# Oklahoma Modified Alternate Assessment Program 

## Grades 3-8 Assessments 2013 Technical Report

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Education

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## Introduction

The Oklahoma School Testing Program (OSTP) is a statewide assessment program that was established to improve academic achievement for all Oklahoma students. It also meets the requirements of the No Child Left Behind Act (NCLB) introduced by the federal government in 2001. The OSTP includes grades 3-8 and high school End-of-Instruction (EOI) assessments, for which students who complete an area of instruction must also take the corresponding statewide standardized assessment.

The OSTP developed three types of tests to assess the three groups of students defined by NCLB: the Oklahoma Core Curriculum Tests (OCCT) for the general student population, the Oklahoma Modified Alternate Assessment Program (OMAAP) for students instructed on grade level but whose IEP designated the OMAAP as the appropriate assessment, and the Oklahoma Alternate Assessment Program (OAAP) for students with the most significant cognitive disabilities. All three tests cover students in grades 3-8 and high school.

The Oklahoma College, Career, and Citizen Ready Standards (OK C ${ }^{3}$ ) academic content standards are the foundation for all three tests. The Curriculum Access Resource Guides (CARG) describe access points to the $O K C^{3}$ through scaffolding of skills. An alternate guide, the CARGA, provides guidance for instruction and assessment of Oklahoma students with the most significant cognitive disabilities.

The Oklahoma Modified Alternate Assessment Program (OMAAP) Grades $3-8$ tests are used to assess student proficiency in Reading, Mathematics, and Science (grades 5 and 8). The OMAAP is intended for a population of students for whom the general OCCT exams and the Oklahoma Alternate Assessment Program (OAAP) portfolio assessments are inappropriate. The OMAAP Grades 3-8 tests are based on modified blueprints and items from the corresponding OCCT Grades 3-8 tests.

In 2013, CTB/McGraw-Hill was contracted by the Oklahoma State Department of Education (SDE) to develop, administer, and maintain the OMAAP Grades 3-8 administration. This technical report focuses on the technical details of work accomplished for the spring test only.

## Purpose

The purpose of this Technical Report is to provide objective information regarding technical aspects of the OMAAP Grades 3-8 assessments. This volume is intended to be one source of information to Oklahoma K-12 educational stakeholders (including test coordinators, educators, parents, and other interested citizens) about the development, implementation, scoring, and technical attributes of the OMAAP Grades 3-8 assessments. Other sources of information regarding the OMAAP Grades 3-8 tests include the administration manuals, interpretation manuals, student, teacher, and parent guides, implementation materials, and training materials.

The information provided here fulfills legal, professional, and scientific guidelines (AERA, APA, \& NCME, 1999) for technical reports of large-scale educational assessments and is intended for use by qualified users within schools who use the OMAAP assessments and
interpret the results. Specifically, information was selected for inclusion in this report based on NCLB requirements and the following Standards for Educational and Psychological Testing:

- Standards 6.1-6.15 Supporting Documentation for Tests
- Standards 10.1-10.12 Testing Individuals with Disabilities
- Standards13.1-13.19 Educational Testing and Assessment

This technical report documents the OMAAP Grades 3-8 test development methods, data analysis, and results for use by qualified users and technical experts. Section 1 provides an overview of the test design, test content, and content standards. Section 2 provides summary information about the test administration. Section 3 details the classical item analyses and reliability results, and Section 4 details the calibration, equating, scaling analyses, and results. Section 5 provides the results of the classification accuracy and classifications studies. Section 6 provides higher-level summaries of all the tests included in the OMAAP Grades 3-8 testing program.

