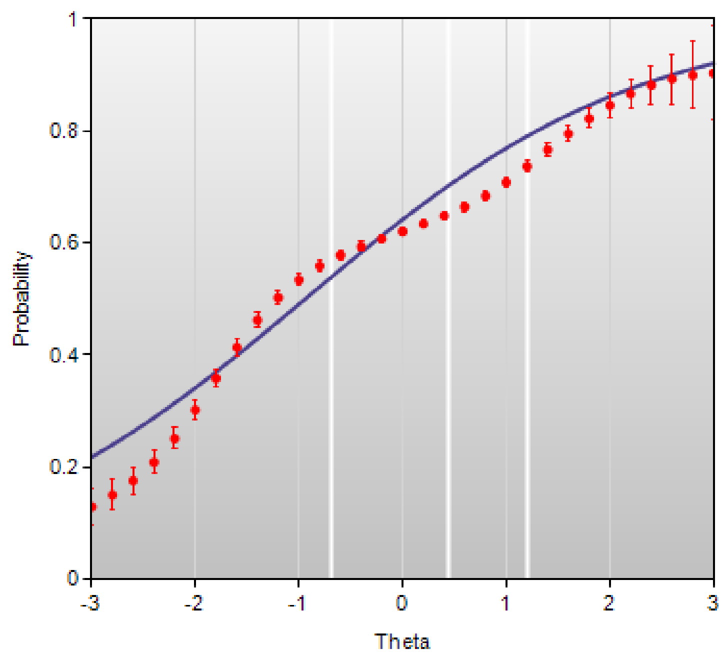
Initial Calibration

English Language Arts Grade 8: 160790A



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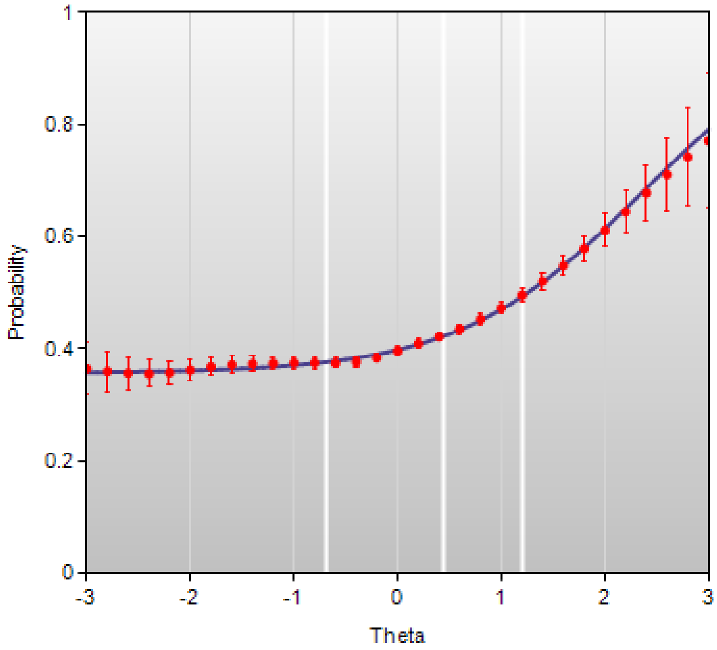
Initial Calibration

English Language Arts Grade 8: 160875A



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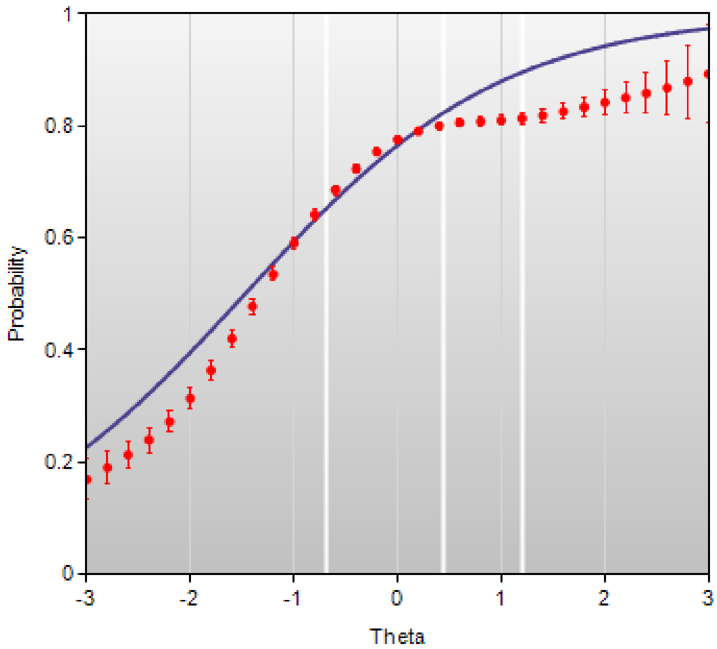
Initial Calibration

English Language Arts Grade 8: 160992A



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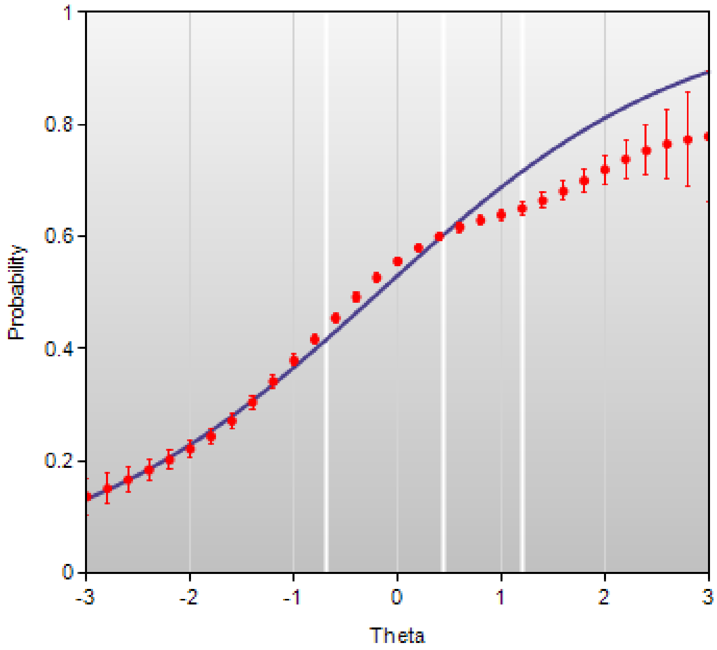
Initial Calibration

English Language Arts Grade 8: 160993A



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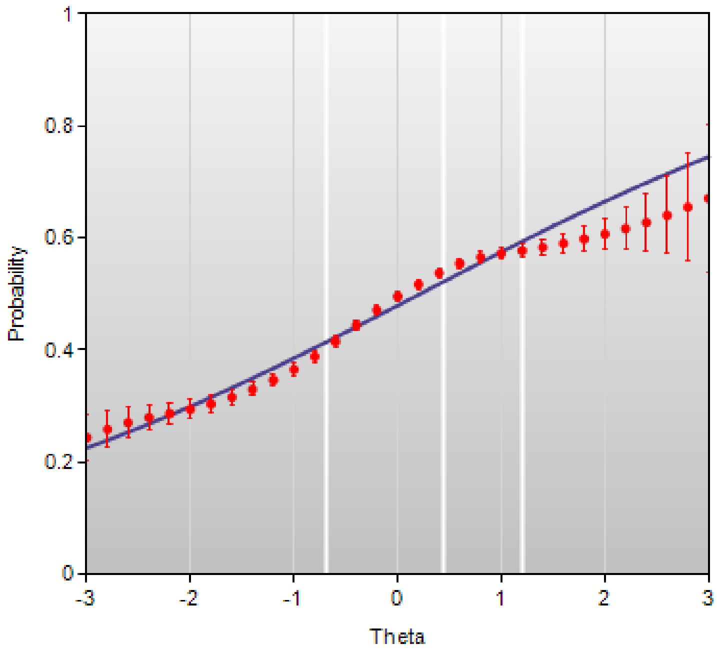
Initial Calibration

English Language Arts Grade 8: 486738



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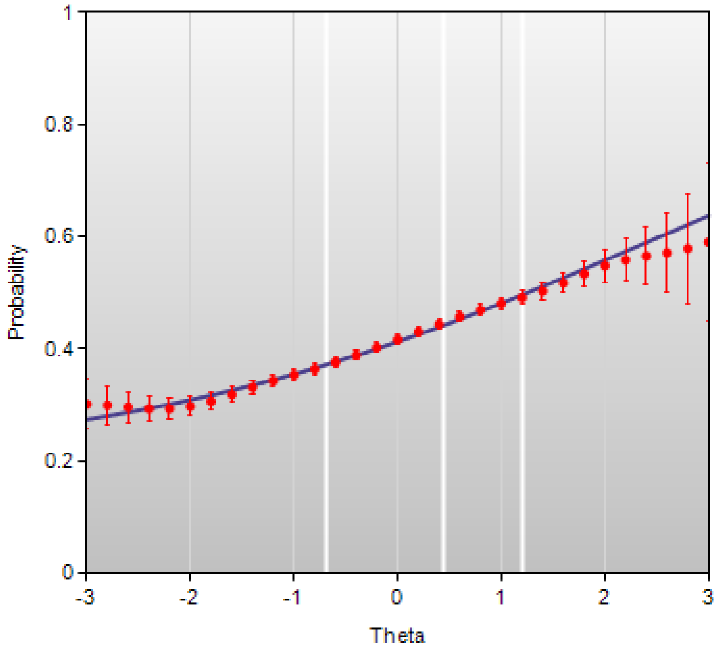
Initial Calibration

English Language Arts Grade 8: 626814



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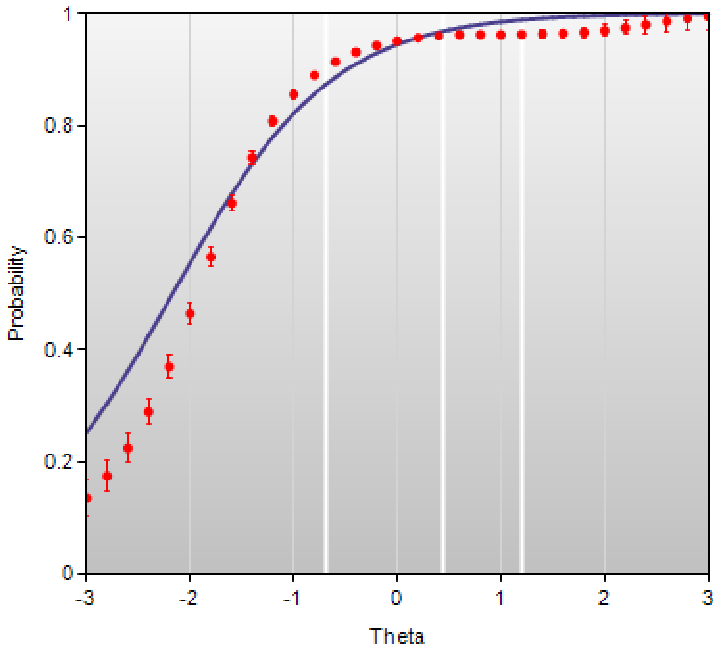
Initial Calibration

English Language Arts Grade 8: 760851



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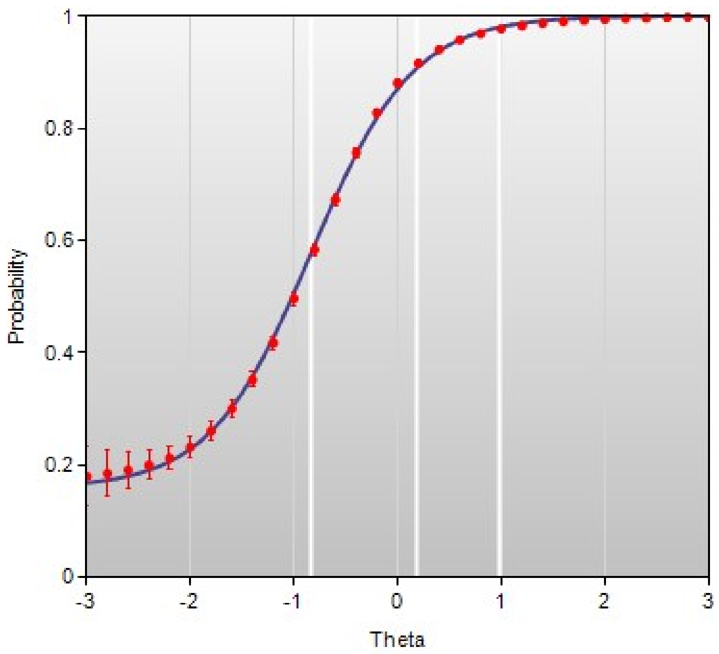
Initial Calibration

Mathematics Grade 3: 152031A



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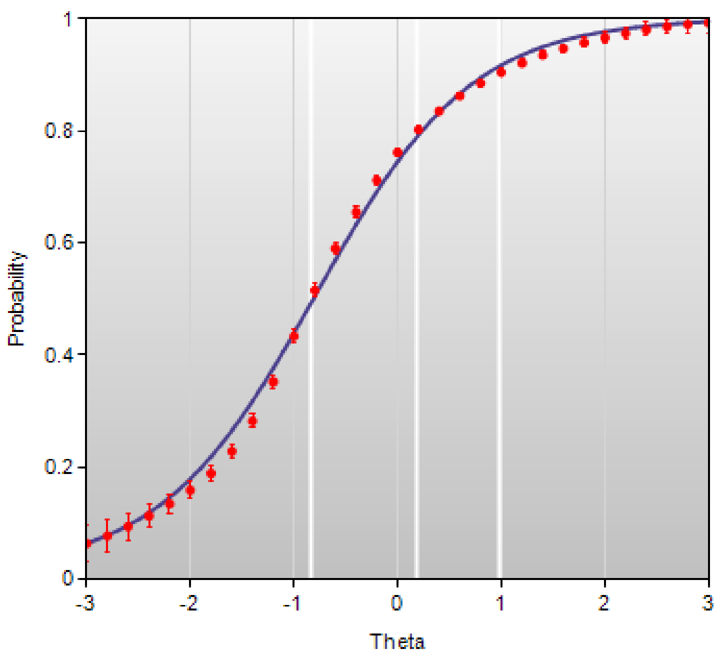
Initial Calibration

Mathematics Grade 3: 152620A



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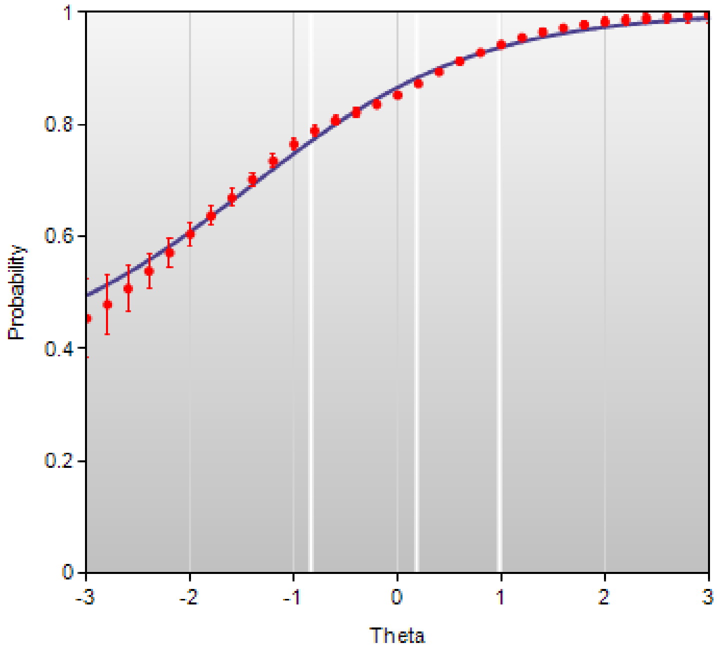
Initial Calibration