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## Acronyms and Abbreviations

2PPC Two Parameter Partial Credit model
3PL Three Parameter Logistic model
ACE Achieving Classroom Excellence
AERA American Educational Research Association
APA American Psychological Association
AYP Adequate Yearly Progress
BR Braille
BTC Building Test Coordinator
$\underline{C}^{3}$ Oklahoma's Core curriculum, the College, Career and Citizen Ready
CCSSO Council of Chief State School Officers
CE Critical Element
CR Constructed-Response
CSEM Conditional Standard Error of Measurement
DIF Differential Item Functioning
DOK Depth of Knowledge
DTC District Test Coordinator
ELL English Language Learners
EOI End-of-Instruction
EQ Equivalent
FN False Negative
FP False Positive
GR Gridded-Response
GRT General Research Tape
HOSS Highest Obtainable Scale Score
ICC Item Characteristic Curve
IEP Individualized Education Program
IRT Item Response Theory
LIU Language in Use
LOSS Lowest Obtainable Scale Score
MC Multiple-Choice

MH Mantel-Haenszel
NCES National Center for Education
Statistics
NCLB No Child Left Behind
NCME National Council on Measurement in Education
NGA National Governors Association Center
OAAP Oklahoma Alternate Assessment
Program
OAC Oklahoma Administrative Code
OCCT Oklahoma Core Curriculum Test
OE Open-Ended
OMAAP Oklahoma Modified Alternate
Assessment Program
$\underline{O K C^{3}}$ Oklahoma College, Career, and
Citizen Ready Standards
OP Operational
OSTP Oklahoma School Testing Program
PASS Priority Academic Student Skills
RT Retest
SAS Statistical Analysis System
SD Standard Deviation
SDE Oklahoma State department of Education
SEM Standard Error of Measurement
SS Scale Score
TA Test Administrator
TCC Test Characteristic Curve
TP Test Proctor
TPM Test Preparation Manual
US DOE United States Department of Education
WP Writing Prompt

## Section 1

# Overview of the Oklahoma Modified Alternate Assessment Program (OMAAP) 

## Grades 3-8 Assessments

### 1.1 Overview of the OMAAP Grades 3-8 Assessments

The Oklahoma Modified Alternate Assessment Program for grades 3-8 evaluates student proficiency in Mathematics, Reading, and Science, and meets the state requirements for mandated, criterion-referenced tests. The OMAAP is specifically designed for students who would not benefit from taking the Oklahoma Alternate Assessment Program (OAAP) and/or the Oklahoma Core Curriculum Tests (OCCT).

The OMAAP Grades 3-8 tests assess student proficiency according to the Oklahoma College, Career, and Citizen Ready Standards ( $O K C^{3}$ ), which are designed to ensure that students receive current and relevant learning experiences in order to become college, career, and citizenship ready. Certain subject exams are administered in specific grades. Mathematics and Reading OMAAP exams are administered in grades $3-8$; however, the Science OMAAP exam is administered only in grades 5 and 8. The Oklahoma State Department of Education (SDE) and CTB/McGraw-Hill collaborated in the development and administration of the Spring 2013 OMAAP assessments. Scoring, equating, and scaling were performed by CTB/McGraw-Hill.

OMAAP Grades 3-8 are exclusively multiple-choice tests. In Spring 2013, each subject and grade had one operational form, which was also used as the base for the Braille test forms. Equivalent forms for each subject were selected from prior administrations’ operational forms. The State Department of Education Office of Accountability and Assessments determined situations when an equivalent form was deemed appropriate, such as a student's illness during test administration or a security breach.

### 1.2 Content Standards

The OMAAP Grades 3-8 assessments were designed to measure the $O K C^{3}$ standards. Table 1.1 outlines the $O K C^{3}$ content standards by subject. Appendix A outlines the objectives of each content and/or process standard. The SDE’s Curriculum Access Resource Guides (CARG) offers assistance to teachers by illustrating various methods of incorporating $O K C^{3}$ into classroom instruction through the appropriate development of skills.