Mathematics Grade 3: 771992



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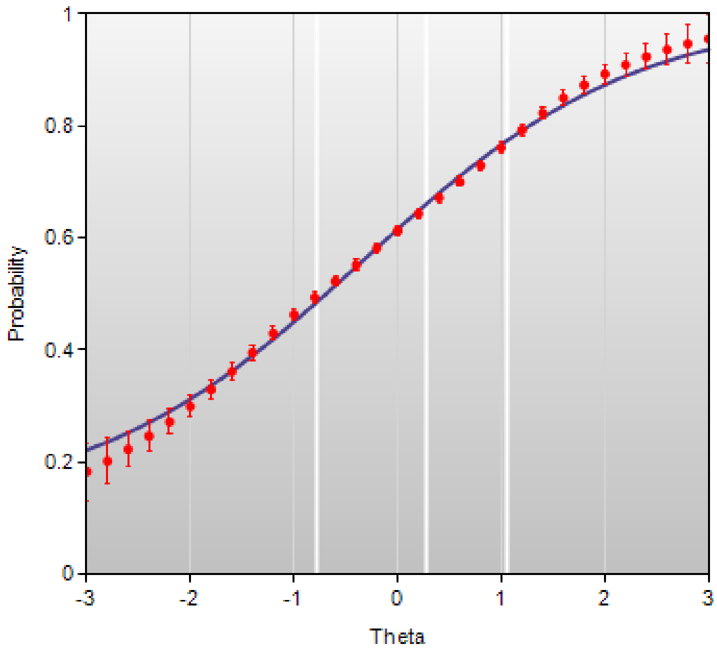
Initial Calibration

Mathematics Grade 4: 146951A



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Initial Calibration

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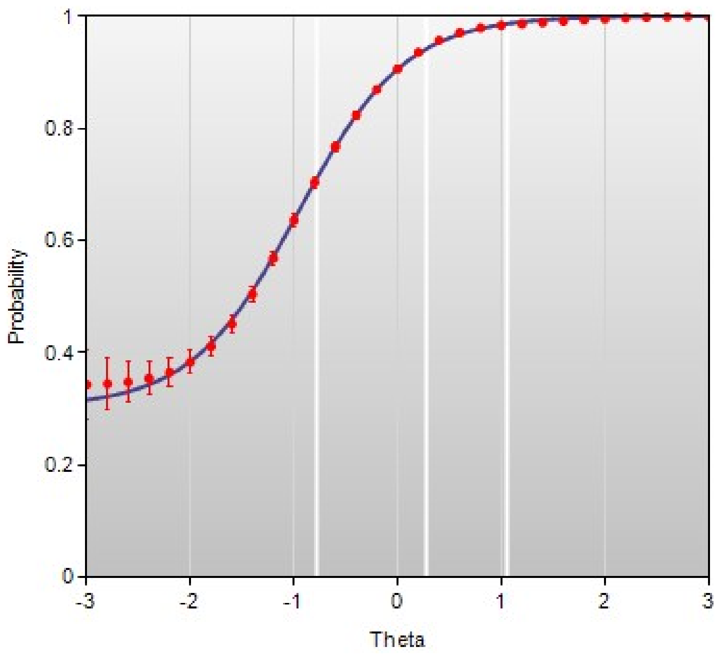

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Initial Calibration

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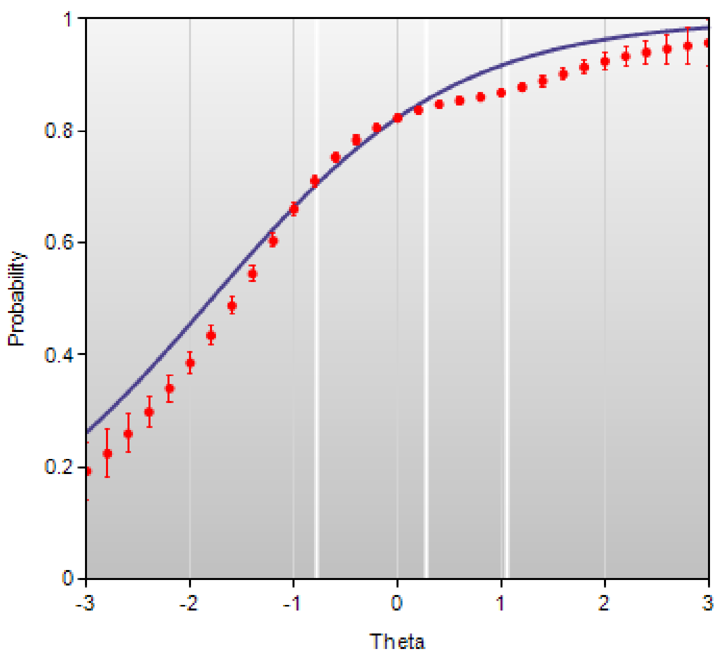

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Initial Calibration

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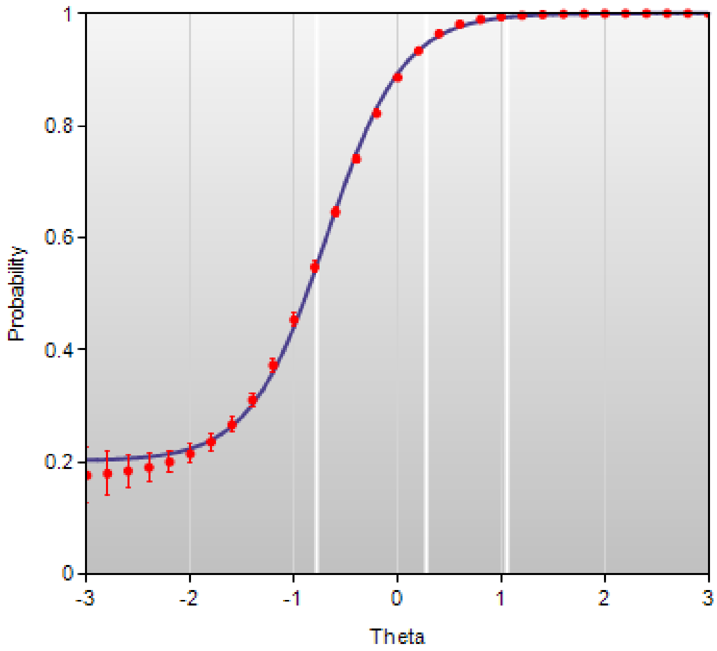

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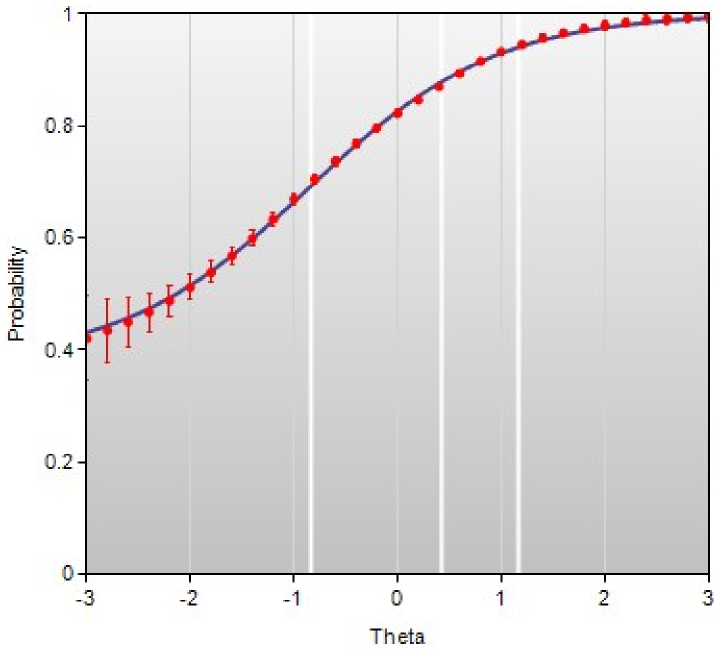
Initial Calibration

Mathematics Grade 5: 151248A



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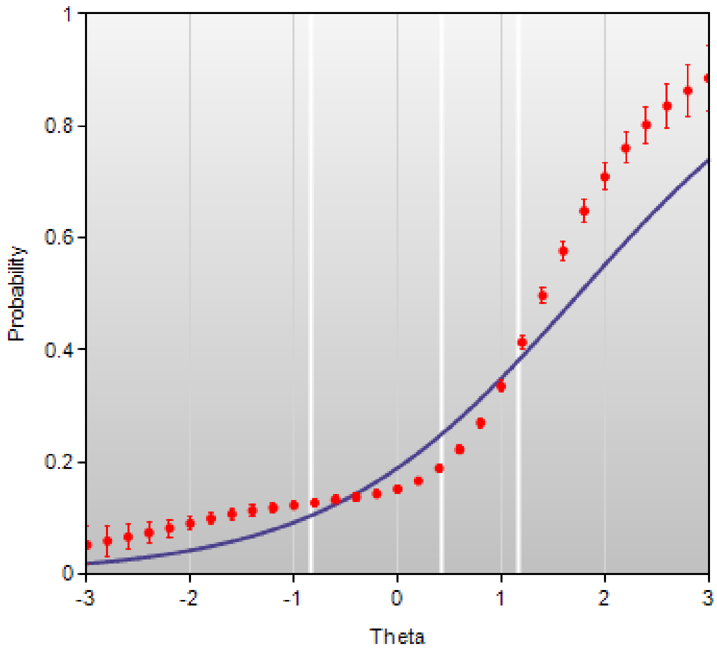
Initial Calibration

Mathematics Grade 5: 674588



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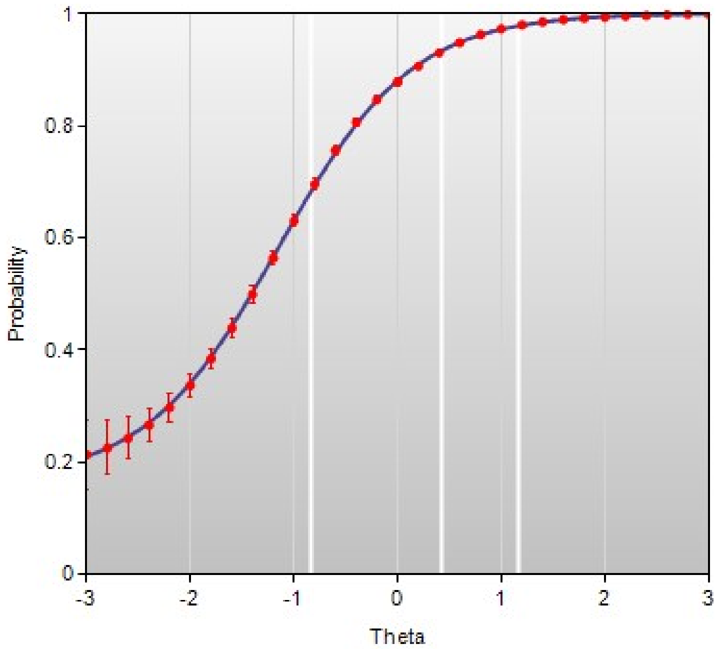
Initial Calibration

Mathematics Grade 5: 733188



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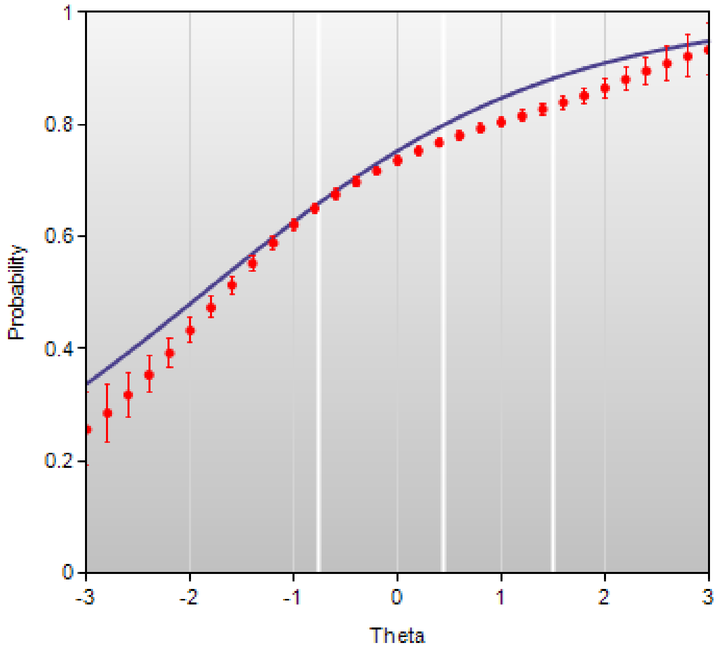
Initial Calibration

Mathematics Grade 6: 148159A



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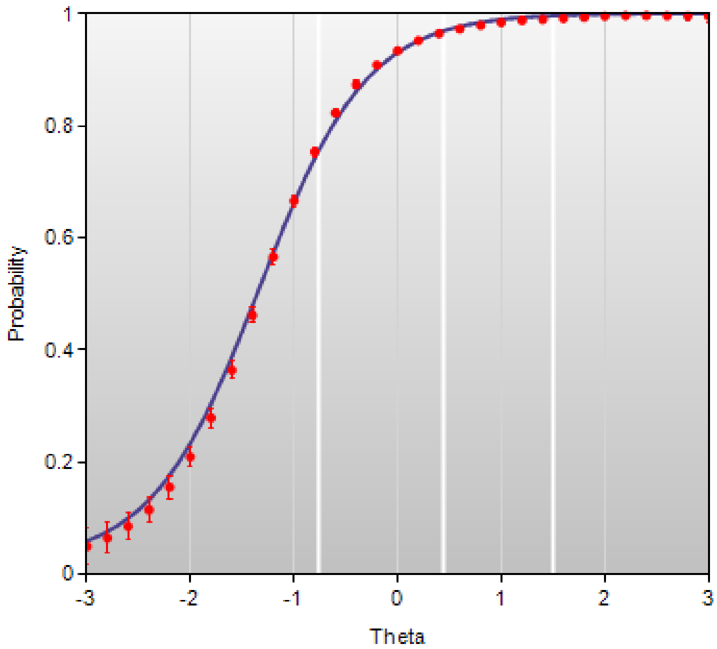
Initial Calibration

Mathematics Grade 6: 149259A



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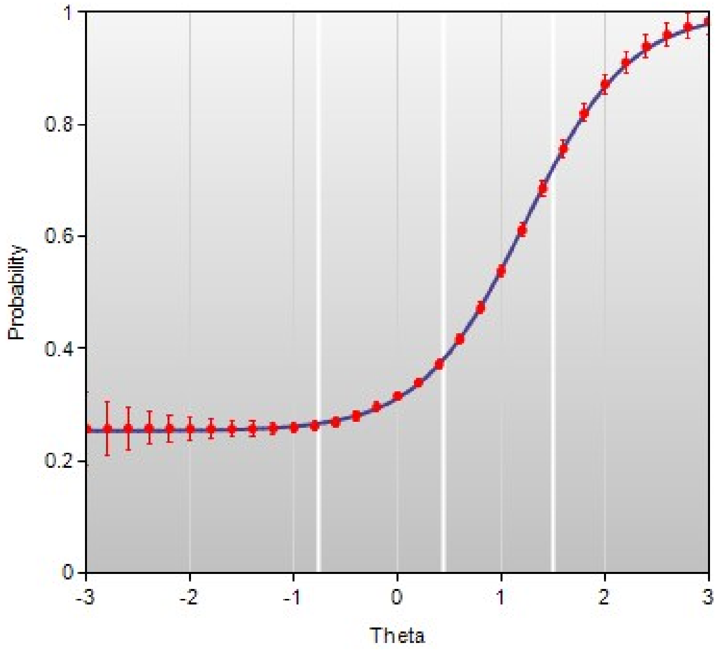
Initial Calibration

Mathematics Grade 6: 155138A



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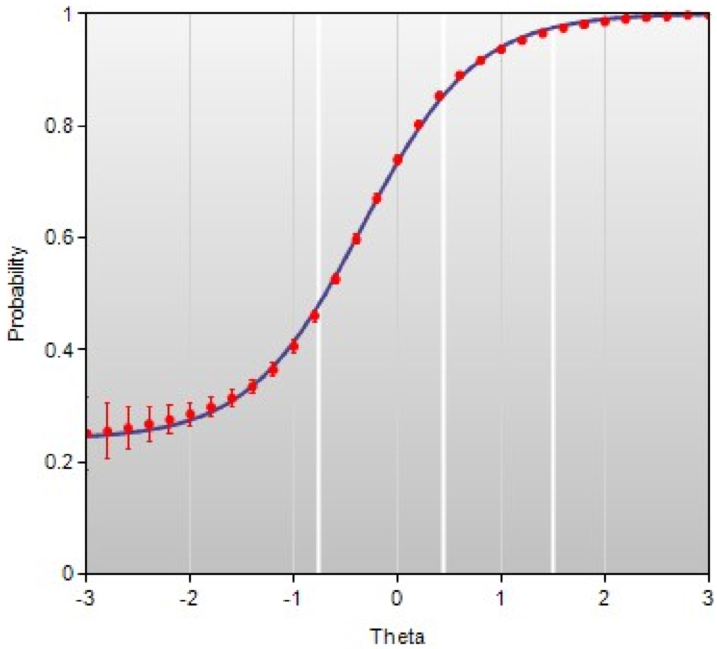
Initial Calibration

Mathematics Grade 6: 479081



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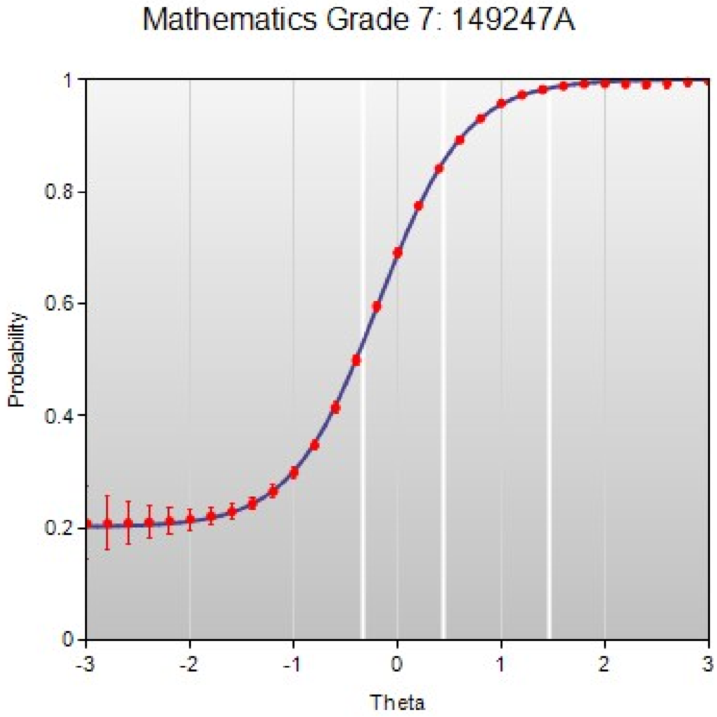

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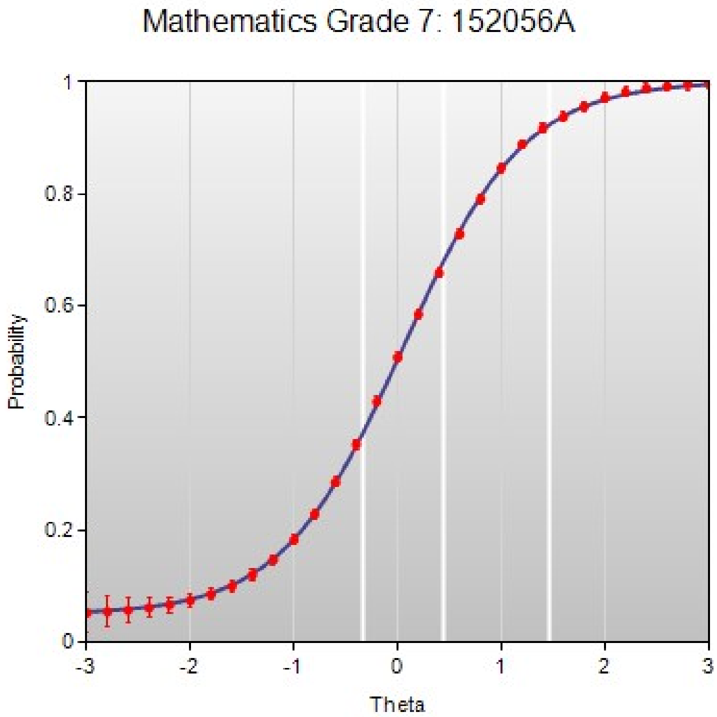

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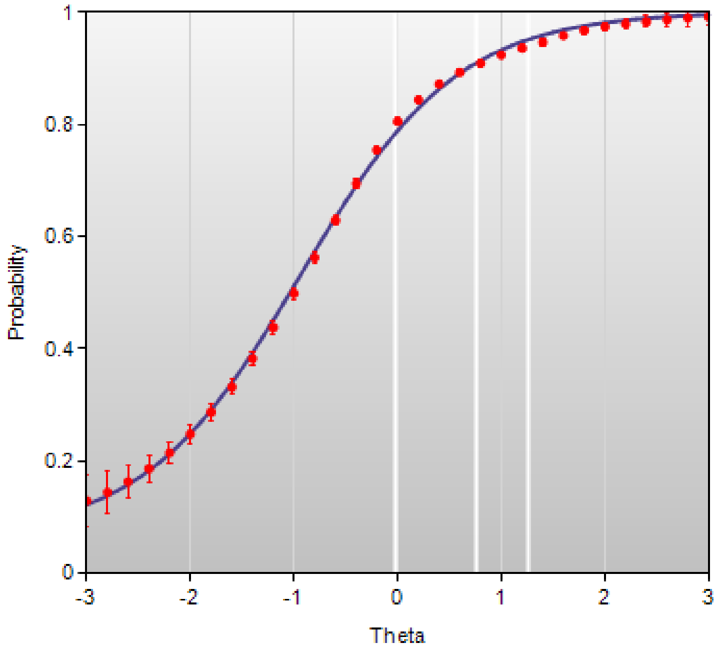

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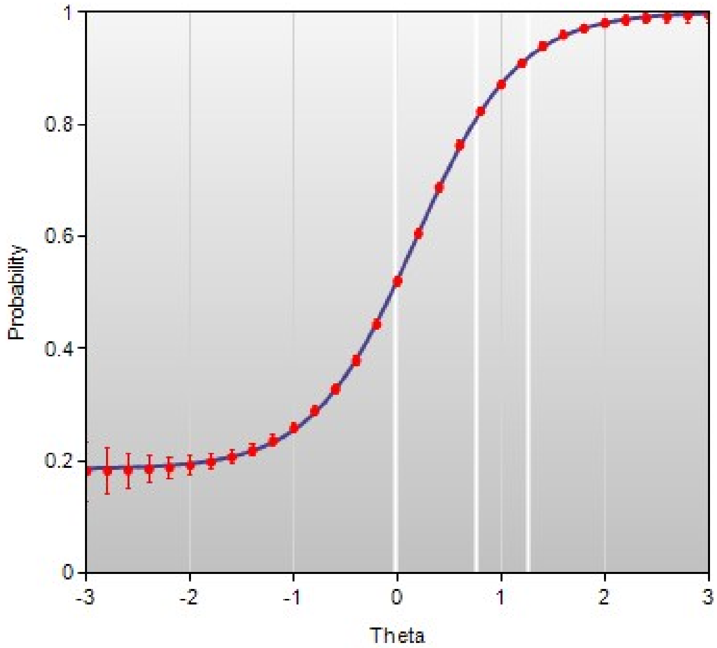

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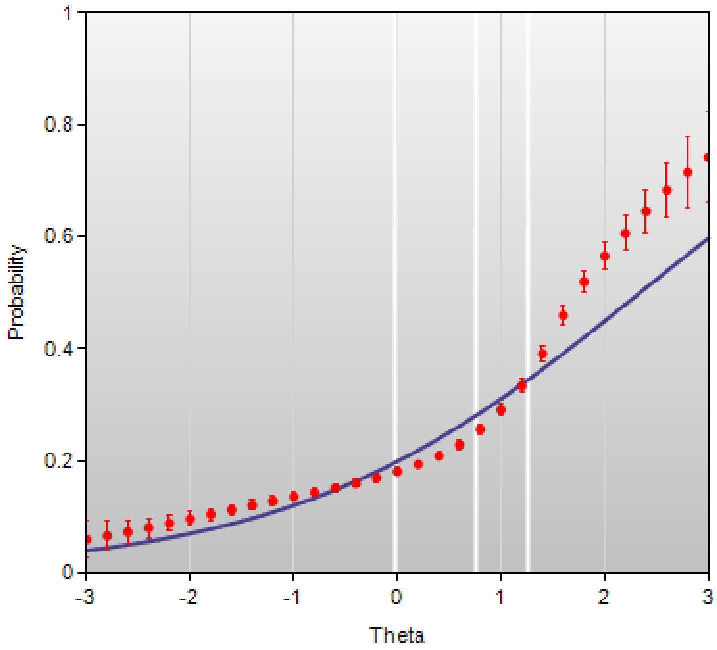
Initial Calibration

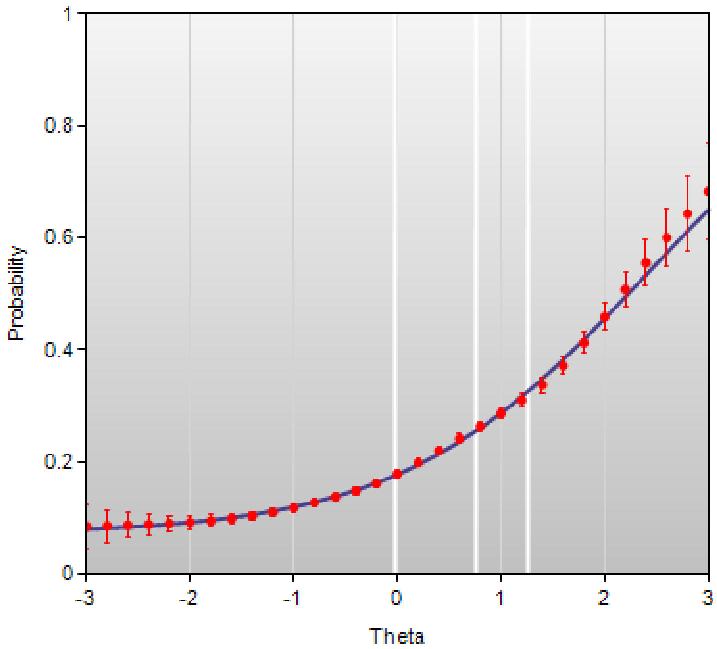
Mathematics Grade 8: 484750



Beta Chart

Initial Calibration

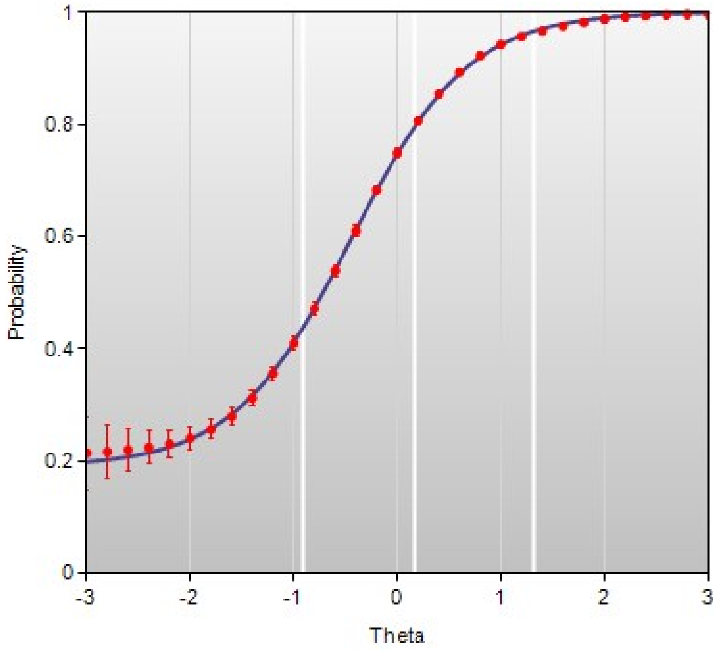
Mathematics Grade 8: 484783



Beta Chart

Initial Calibration

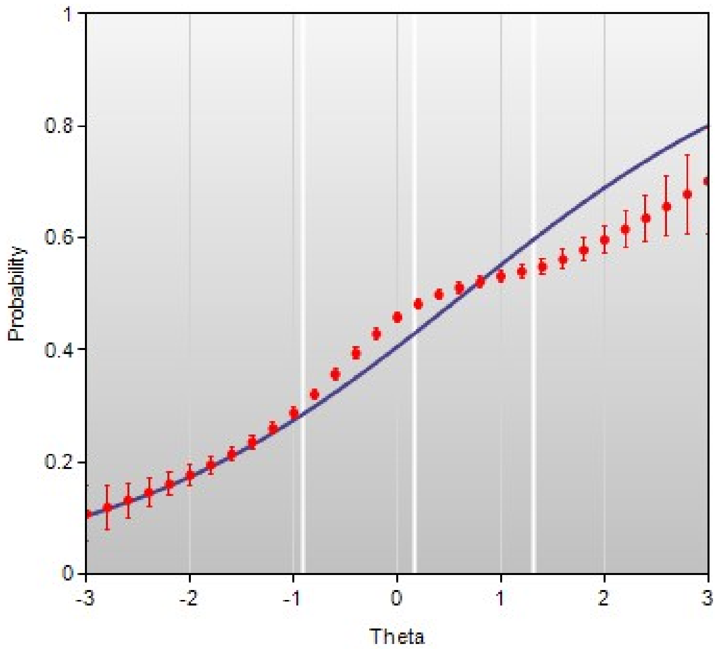
Science Grade 5: 465317



Beta Chart

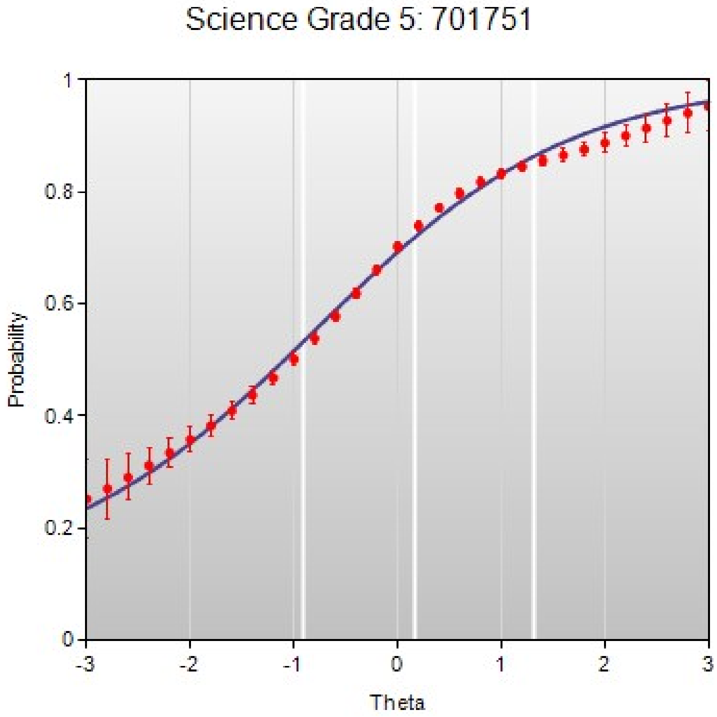
Initial Calibration

Science Grade 5: 638751



Beta Chart

Initial Calibration



Beta Chart

Oklahoma College and Career Readiness Assessment

2022–2023: EQUATING REPORT

2022–2023 Oklahoma College and Career Readiness Assessment

Equating Report

The purpose of this document is to summarize the equating results obtained from Cognia for CCRA. Presented in this report are various program summary statistics and specific results related to the equating study.

The results of this report are organized as follows:

1. Aggregate Results
    1. Percentage of Students by Performance Level Categories
    2. Theta Cuts and Scaling Constants
    3. Calibration Report
    4. Equating Item Summary Statistics
2. Grade Subject Results
    1. A/A, B/B, Delta, and Cumulative Scale Score Distribution Plots
    2. Cumulative Scale Score Distribution Tables
    3. Tabled Delta Analysis Results
    4. Tabled B/B Analysis Results
    5. Final Item Parameters
    6. Decision Accuracy and Consistency (DAC)
    7. Fit Plots of Watchlist Items

The final results of this equating will be included as part of the 2022–2023 CCRA Technical Manual.

Section 1.1

Percentage of Students by Performance Level Categories

Table 1.1.1
Percentage of Students by Performance Level Categories
Science

Grade	Year	Count	BB	B	P	A	P+A	Delta	Ave. SS
11	2023	46302	57	21	16	6	22	-3.5	272.0
	2022	44157	54	21	18	8	25	1.5	272.4
	2021	42566	52	24	17	6	24	-0.2	271.5
	2019	43638	57	20	17	7	24		271.2

Table 1.1.2
Percentage of Students by Performance Level Categories
History

Grade	Year	Count	BB	B	P	A	P+A	Delta	Ave. SS
11	2023	46355	42	14	35	9	44	-2.7	295.7
	2022	44168	40	14	36	10	46		294.6

Section 1.2

Theta Cuts and Scaling Constants

Table 1.2.1

Theta and Scale Score Cuts

Subject	Grade	Type	Theta 1	Theta 2	Theta 3	Minimum	Scale Score 1	Scale Score 2	Scale Score 3	Maximum
Science	Grade 11	Scaling	0.17	0.80	1.53	200	278	300	327	399
History	Grade 11	Scaling	-0.26	0.14	1.30	200	290	300	330	399

Table 1.2.2

Scaling Slope and Intercept

Subject	Grade	Slope	Intercept
Science	Grade 11	35.8776457400000	271.2212872000000
History	Grade 11	25.9553119200000	296.3759796000000

Section 1.3

Calibration Report

Calibration Report—Executive Summary

PARSCALE 4.1 was used for all analyses. All command files were set up in a way that all general settings were identical to last year. For example, the calibration statement reads:

CAL GRADED,LOGISTIC,CYCLE= (150,1,1,1,1),TPRIOR,SPRIOR,GPRIOR;

Thus, a 3PLM was used for all MC items, and a Graded Response Model was specified for the polytomous items. The logistic version of the IRT models was used, and default priors were used for all parameter estimates. Each item occupied its own unique block in the command file, and for most items initial guessing parameters were set to 0.22.

The resulting parameters demonstrated excellent model fit. In particular, the largest change in parameter values (from one iteration to the next) was monotonically decreasing and tended to flatten out towards the end of the calibration process. The number of Newton cycles to conversion for each grade/content for the initial calibrations are listed in the following table:

Table 1.3.1

Number of Cycles to Convergence

Subject	Grade	Initial Cycles
Science	Grade 11	74
History	Grade 11	58

For some items, the guessing parameter was poorly estimated. This is not at all unusual as difficulty in estimating the c-parameter has been well documented in the psychometric literature. This often happens when item discrimination is low (e.g., less than 0.50). After carefully studying these items, we found that fixing the lower asymptote (for example to a value of 0.00) resulted in stable and reasonable estimates for both the a and b parameters (relative to CTT statistics). This technique also produced item parameters that resulted in excellent model fit (comparing theoretical ICCs to observed ICCs).

Three methods of evaluating the suitability of the equating items were used: the delta analysis, the b/b analysis and the rescore analysis. As a result of all three analyses very few items were removed from the equating analysis. Results such as this are quite common particularly, given the number of grade/content combinations, and the number and types of items in the program. Results from these analyses are included in Section II of this report.

Items flagged by the delta, b/b, or rescore analyses, or any item that required intervention during the calibration process, were compiled and placed in our item watch list, which includes the final actions taken on these items. The final watch list is presented in the following table:

Table 1.3.2

Final Items Watch List

Subject	Grade	ItemID	Reason	Action
Science	11	188458A	b/b analysis	removed from equating
Science	11	586659	delta analysis	removed from equating
Science	11	701400	delta analysis	removed from equating
Science	11	701635	c-parameter	set c = 0
History	11	143295A	c-parameter	set c = 0
History	11	143295A	b/b analysis	removed from equating
History	11	143340A	c-parameter	set c = 0
History	11	143377A	b/b analysis	removed from equating
History	11	648572	c-parameter	set c = 0
History	11	652328	c-parameter	set c = 0
History	11	658078	delta analysis	retained for equating

Stocking and Lord procedure was used to transform parameter estimates onto the operational scale. This procedure results in constants which were applied to the resulting IRT parameters for each grade/content. These transformation constants were found using the STUIRT program which can be found at the CASMA website: http://www.education.uiowa.edu/casma/. The Stocking & Lord transformation constants that were used in the equating process are listed in the following table:

Table 1.3.3

Stocking and Lord Constants

Subject	Grade	Slope	Intercept	Num Eq Items	Num Eq Items Rem
Science	11	1.01	0.01	60	3
History	11	1.02	-0.02	50	2

Section 1.4

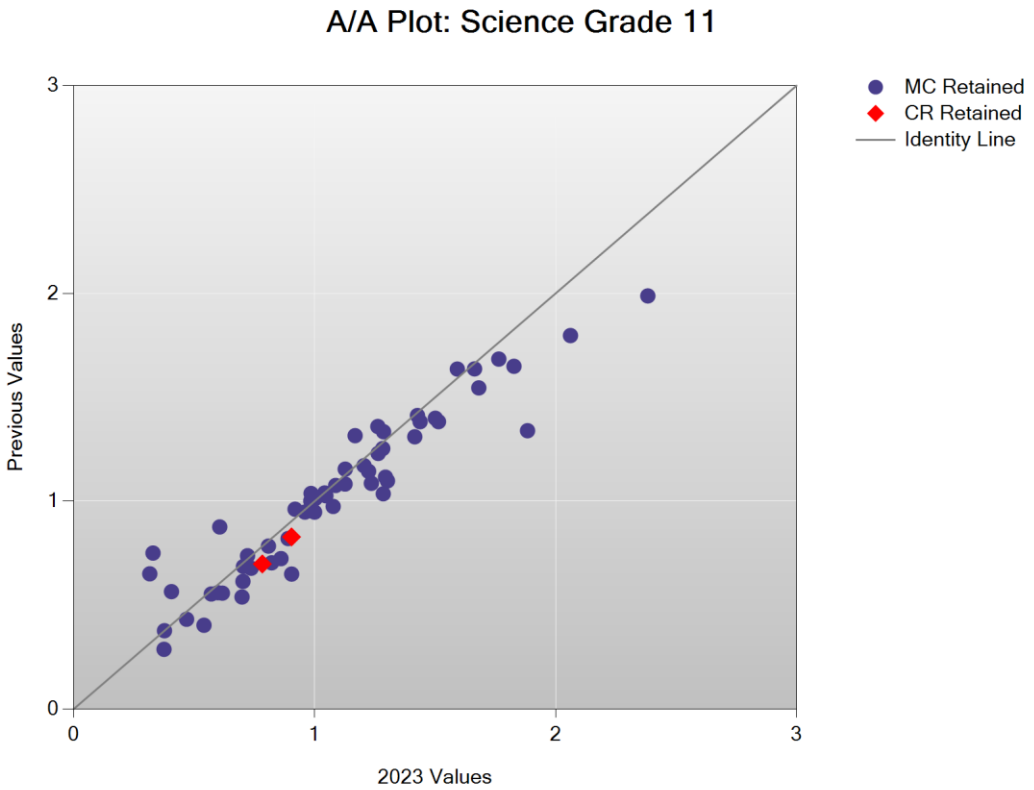
Equating Item Summary Statistics

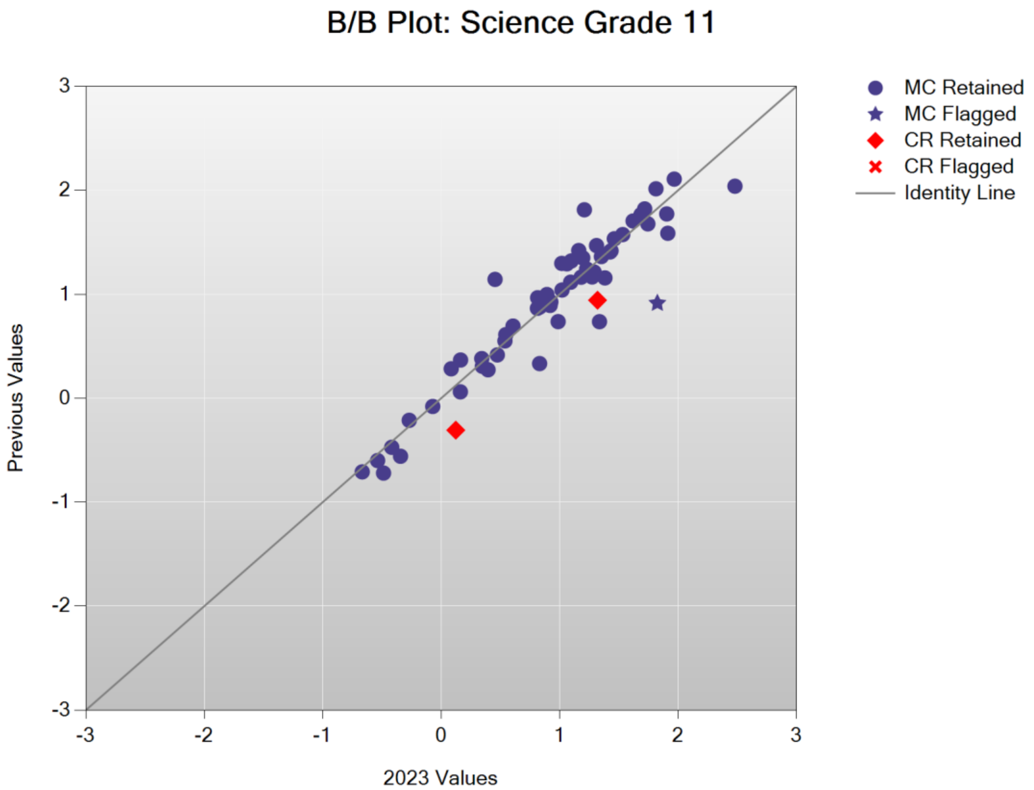
Table 1.4.1
Equating Item Summary Statistics

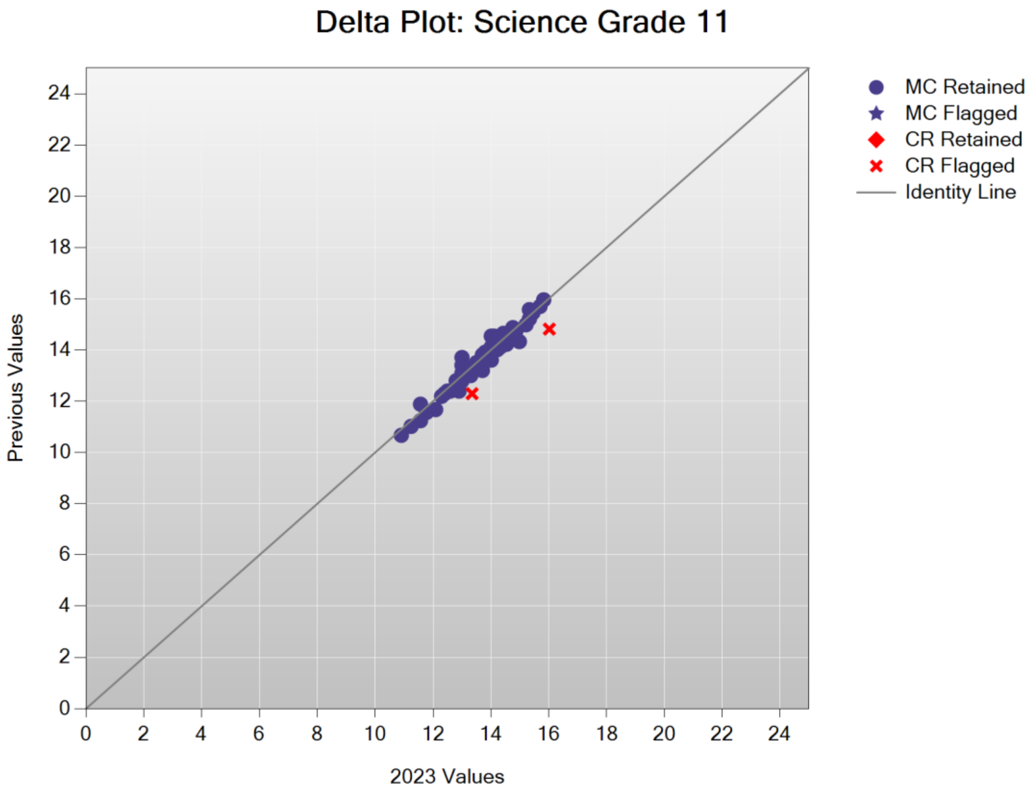
			P-Value		Point Biserial		a		b	
Subject	Grade	Year	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Science	11	2023	0.43	0.11	0.37	0.10	1.07	0.45	0.93	0.70
		Previous	0.44	0.11	0.36	0.10	1.02	0.38	0.91	0.72
History	11	2023	0.51	0.13	0.41	0.10	0.98	0.40	0.41	0.78
		Previous	0.52	0.13	0.40	0.10	0.99	0.40	0.37	0.77

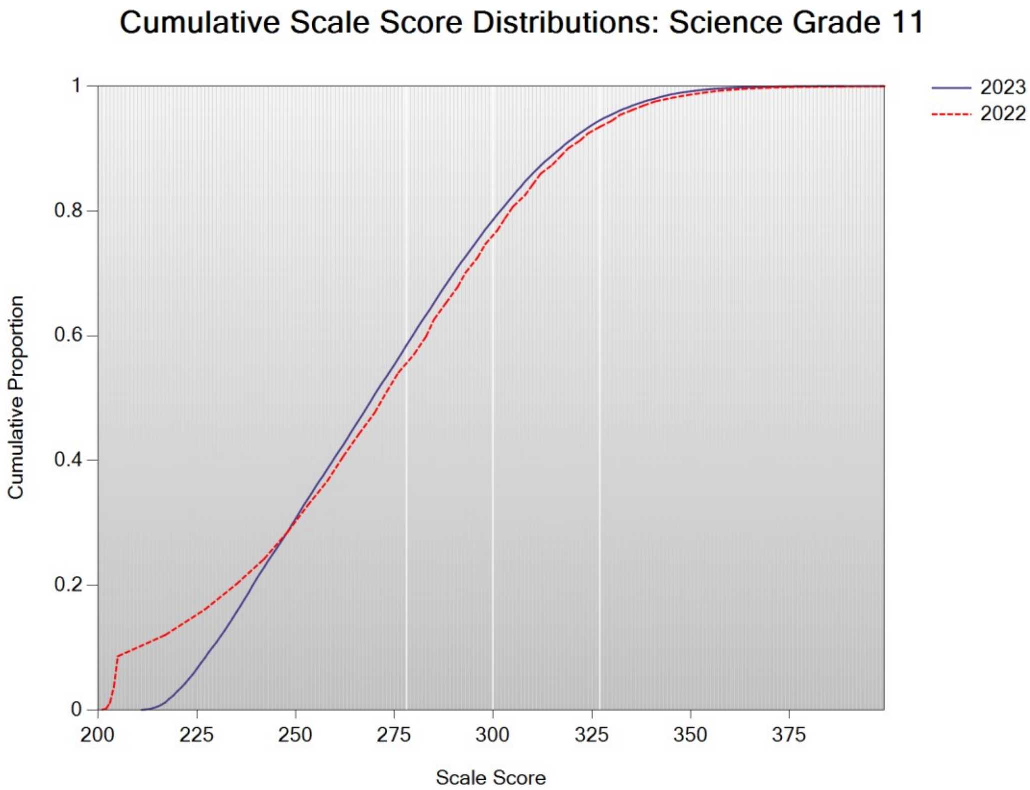
Section 2.1

A/A, B/B, Delta, and Cumulative Scale Score Distribution Plots

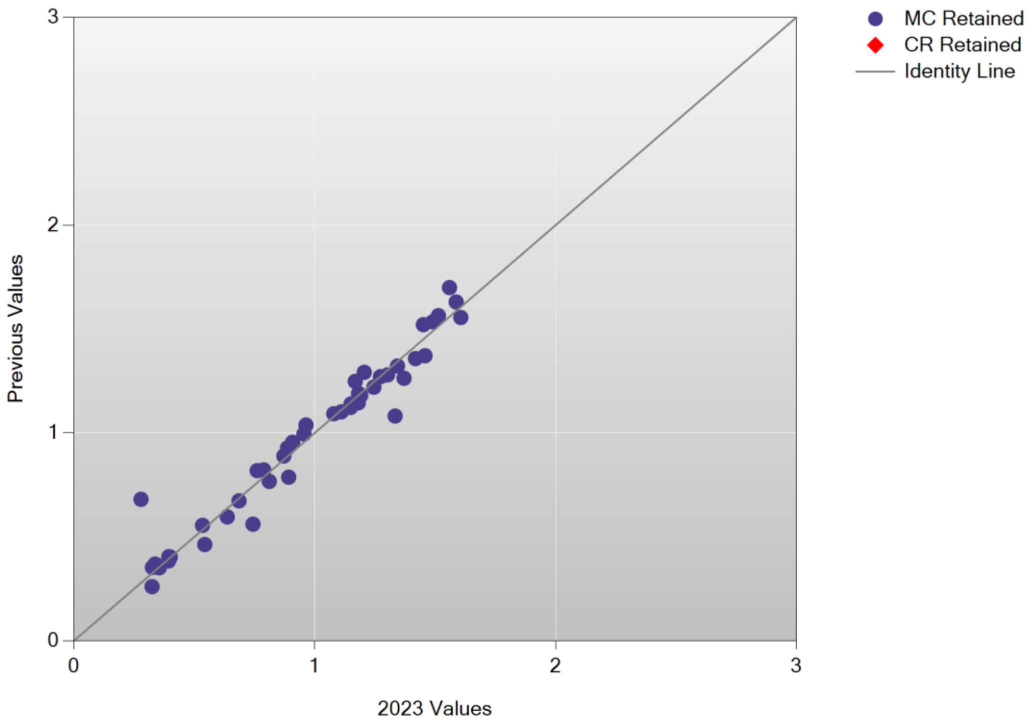

A/A Plot: Science Grade 11
MC Retained
CR Retained
Identity Line
Previous Values
2023 Values
0
1
2
3


B/B Plot: Science Grade 11
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line
Previous Values
2023 Values
-3
-2
-1
0
1
2
3

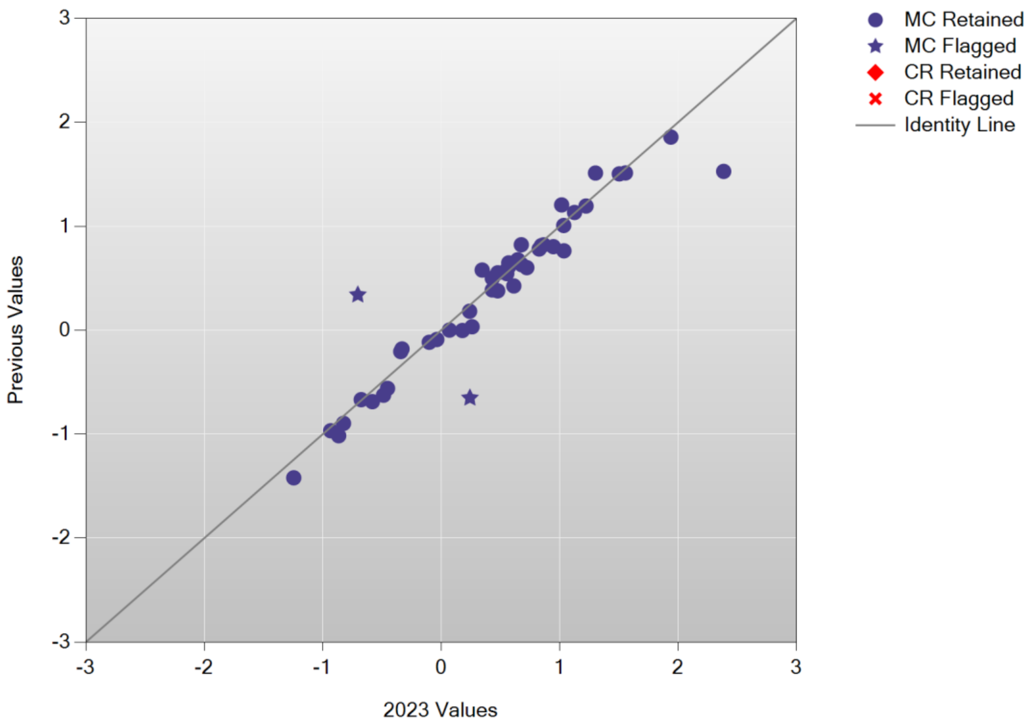

Delta Plot: Science Grade 11
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line
Previous Values
2023 Values
0
2
4
6
8
10
12
14
16
18
20
22
24

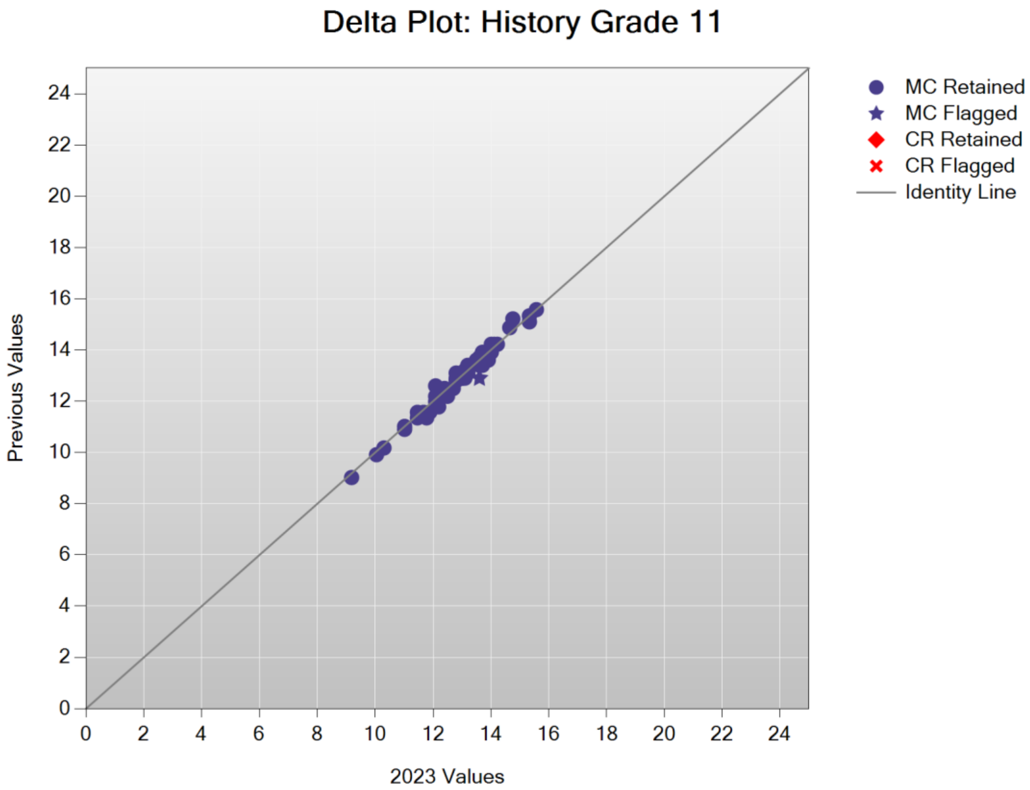

Cumulative Scale Score Distributions: Science Grade 11
2023
2022
Cumulative Proportion
Scale Score
0
0.2
0.4
0.6
0.8
1
200
225
250
275
300
325
350
375

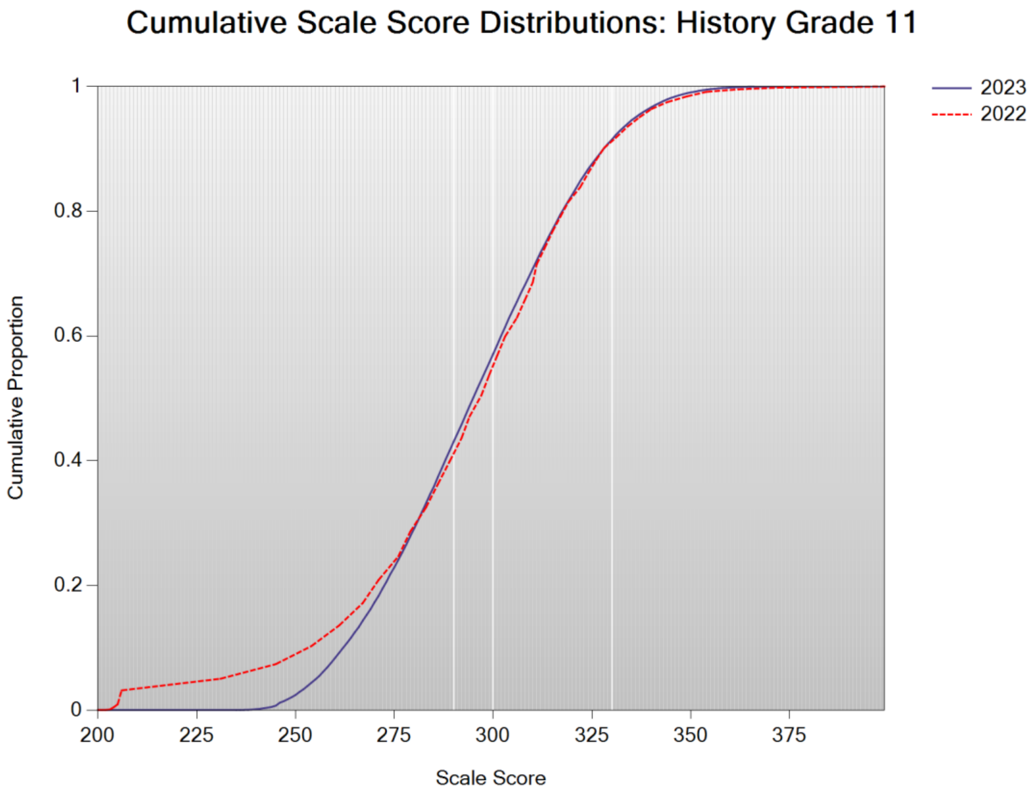
A/A Plot: History Grade 11



B/B Plot: History Grade 11




Delta Plot: History Grade 11
MC Retained
MC Flagged
CR Retained
CR Flagged
Identity Line
Previous Values
2023 Values
0
2
4
6
8
10
12
14
16
18
20
22
24


Cumulative Scale Score Distributions: History Grade 11
2023
2022
Cumulative Proportion
Scale Score
0
0.2
0.4
0.6
0.8
1
200
225
250
275
300
325
350
375

Section 2.2

Cumulative Scale Score Distribution Tables

Table 2.2.1
Cumulative Scale Score Distribution
Science Grade 11

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
211	BB	3	0.00006	0.00006
212	BB	16	0.00035	0.00041
213	BB	39	0.00084	0.00125
214	BB	71	0.00153	0.00279
215	BB	98	0.00212	0.00490
216	BB	141	0.00305	0.00795
217	BB	170	0.00367	0.01162
218	BB	278	0.00600	0.01762
219	BB	228	0.00492	0.02255
220	BB	318	0.00687	0.02942
221	BB	275	0.00594	0.03535
222	BB	310	0.00670	0.04205
223	BB	355	0.00767	0.04972
224	BB	334	0.00721	0.05693
225	BB	408	0.00881	0.06574
226	BB	413	0.00892	0.07466
227	BB	380	0.00821	0.08287
228	BB	436	0.00942	0.09229
229	BB	383	0.00827	0.10056
230	BB	372	0.00803	0.10859
231	BB	428	0.00924	0.11784
232	BB	412	0.00890	0.12673
233	BB	450	0.00972	0.13645
234	BB	455	0.00983	0.14628
235	BB	470	0.01015	0.15643
236	BB	454	0.00981	0.16623
237	BB	483	0.01043	0.17667
238	BB	463	0.01000	0.18667
239	BB	531	0.01147	0.19813
240	BB	493	0.01065	0.20878
241	BB	464	0.01002	0.21880
242	BB	437	0.00944	0.22824
243	BB	479	0.01035	0.23859
244	BB	429	0.00927	0.24785
245	BB	432	0.00933	0.25718
246	BB	439	0.00948	0.26666
247	BB	444	0.00959	0.27625
248	BB	443	0.00957	0.28582
249	BB	483	0.01043	0.29625
250	BB	473	0.01022	0.30647

Table 2.2.1 (continued)
Cumulative Scale Score Distribution
Science Grade 11

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
251	BB	484	0.01045	0.31692
252	BB	498	0.01076	0.32767
253	BB	438	0.00946	0.33713
254	BB	451	0.00974	0.34687
255	BB	478	0.01032	0.35720
256	BB	451	0.00974	0.36694
257	BB	407	0.00879	0.37573
258	BB	475	0.01026	0.38599
259	BB	438	0.00946	0.39545
260	BB	473	0.01022	0.40566
261	BB	437	0.00944	0.41510
262	BB	421	0.00909	0.42419
263	BB	466	0.01006	0.43426
264	BB	490	0.01058	0.44484
265	BB	463	0.01000	0.45484
266	BB	450	0.00972	0.46456
267	BB	454	0.00981	0.47436
268	BB	476	0.01028	0.48464
269	BB	468	0.01011	0.49475
270	BB	505	0.01091	0.50566
271	BB	459	0.00991	0.51557
272	BB	449	0.00970	0.52527
273	BB	419	0.00905	0.53432
274	BB	449	0.00970	0.54402
275	BB	438	0.00946	0.55348
276	BB	472	0.01019	0.56367
277	BB	460	0.00993	0.57360
278	B	494	0.01067	0.58427
279	B	446	0.00963	0.59391
280	B	465	0.01004	0.60395
281	B	476	0.01028	0.61423
282	B	446	0.00963	0.62386
283	B	432	0.00933	0.63319
284	B	423	0.00914	0.64233
285	B	466	0.01006	0.65239
286	B	464	0.01002	0.66241
287	B	458	0.00989	0.67230
288	B	426	0.00920	0.68150
289	B	435	0.00939	0.69090
290	B	424	0.00916	0.70006

Table 2.2.1 (continued)
Cumulative Scale Score Distribution
Science Grade 11

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
291	B	440	0.00950	0.70956
292	B	415	0.00896	0.71852
293	B	378	0.00816	0.72669
294	B	406	0.00877	0.73545
295	B	393	0.00849	0.74394
296	B	410	0.00885	0.75280
297	B	401	0.00866	0.76146
298	B	408	0.00881	0.77027
299	B	363	0.00784	0.77811
300	P	365	0.00788	0.78599
301	P	379	0.00819	0.79418
302	P	340	0.00734	0.80152
303	P	347	0.00749	0.80901
304	P	364	0.00786	0.81688
305	P	342	0.00739	0.82426
306	P	367	0.00793	0.83219
307	P	309	0.00667	0.83886
308	P	376	0.00812	0.84698
309	P	294	0.00635	0.85333
310	P	316	0.00682	0.86016
311	P	290	0.00626	0.86642
312	P	289	0.00624	0.87266
313	P	284	0.00613	0.87880
314	P	236	0.00510	0.88389
315	P	254	0.00549	0.88938
316	P	255	0.00551	0.89489
317	P	230	0.00497	0.89985
318	P	273	0.00590	0.90575
319	P	235	0.00508	0.91082
320	P	210	0.00454	0.91536
321	P	233	0.00503	0.92039
322	P	208	0.00449	0.92488
323	P	197	0.00425	0.92914
324	P	209	0.00451	0.93365
325	P	192	0.00415	0.93780
326	P	184	0.00397	0.94177
327	A	168	0.00363	0.94540
328	A	163	0.00352	0.94892
329	A	130	0.00281	0.95173
330	A	138	0.00298	0.95471

Table 2.2.1 (continued)
Cumulative Scale Score Distribution
Science Grade 11

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
331	A	139	0.00300	0.95771
332	A	143	0.00309	0.96080
333	A	131	0.00283	0.96363
334	A	94	0.00203	0.96566
335	A	127	0.00274	0.96840
336	A	107	0.00231	0.97071
337	A	100	0.00216	0.97287
338	A	95	0.00205	0.97493
339	A	100	0.00216	0.97709
340	A	70	0.00151	0.97860
341	A	73	0.00158	0.98017
342	A	97	0.00209	0.98227
343	A	70	0.00151	0.98378
344	A	73	0.00158	0.98536
345	A	73	0.00158	0.98693
346	A	48	0.00104	0.98797
347	A	53	0.00114	0.98911
348	A	51	0.00110	0.99022
349	A	32	0.00069	0.99091
350	A	45	0.00097	0.99188
351	A	35	0.00076	0.99264
352	A	37	0.00080	0.99343
353	A	26	0.00056	0.99400
354	A	35	0.00076	0.99475
355	A	29	0.00063	0.99538
356	A	20	0.00043	0.99581
357	A	21	0.00045	0.99626
358	A	15	0.00032	0.99659
359	A	16	0.00035	0.99693
360	A	19	0.00041	0.99734
361	A	20	0.00043	0.99778
362	A	9	0.00019	0.99797
363	A	15	0.00032	0.99829
364	A	8	0.00017	0.99847
365	A	5	0.00011	0.99857
366	A	9	0.00019	0.99877
367	A	8	0.00017	0.99894
368	A	6	0.00013	0.99907
369	A	6	0.00013	0.99920
370	A	5	0.00011	0.99931

Table 2.2.1 (continued)
Cumulative Scale Score Distribution
Science Grade 11

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
371	A	1	0.00002	0.99933
372	A	5	0.00011	0.99944
373	A	2	0.00004	0.99948
374	A	4	0.00009	0.99957
375	A	2	0.00004	0.99961
376	A	4	0.00009	0.99970
377	A	4	0.00009	0.99978
378	A	2	0.00004	0.99983
379	A	2	0.00004	0.99987
381	A	1	0.00002	0.99989
382	A	3	0.00006	0.99996
399	A	2	0.00004	1.00000

Table 2.2.2
Cumulative Scale Score Distribution
History Grade 11

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
200	BB	1	0.00002	0.00002
235	BB	2	0.00004	0.00006
236	BB	3	0.00006	0.00013
237	BB	2	0.00004	0.00017
238	BB	8	0.00017	0.00035
239	BB	16	0.00035	0.00069
240	BB	29	0.00063	0.00132
241	BB	29	0.00063	0.00194
242	BB	43	0.00093	0.00287
243	BB	44	0.00095	0.00382
244	BB	60	0.00129	0.00511
245	BB	84	0.00181	0.00692
246	BB	220	0.00475	0.01167
247	BB	115	0.00248	0.01415
248	BB	144	0.00311	0.01726
249	BB	153	0.00330	0.02056
250	BB	166	0.00358	0.02414
251	BB	227	0.00490	0.02904
252	BB	198	0.00427	0.03331
253	BB	238	0.00513	0.03844
254	BB	245	0.00529	0.04373
255	BB	242	0.00522	0.04895
256	BB	261	0.00563	0.05458
257	BB	320	0.00690	0.06148
258	BB	313	0.00675	0.06823
259	BB	346	0.00746	0.07570
260	BB	362	0.00781	0.08351
261	BB	374	0.00807	0.09158
262	BB	371	0.00800	0.09958
263	BB	362	0.00781	0.10739
264	BB	385	0.00831	0.11569
265	BB	423	0.00913	0.12482
266	BB	383	0.00826	0.13308
267	BB	472	0.01018	0.14326
268	BB	434	0.00936	0.15263
269	BB	436	0.00941	0.16203
270	BB	507	0.01094	0.17297
271	BB	464	0.01001	0.18298
272	BB	544	0.01174	0.19471
273	BB	512	0.01105	0.20576

Table 2.2.2 (continued)
Cumulative Scale Score Distribution
History Grade 11

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
274	BB	580	0.01251	0.21827
275	BB	495	0.01068	0.22895
276	BB	551	0.01189	0.24084
277	BB	556	0.01199	0.25283
278	BB	572	0.01234	0.26517
279	BB	611	0.01318	0.27835
280	BB	583	0.01258	0.29093
281	BB	617	0.01331	0.30424
282	BB	640	0.01381	0.31805
283	BB	623	0.01344	0.33149
284	BB	658	0.01419	0.34568
285	BB	588	0.01268	0.35836
286	BB	708	0.01527	0.37364
287	BB	654	0.01411	0.38775
288	BB	676	0.01458	0.40233
289	BB	649	0.01400	0.41633
290	B	658	0.01419	0.43053
291	B	631	0.01361	0.44414
292	B	640	0.01381	0.45794
293	B	683	0.01473	0.47268
294	B	680	0.01467	0.48735
295	B	648	0.01398	0.50133
296	B	667	0.01439	0.51572
297	B	636	0.01372	0.52944
298	B	645	0.01391	0.54335
299	B	639	0.01378	0.55714
300	P	654	0.01411	0.57124
301	P	658	0.01419	0.58544
302	P	681	0.01469	0.60013
303	P	642	0.01385	0.61398
304	P	681	0.01469	0.62867
305	P	611	0.01318	0.64185
306	P	605	0.01305	0.65490
307	P	635	0.01370	0.66860
308	P	584	0.01260	0.68120
309	P	611	0.01318	0.69438
310	P	619	0.01335	0.70773
311	P	605	0.01305	0.72079
312	P	620	0.01338	0.73416
313	P	558	0.01204	0.74620

Table 2.2.2 (continued)
Cumulative Scale Score Distribution
History Grade 11

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
314	P	584	0.01260	0.75880
315	P	546	0.01178	0.77057
316	P	552	0.01191	0.78248
317	P	571	0.01232	0.79480
318	P	508	0.01096	0.80576
319	P	490	0.01057	0.81633
320	P	477	0.01029	0.82662
321	P	498	0.01074	0.83736
322	P	505	0.01089	0.84826
323	P	438	0.00945	0.85771
324	P	447	0.00964	0.86735
325	P	402	0.00867	0.87602
326	P	376	0.00811	0.88413
327	P	380	0.00820	0.89233
328	P	384	0.00828	0.90061
329	P	340	0.00733	0.90795
330	A	307	0.00662	0.91457
331	A	355	0.00766	0.92223
332	A	301	0.00649	0.92872
333	A	273	0.00589	0.93461
334	A	262	0.00565	0.94027
335	A	263	0.00567	0.94594
336	A	208	0.00449	0.95043
337	A	217	0.00468	0.95511
338	A	190	0.00410	0.95921
339	A	175	0.00378	0.96298
340	A	176	0.00380	0.96678
341	A	163	0.00352	0.97029
342	A	141	0.00304	0.97334
343	A	147	0.00317	0.97651
344	A	129	0.00278	0.97929
345	A	114	0.00246	0.98175
346	A	94	0.00203	0.98378
347	A	95	0.00205	0.98583
348	A	77	0.00166	0.98749
349	A	82	0.00177	0.98926
350	A	60	0.00129	0.99055
351	A	49	0.00106	0.99161
352	A	63	0.00136	0.99297
353	A	47	0.00101	0.99398

Table 2.2.2 (continued)
Cumulative Scale Score Distribution
History Grade 11

Scale Score	Performance Level	N	Proportion	Cumulative Proportion
354	A	49	0.00106	0.99504
355	A	34	0.00073	0.99577
356	A	21	0.00045	0.99622
357	A	38	0.00082	0.99704
358	A	28	0.00060	0.99765
359	A	12	0.00026	0.99791
360	A	19	0.00041	0.99832
361	A	14	0.00030	0.99862
362	A	16	0.00035	0.99896
363	A	11	0.00024	0.99920
365	A	17	0.00037	0.99957
366	A	2	0.00004	0.99961
399	A	18	0.00039	1.00000

Section 2.3

Tabled Delta Analysis Results

Table 2.3.1
Delta Analysis
Science Grade 11

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
186972A	0.35000	0.34000	14.54128	14.64985	1	False	-0.69873
186989A	0.54000	0.51000	12.59827	12.89972	1	False	-0.11569
186992A	0.63000	0.59000	11.67259	12.08982	1	False	0.26754
187933A	0.72000	0.70000	10.66863	10.90240	1	False	-0.68159
187935A	0.58000	0.57000	12.19243	12.29450	1	False	-0.78096
187938A	0.64000	0.62000	11.56616	11.77808	1	False	-0.65393
187996A	0.61000	0.64000	11.88272	11.56616	1	False	1.11067
187999A	0.35000	0.39000	14.54128	14.11728	1	False	1.21739
188008A	0.49000	0.50000	13.10028	13.00000	1	False	-0.01292
188454A	0.56000	0.51000	12.39612	12.89972	1	False	0.74905
188458A	0.44000	0.40000	13.60388	14.01339	1	False	0.50061
188459A	0.48000	0.43000	13.20061	13.70550	1	False	0.86600
188544A	0.34000	0.36000	14.64985	14.43384	1	False	0.28385
188545A	0.50000	0.47000	13.00000	13.30108	1	False	-0.06179
188546A	0.41000	0.42000	13.91018	13.80757	1	False	-0.11467
188657A	0.48000	0.47000	13.20061	13.30108	1	False	-0.91332
188658A	0.38000	0.39000	14.22192	14.11728	1	False	-0.14879
188659A	0.42000	0.43000	13.80757	13.70550	1	False	-0.10281
189596A	0.43000	0.50000	13.70550	13.00000	1	False	2.57614
189597A	0.26000	0.28000	15.57338	15.33137	1	False	0.27090
300016A	0.35000	0.40000	14.54128	14.01339	1	False	1.67618
586027	0.34000	0.34000	14.64985	14.64985	1	False	-0.67013
586029	0.41000	0.42000	13.91018	13.80757	1	False	-0.11467
586031	0.50000	0.49000	13.00000	13.10028	1	False	-0.88473
586051	0.45000	0.43000	13.50265	13.70550	1	False	-0.42605
586069	0.39000	0.39000	14.11728	14.11728	1	False	-0.59645
586106	0.47000	0.48000	13.30108	13.20061	1	False	-0.03986
586108	0.39000	0.39000	14.11728	14.11728	1	False	-0.59645
586110	0.33000	0.33000	14.75965	14.75965	1	False	-0.68532
586218	0.56000	0.55000	12.39612	12.49735	1	False	-0.80541
586649	0.43000	0.41000	13.70550	13.91018	1	False	-0.38990
586655	0.39000	0.37000	14.11728	14.32741	1	False	-0.30884
586659	0.57000	0.46500	12.29450	13.35138	2	True	3.17837

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
586701	0.45000	0.45000	13.50265	13.50265	1	False	-0.51142
586709	0.37000	0.35000	14.32741	14.54128	1	False	-0.26329
586711	0.38000	0.35000	14.22192	14.54128	1	False	0.18798
592069	0.56000	0.54000	12.39612	12.59827	1	False	-0.58226
592071	0.69000	0.67000	11.01660	11.24035	1	False	-0.67768
592073	0.29000	0.28000	15.21354	15.33137	1	False	-0.56485
593424	0.42000	0.42000	13.80757	13.80757	1	False	-0.55361
593426	0.50000	0.49000	13.00000	13.10028	1	False	-0.88473
603684	0.45000	0.45000	13.50265	13.50265	1	False	-0.51142
639009	0.31000	0.29000	14.98340	15.21354	1	False	-0.10070
639014	0.37000	0.31000	14.32741	14.98340	1	False	1.68920
639018	0.27000	0.27000	15.45125	15.45125	1	False	-0.78100
701400	0.32500	0.22500	14.81505	16.02166	2	True	4.18833
701417	0.33000	0.32000	14.75965	14.87080	1	False	-0.65716
701425	0.32000	0.33000	14.87080	14.75965	1	False	-0.20987
701601	0.25000	0.25000	15.69796	15.69796	1	False	-0.81513
701612	0.46000	0.50000	13.40173	13.00000	1	False	1.27668
701624	0.23000	0.24000	15.95539	15.82521	1	False	-0.27585
701635	0.57000	0.56000	12.29450	12.39612	1	False	-0.79306
701641	0.52000	0.52000	12.79939	12.79939	1	False	-0.41414
701654	0.67000	0.64000	11.24035	11.56616	1	False	-0.19597
754205	0.40000	0.38000	14.01339	14.22192	1	False	-0.33029
754209	0.52000	0.50000	12.79939	13.00000	1	False	-0.53322
754213	0.37000	0.39000	14.32741	14.11728	1	False	0.30249
786847	0.48000	0.49000	13.20061	13.10028	1	False	-0.02652
786849	0.39000	0.40000	14.11728	14.01339	1	False	-0.13766
786851	0.36000	0.35000	14.43384	14.54128	1	False	-0.71855

Table 2.3.2
Delta Analysis
History Grade 11

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
140941A	0.26000	0.26000	15.57338	15.57338	1	False	-0.70502
141113A	0.44000	0.41000	13.60388	13.91018	1	False	0.95841
143252A	0.70000	0.69000	10.90240	11.01660	1	False	-1.06525
143254A	0.43000	0.41000	13.70550	13.91018	1	False	0.25759
143278A	0.62000	0.58000	11.77808	12.19243	1	False	1.23983
143286A	0.45000	0.45000	13.50265	13.50265	1	False	-0.94879
143291A	0.59000	0.58000	12.08982	12.19243	1	False	-0.91012
143295A	0.54000	0.59000	12.59827	12.08982	1	False	2.93912
143307A	0.38000	0.38000	14.22192	14.22192	1	False	-1.06986
143326A	0.29000	0.33000	15.21354	14.75965	1	False	1.84210
143333A	0.45000	0.44000	13.50265	13.60388	1	False	-0.53856
143337A	0.76000	0.75000	10.17479	10.30204	1	False	-0.96235
143340A	0.64000	0.65000	11.56616	11.45872	1	False	0.34400
143361A	0.41000	0.40000	13.91018	14.01339	1	False	-0.41437
143364A	0.57000	0.58000	12.29450	12.19243	1	False	0.10889
143365A	0.46000	0.43000	13.40173	13.70550	1	False	0.88563
143371A	0.52000	0.52000	12.79939	12.79939	1	False	-0.75894
143377A	0.66000	0.62000	11.35015	11.77808	1	False	1.22162
143416A	0.64000	0.63000	11.56616	11.67259	1	False	-1.02414
143447A	0.58000	0.59000	12.19243	12.08982	1	False	0.14024
648566	0.49000	0.48000	13.10028	13.20061	1	False	-0.65358
648568	0.46000	0.44000	13.40173	13.60388	1	False	0.15737
648570	0.55000	0.56000	12.49735	12.39612	1	False	0.04807
648572	0.51000	0.50000	12.89972	13.00000	1	False	-0.70818
648621	0.46000	0.48000	13.40173	13.20061	1	False	0.51978
648623	0.49000	0.52000	13.10028	12.79939	1	False	1.31615
648625	0.51000	0.52000	12.89972	12.79939	1	False	-0.06695
648627	0.41000	0.43000	13.91018	13.70550	1	False	0.40805
652304	0.69000	0.69000	11.01660	11.01660	1	False	-0.27766
652307	0.51000	0.50000	12.89972	13.00000	1	False	-0.70818
652328	0.64000	0.61000	11.56616	11.88272	1	False	0.48181
658018	0.43000	0.44000	13.70550	13.60388	1	False	-0.27530
658020	0.38000	0.39000	14.22192	14.11728	1	False	-0.39302

Item Id	Old P	New P	Old Delta	New Delta	Max	Discard	Std Dist
658029	0.28000	0.28000	15.33137	15.33137	1	False	-0.77035
658051	0.51000	0.50000	12.89972	13.00000	1	False	-0.70818
658053	0.65000	0.64000	11.45872	11.56616	1	False	-1.04580
658058	0.44000	0.45000	13.60388	13.50265	1	False	-0.25065
658060	0.66000	0.65000	11.35015	11.45872	1	False	-1.06705
658074	0.30000	0.28000	15.09760	15.33137	1	False	0.84181
658076	0.48000	0.49000	13.20061	13.10028	1	False	-0.14818
658078	0.51000	0.44000	12.89972	13.60388	1	True	3.61950
658082	0.46000	0.47000	13.40173	13.30108	1	False	-0.20021
700021	0.55000	0.53000	12.49735	12.69892	1	False	-0.09090
700082	0.84000	0.83000	9.02217	9.18334	1	False	-0.89427
700300	0.51000	0.49000	12.89972	13.10028	1	False	0.01045
700377	0.78000	0.77000	9.91123	10.04461	1	False	-0.93516
700443	0.58000	0.55000	12.19243	12.49735	1	False	0.56752
700979	0.60000	0.59000	11.98661	12.08982	1	False	-0.93366
755321	0.38000	0.40000	14.22192	14.01339	1	False	0.35149
755336	0.32000	0.34000	14.87080	14.64985	1	False	0.26524

Section 2.4

Tabled B/B Analysis Results

Table 2.4.1
b/b Analysis
Science Grade 11

Item Id	Old b	New b	Std Dist	Flag
186972A	1.21469	1.29141	-0.50170	False
186989A	0.41698	0.47419	-0.73903	False
186992A	-0.55823	-0.34306	-0.04303	False
187933A	-0.70840	-0.66664	-0.74810	False
187935A	-0.21208	-0.26974	-0.29067	False
187938A	-0.71999	-0.48686	0.02771	False
187996A	0.28337	0.08468	0.39258	False
187999A	1.29794	1.01830	0.66439	False
188008A	1.32140	1.09839	0.35337	False
188454A	0.73692	1.33695	2.25791	False
188458A	0.91516	1.82575	3.97174	True
188459A	0.33363	0.83141	1.63684	False
188544A	1.29348	1.06164	0.40587	False
188545A	0.73734	0.98760	0.36087	False
188546A	0.96740	0.81468	0.03048	False
188657A	1.46912	1.31201	-0.02842	False
188658A	2.01556	1.81387	0.12330	False
188659A	0.99827	0.89321	-0.23311	False
189596A	1.14359	0.45501	2.90788	False
189597A	2.04057	2.48108	1.60761	False
300016A	1.81374	1.20915	2.34186	False
586027	1.21923	1.24695	-0.76672	False
586029	0.86575	0.81260	-0.49282	False
586031	0.55155	0.53837	-0.65781	False
586051	1.16706	1.27479	-0.34136	False
586069	1.70593	1.62086	-0.45819	False
586106	0.69462	0.60666	-0.27580	False
586108	1.04145	1.02061	-0.69703	False
586110	2.10852	1.96849	-0.22646	False
586218	0.38186	0.34244	-0.48752	False
586649	0.92688	0.92637	-0.78841	False
586655	1.35058	1.19566	-0.02075	False
586659	-0.30706	0.12323	1.16516	False
586701	0.95137	0.87926	-0.40410	False
586709	0.89345	0.91975	-0.82813	False
586711	1.36347	1.35280	-0.80528	False
592069	-0.07900	-0.07120	-0.66766	False
592071	-0.59955	-0.53682	-0.87666	False
592073	1.57507	1.53338	-0.67191	False
593424	1.24380	1.22835	-0.75962	False

Table 2.4.1 (continued)
b/b Analysis
Science Grade 11

Item Id	Old b	New b	Std Dist	Flag
593426	0.61204	0.54548	-0.37826	False
603684	0.27402	0.39590	-0.41183	False
639009	1.58752	1.91408	0.91487	False
639014	1.15798	1.38279	0.29217	False
639018	1.77353	1.90497	-0.11278	False
701400	0.94326	1.32035	1.08273	False
701417	1.16505	1.18238	-0.83201	False
701425	1.40757	1.42609	-0.78557	False
701601	1.76695	1.68755	-0.49901	False
701612	0.36783	0.16372	0.40806	False
701624	1.82208	1.71877	-0.37841	False
701635	-0.47180	-0.41758	-0.85468	False
701641	0.30779	0.34748	-0.85205	False
701654	0.06171	0.16234	-0.56209	False
754205	1.41901	1.43466	-0.79926	False
754209	0.87850	0.83304	-0.53663	False
754213	1.67784	1.74554	-0.47427	False
786847	1.11690	1.09335	-0.69477	False
786849	1.53477	1.46248	-0.49929	False
786851	1.42131	1.16163	0.53579	False

Table 2.4.2
b/b Analysis
History Grade 11

Item Id	Old b	New b	Std Dist	Flag
140941A	1.85876	1.94009	-0.62152	False
141113A	0.80447	0.94738	-0.24273	False
143252A	-0.55960	-0.45308	-0.27649	False
143254A	0.76419	1.03674	0.34625	False
143278A	0.03347	0.26106	0.21322	False
143286A	0.60266	0.72308	-0.32493	False
143291A	-0.00232	0.17946	0.00988	False
143295A	0.34133	-0.70384	4.24385	True
143307A	1.00816	1.03489	-0.53032	False
143326A	1.51277	1.30320	0.58447	False
143333A	0.64823	0.57053	-0.09341	False
143337A	-0.89581	-0.82474	-0.40433	False
143340A	-1.41970	-1.24496	0.11369	False
143361A	0.82210	0.86555	-0.62359	False
143364A	0.37932	0.47744	-0.40422	False
143365A	0.54502	0.55391	-0.49411	False
143371A	0.00173	0.07009	-0.50242	False
143377A	-0.65093	0.24285	3.28550	True
143416A	-0.20500	-0.34158	0.09072	False
143447A	0.18314	0.24008	-0.57132	False
648566	0.81435	0.84668	-0.57414	False
648568	0.63085	0.67990	-0.64975	False
648570	-0.17990	-0.33066	0.15712	False
648572	-0.08898	-0.03669	-0.56627	False
648621	0.55284	0.47804	-0.11563	False
648623	0.57933	0.34623	0.60138	False
648625	1.52874	2.38570	2.91081	False
648627	0.82300	0.67663	0.23324	False
652304	-0.66788	-0.67509	-0.53746	False
652307	0.38803	0.43169	-0.65085	False
652328	-1.01511	-0.86559	-0.03884	False
658018	0.67847	0.64706	-0.29945	False
658020	1.19529	1.22338	-0.51856	False
658029	1.51352	1.55618	-0.55388	False
658051	0.61512	0.57268	-0.25573	False
658053	-0.11536	-0.10052	-0.58413	False
658058	1.13346	1.12613	-0.36461	False
658060	-0.68707	-0.58107	-0.26664	False
658074	1.50471	1.50414	-0.35961	False
658076	0.57057	0.54527	-0.33735	False
658078	0.42652	0.61340	-0.00812	False
658082	0.49974	0.43185	-0.15190	False
700082	-0.96687	-0.93293	-0.56512	False
700300	0.78220	0.82787	-0.63742	False
700377	-0.62480	-0.48662	-0.12736	False
755321	1.20628	1.01734	0.46204	False

Section 2.5

Final Item Parameters

Table 2.5.1

IRT Parameters for Dichotomous Items

Science Grade 11

	Parameters and Measures of Standard Error					
Item ID	a	SE(a)	b	SE(b)	c	SE(c)
186972A	0.69154	0.02104	1.31839	0.02056	0.14620	0.00631
186989A	1.10905	0.02218	0.48907	0.01400	0.22629	0.00551
186992A	0.69361	0.01004	-0.34027	0.01911	0.02008	0.00762
187933A	1.03084	0.01534	-0.66864	0.01787	0.06496	0.00983
187935A	0.71031	0.01131	-0.26587	0.02145	0.02895	0.00892
187938A	0.56196	0.01254	-0.48620	0.04791	0.06563	0.01792
187996A	1.65641	0.03096	0.09380	0.01132	0.32506	0.00526
187999A	0.97793	0.02370	1.04123	0.01450	0.19884	0.00472
188008A	0.79574	0.02716	1.12251	0.02341	0.33500	0.00655
188454A	0.68777	0.03009	1.36460	0.03021	0.37430	0.00741
188458A	0.36875	0.02534	1.86063	0.06313	0.18902	0.01768
188459A	0.89074	0.02151	0.85158	0.01668	0.20480	0.00580
188544A	1.27466	0.02838	1.08522	0.01118	0.19725	0.00354
188545A	0.80891	0.02413	1.01008	0.02101	0.27402	0.00651
188546A	1.26548	0.02609	0.83460	0.01117	0.21097	0.00403
188657A	0.84727	0.03068	1.33929	0.02213	0.34206	0.00558
188658A	1.06073	0.04547	1.84858	0.02462	0.32431	0.00372
188659A	0.46098	0.01822	0.91429	0.04936	0.13047	0.01497
189596A	0.59662	0.01703	0.46961	0.03556	0.15227	0.01199
189597A	0.31045	0.02167	2.52566	0.06456	0.07034	0.01669
300016A	0.32366	0.01765	1.23491	0.09006	0.08650	0.02269
586027	0.90477	0.02390	1.27327	0.01567	0.17140	0.00454
586029	1.24478	0.02563	0.83249	0.01128	0.20676	0.00407
586031	1.26677	0.02446	0.55420	0.01175	0.22678	0.00468
586051	1.21687	0.03589	1.30152	0.01475	0.31372	0.00384
586069	1.28282	0.04633	1.65271	0.01761	0.31637	0.00333
586106	0.97013	0.02101	0.62350	0.01572	0.20944	0.00586
586108	0.94532	0.02330	1.04358	0.01505	0.19802	0.00491
586110	1.24351	0.05565	2.00549	0.02499	0.28595	0.00306
586218	1.56852	0.02869	0.35537	0.01026	0.26347	0.00453
586649	1.26356	0.02796	0.94794	0.01162	0.23069	0.00394
586655	0.72501	0.02179	1.22122	0.02039	0.17879	0.00639
586701	1.02597	0.02468	0.90014	0.01487	0.24573	0.00500

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
586709	2.03139	0.03946	0.94123	0.00730	0.18182	0.00271
586711	1.39450	0.03827	1.38068	0.01259	0.25105	0.00320
592069	1.07086	0.01441	-0.06439	0.01091	0.03437	0.00498
592071	0.98479	0.01532	-0.53690	0.01881	0.07928	0.00982
592073	0.98805	0.02832	1.56394	0.01666	0.16306	0.00362
593424	1.80036	0.04934	1.25439	0.01069	0.31862	0.00306

Table 2.5.1 (continued)
IRT Parameters for Dichotomous Items
Science Grade 11

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
593426	1.41623	0.02712	0.56142	0.01070	0.24329	0.00432
603684	0.58861	0.01340	0.40962	0.02731	0.04840	0.00991
639009	1.85584	0.07870	1.95027	0.01693	0.25231	0.00243
639014	1.73821	0.04546	1.41112	0.01039	0.21544	0.00267
639018	2.34790	0.10258	1.94103	0.01407	0.24260	0.00225
701417	1.47863	0.03313	1.20774	0.01008	0.18281	0.00296
701425	1.49155	0.04151	1.45506	0.01226	0.23498	0.00295
701601	1.10991	0.03345	1.72039	0.01731	0.15956	0.00303
701612	1.15038	0.01763	0.17401	0.01120	0.09633	0.00511
701624	1.63897	0.05147	1.75207	0.01374	0.18029	0.00238
701635	0.37051	0.00613	-0.41590	0.01660	0.00000	0.00000
701641	0.60740	0.01684	0.36049	0.03641	0.15687	0.01238
701654	0.96903	0.02275	0.17261	0.02315	0.34767	0.00814
754205	1.20549	0.03755	1.46376	0.01556	0.28744	0.00361
754209	0.87618	0.02432	0.85323	0.02005	0.29745	0.00637
754213	0.53229	0.02714	1.77924	0.03652	0.23738	0.00925
786847	1.40536	0.03905	1.11739	0.01321	0.36437	0.00377
786849	1.18688	0.03868	1.49199	0.01641	0.30518	0.00367
786851	0.39914	0.01413	1.18669	0.04254	0.04181	0.01268

Table 2.5.2
IRT Parameters for Polytomous Items
Science Grade 11

Item ID	Parameters and Measures of Standard Error									
	a	SE(a)	b	SE(b)	d0	SE(d0)	d1	SE(d1)	d2	SE(d2)
586659	0.89029	0.00587	0.13292	0.00628	0.61420	0.00748	-0.61420	0.00772	0.00000	0.00000
701400	0.77068	0.00586	1.34775	0.00916	0.67014	0.00852	-0.67014	0.01203	0.00000	0.00000

Table 2.5.3

IRT Parameters for Dichotomous Items

History Grade 11

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
140941A	1.22299	0.04695	1.95062	0.02290	0.20376	0.00283
141113A	1.14700	0.02668	0.94006	0.01278	0.23221	0.00429
143252A	1.16025	0.01854	-0.48559	0.01617	0.15400	0.00852
143254A	0.53303	0.01915	1.03102	0.03370	0.15631	0.01080
143278A	1.30964	0.02474	0.24139	0.01272	0.26932	0.00547
143286A	1.15775	0.02439	0.71172	0.01244	0.22291	0.00464
143291A	0.67277	0.01768	0.15833	0.03444	0.21570	0.01175
143295A	0.31944	0.00598	-0.74086	0.02148	0.00000	0.00000
143307A	0.38527	0.01388	1.02914	0.04790	0.04562	0.01387
143326A	0.93778	0.02552	1.30228	0.01587	0.18296	0.00432
143333A	0.39211	0.01324	0.55643	0.05848	0.05350	0.01651
143337A	1.12781	0.01641	-0.86394	0.01680	0.06952	0.00969
143340A	0.31801	0.00614	-1.29171	0.02841	0.00000	0.00000
143361A	0.94602	0.02127	0.85676	0.01425	0.17175	0.00504
143364A	0.77340	0.02163	0.46167	0.02750	0.31201	0.00876
143365A	1.15955	0.02036	0.53951	0.01074	0.13482	0.00438
143371A	0.79621	0.01446	0.04699	0.01928	0.07883	0.00807
143377A	0.72984	0.02047	0.22286	0.03383	0.31539	0.01065
143416A	0.74699	0.01482	-0.37209	0.02980	0.11839	0.01252
143447A	0.87549	0.02006	0.22004	0.02263	0.26663	0.00830
648566	1.55888	0.03593	0.83755	0.01073	0.31472	0.00378
648568	1.53164	0.02929	0.66777	0.00932	0.21972	0.00375
648570	0.38657	0.00862	-0.36097	0.05173	0.03285	0.01426
648572	0.34731	0.00602	-0.06171	0.01639	0.00000	0.00000
648621	1.09020	0.02069	0.46228	0.01292	0.18108	0.00527
648623	1.57784	0.02715	0.32810	0.00929	0.21653	0.00429
648625	0.27287	0.03599	2.40425	0.14656	0.36087	0.02800
648627	1.34598	0.02520	0.66444	0.00996	0.18496	0.00394
652304	0.62488	0.01444	-0.71159	0.05071	0.12388	0.01981
652307	1.43164	0.02531	0.41509	0.00996	0.20676	0.00436
652328	0.33060	0.00606	-0.90552	0.02249	0.00000	0.00000
658018	1.46339	0.02746	0.63434	0.00955	0.20749	0.00387
658020	0.89157	0.02572	1.22102	0.01734	0.22722	0.00500

Item ID	Parameters and Measures of Standard Error					
	a	SE(a)	b	SE(b)	c	SE(c)
658029	0.85564	0.02585	1.55981	0.01919	0.15395	0.00421
658051	1.12973	0.02365	0.55862	0.01360	0.24561	0.00522
658053	1.48633	0.02468	-0.12669	0.01153	0.23305	0.00592
658058	1.27890	0.03509	1.12202	0.01359	0.31829	0.00392
658060	0.52385	0.01342	-0.61588	0.06267	0.09316	0.02184
658074	0.87047	0.02473	1.50683	0.01784	0.13755	0.00405
658076	1.42487	0.02697	0.53072	0.01031	0.23338	0.00427
658078	1.24997	0.02307	0.60007	0.01058	0.17388	0.00425
658082	1.31928	0.02223	0.41526	0.00992	0.15685	0.00431
700021	1.80998	0.03565	0.51237	0.00911	0.29737	0.00391
700082	1.39275	0.02461	-0.97407	0.01911	0.24201	0.01167
700300	1.18387	0.02873	0.81840	0.01383	0.30629	0.00466
700377	1.05944	0.02258	-0.51973	0.02677	0.36506	0.01099
700443	1.46765	0.02556	0.23761	0.01045	0.22979	0.00482
700979	1.39351	0.02252	-0.00575	0.01109	0.19090	0.00550
755321	1.16944	0.02764	1.01128	0.01257	0.22793	0.00408
755336	0.94603	0.02541	1.25795	0.01560	0.18917	0.00439

Section 2.6

Decision Accuracy and Consistency (DAC)

Table 2.6.1
DAC Results
Science Grade 11

N	Reliability	Kappa		Accuracy	Consistency	F Pos	F Neg
46302	0.92	0.64	Overall	0.84	0.78	0.09	0.06
			Cut 1	0.92	0.89	0.05	0.03
			Cut 2	0.95	0.92	0.03	0.02
			Cut 3	0.98	0.97	0.01	0.01
			Cut 4	1.00	1.00	0.00	0.00
			Perf 1	0.92	0.90		
			Perf 2	0.69	0.57		
			Perf 3	0.77	0.67		
			Perf 4	0.85	0.75		

Table 2.6.2
DAC Results
History Grade 11

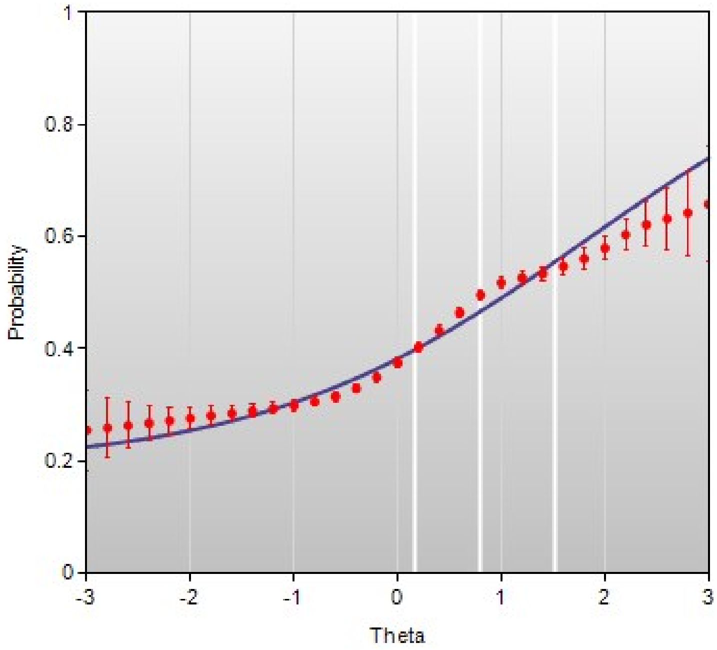
N	Reliability	Kappa		Accuracy	Consistency	F Pos	F Neg
46355	0.90	0.61	Overall	0.81	0.74	0.12	0.10
			Cut 1	0.91	0.87	0.05	0.04
			Cut 2	0.92	0.89	0.04	0.03
			Cut 3	0.96	0.95	0.02	0.02
			Cut 4	1.00	1.00	0.00	0.00
			Perf 1	0.88	0.84		
			Perf 2	0.49	0.37		
			Perf 3	0.85	0.77		
			Perf 4	0.81	0.72		

Section 2.7

Fit Plots of Watchlist Items

Initial Calibration

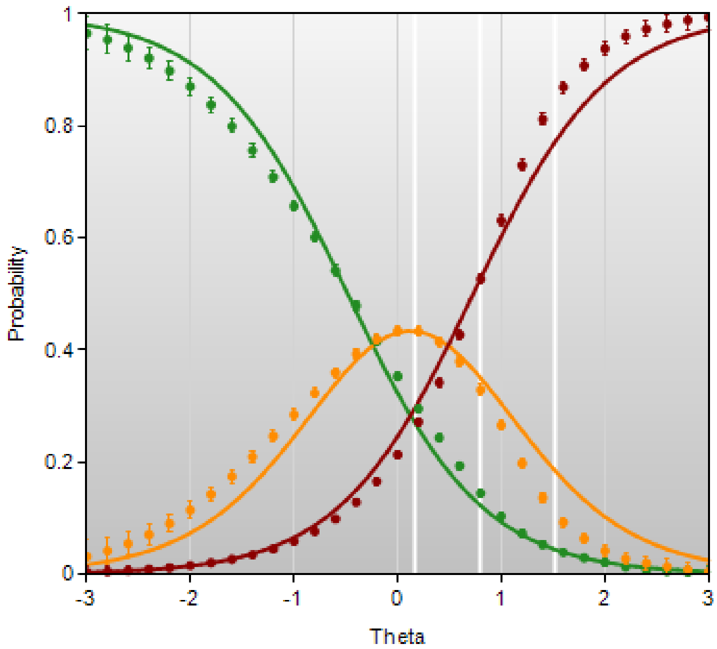
Science Grade 11: 188458A



Beta Chart

Initial Calibration

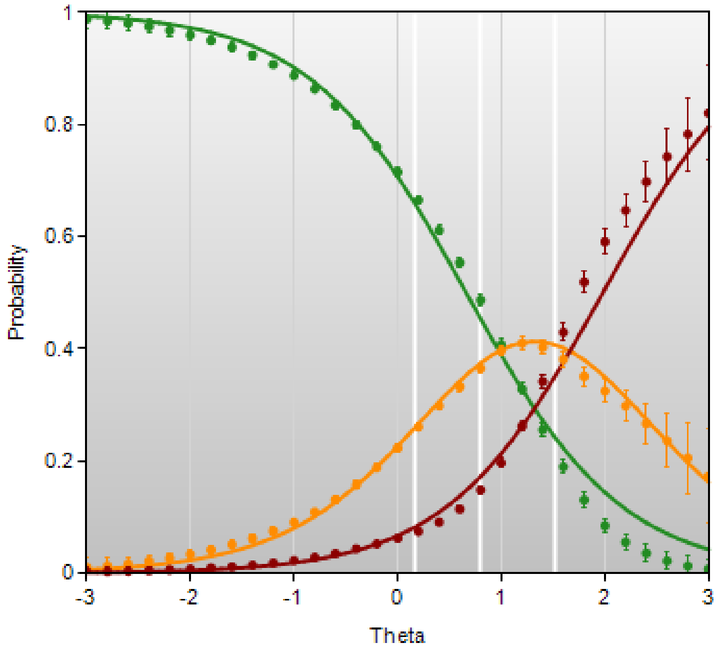
Science Grade 11: 586659



Beta Chart

Initial Calibration

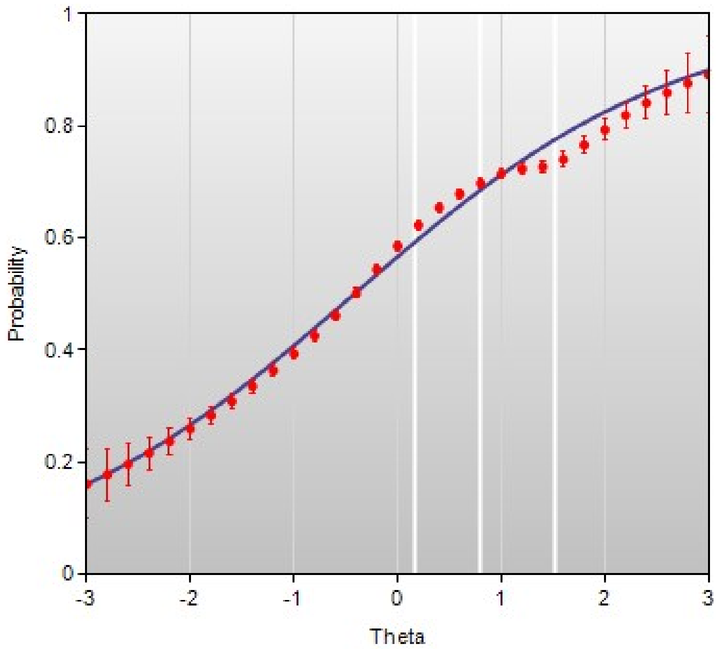
Science Grade 11: 701400



Beta Chart

Initial Calibration

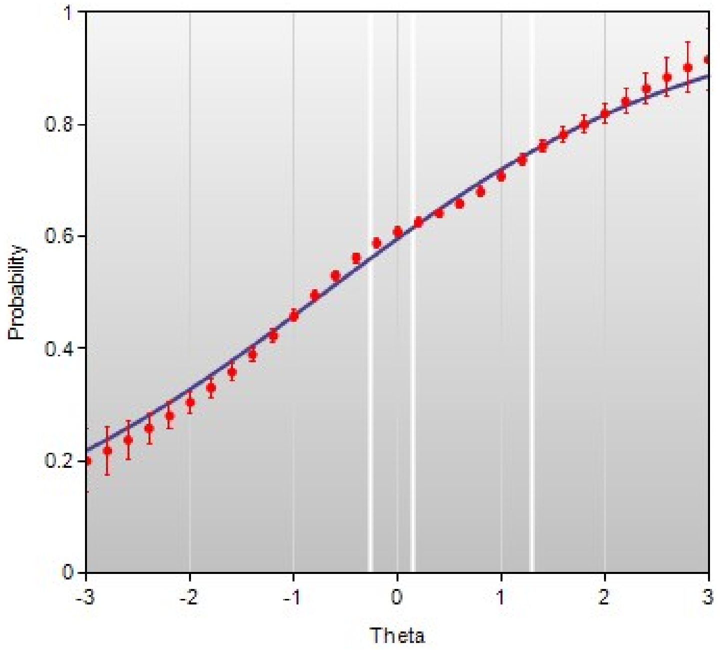
Science Grade 11: 701635



Beta Chart

Initial Calibration

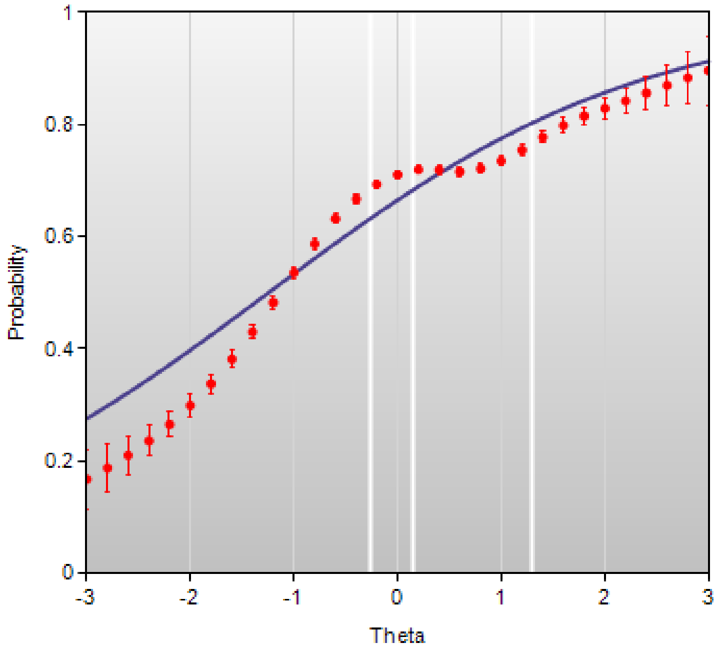
History Grade 11: 143295A



Beta Chart

Initial Calibration

History Grade 11: 143340A



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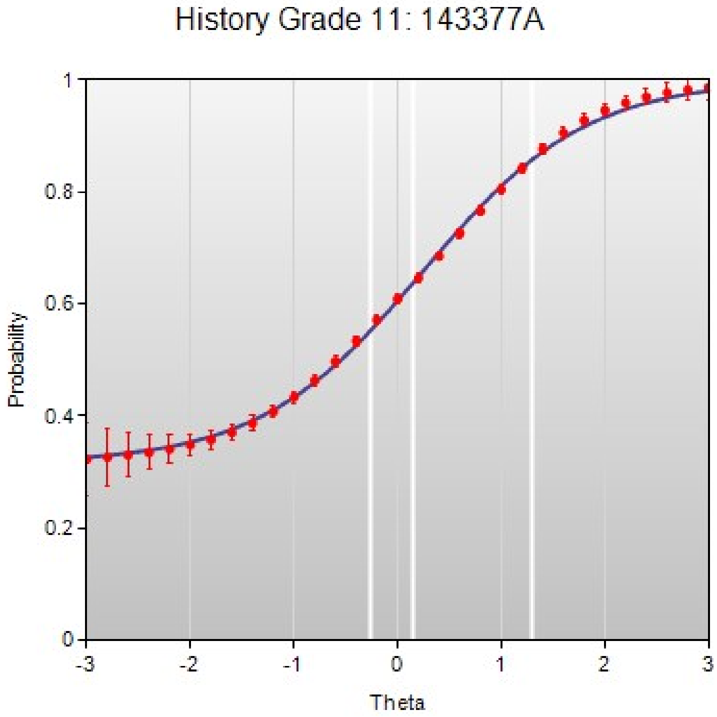
Initial Calibration



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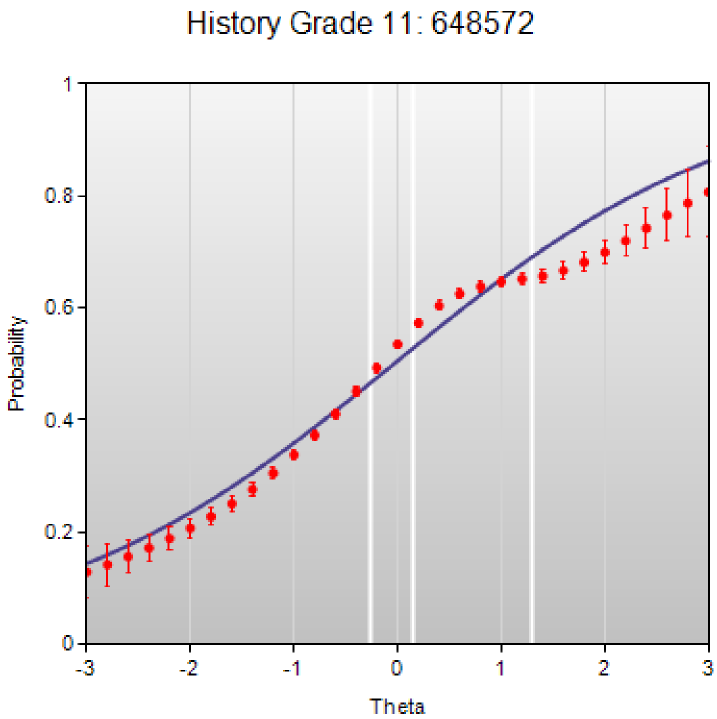
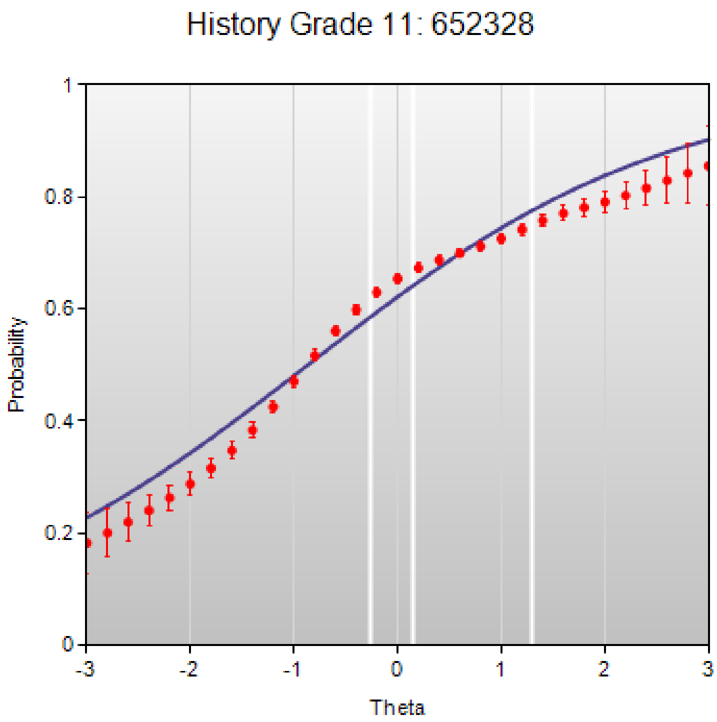
Initial Calibration



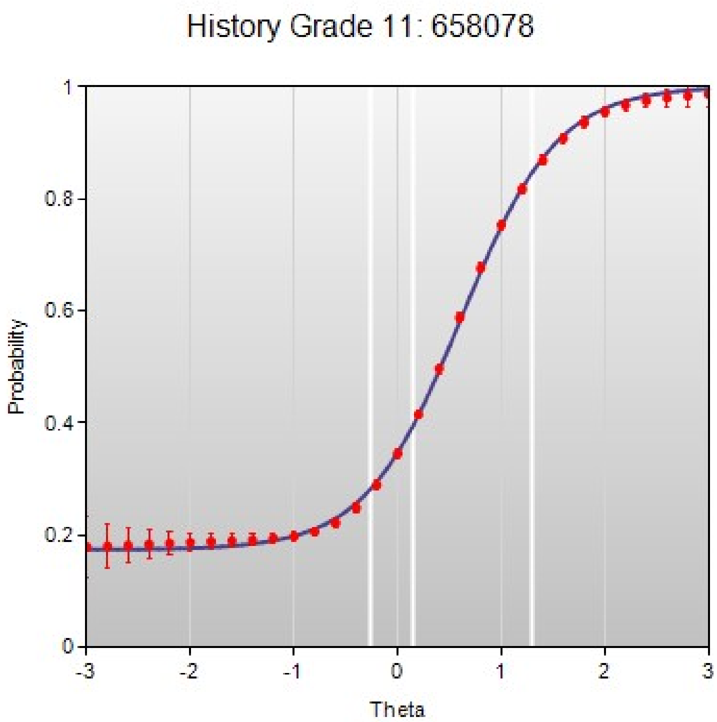
Beta Chart

Initial Calibration



Beta Chart

Initial Calibration



Beta Chart