### 1.3 Blueprint

The OMAAP blueprints have fewer items than the OCCT, but maintain similar proportions across standards. Guidelines dictate that in order for a standard to serve as a reporting category, it must have at least five items. The OMAAP adheres to this guideline, and test blueprints underwent thorough scrutiny before approval. First, committees of teachers and administrators proposed test blueprints for OMAAP. After the committees reviewed the $O K C^{3}$ content standards and the OCCT blueprints, they determined which proposed OMAAP Grades 3-8
blueprints were appropriate for the OMAAP student population. Final review of proposed test blueprints was conducted by the SDE before being submitted to the School Board of Education for approval.

OMAAP forms have 86-96\% of operational items as the OCCT exams. Also, there are fewer or no field-test items in OMAAP tests. Table 1.2 shows a comparison of item counts across the Spring 2013 OCCT and the OMAAP forms.

Table 1.1. Oklahoma $O K C^{3}$ Content Standards by Subject

|  | Mathematics |
| :--- | :--- |
| Standard 1. | Algebraic Reasoning: Patterns and Relationships |
| Standard 2. | Number Sense and Operation |
| Standard 3. | Geometry |
| Standard 4. | Measurement |
| Standard 5. | Data Analysis |
| Reading |  |
| Grade 3 |  |
| Standard 2. | Vocabulary |
| Standard 4. | Comprehension/Critical Literacy |
| Standard 5. | Literature |
| Standard 6. | Research and Information |
| Grades 4-8 |  |
| Standard 1. | Vocabulary |
| Standard 3. | Comprehension/Critical Literacy |
| Standard 4. | Literature |
| Standard 5. | Research and Information |
| $\quad$ Science |  |
| Process Standards: Grades 5 and 8 |  |
| Standard 1. | Observe and Measure |
| Standard 2. | Classify |
| Standard 3. | Experiment |
| Standard 4. | Interpret and Communicate |
| Content Standards: Grade 5 |  |
| Standard 1. | Properties of Matter and Energy |
| Standard 2. | Organisms and Environments |
| Standard 3. | Structures of the Earth and the Solar System |
| Content Standards: Grade 8 |  |
| Standard 1. | Properties and Chemical Changes in Matter |
| Standard 2. | Motion and Forces |
| Standard 3. | Diversity and Adaptations of Organisms |
| Standard 4. | Structures/Forces of the Earth/Solar System |
| Standard 5. | Earth’s History |

Table 1.2. OCCT and OMAAP Grades 3-8 Item Count Comparison

|  | OCCT Items |  | OMAAP Items |  |
| :--- | :---: | :---: | :---: | :---: |
| Subject | OP | FT | OP | FT |
| Mathematics | 50 | 10 | 43 | 0 |
| Reading | 50 | 10 | 43 | 0 |
| Science | 45 | 10 | 43 | 7 |

*OP=Operational, $\mathrm{FT}=$ Field test.

### 1.4 Universal Design and Modifications

OMAAP item and test formats follow the Universal Design guidelines, ensuring tests are appropriate for students with various needs. Subject specific modifications have also been applied to increase test suitability. Table 1.3 lists the Universal Design and subject specific modifications.

Table 1.3. OMAAP Item Modification Rules

## Universal Design

Minimize the number of questions on the page (limit to 2 )
Use a larger font size
Provide only three answer options instead of four
Highlight the main points in the question or passage by underlining and using boldface Allow for the same accommodations as in the standard assessment
Avoid questions that require students to select the better/best answer
Eliminate answer choices that give students the option of making "no change" to the item

## Mathematics

Allow for read-aloud and calculators
For lower grades, display numbers on all sides of figures for questions about perimeter Unless required by standard, avoid items with negative and positive answer choices that use the same number (e.g., -4 and +4 )
Place any items with coordinate grids on one page
Be consistent with qualifiers in the stem and answer choices (e.g., use ml throughout or milliliters throughout)
Avoid questions that use best or closest
Avoid complicated art

## Reading

Display passages in a one-column format
Break passages into smaller portions, and place the questions that pertain to the smaller portion Science
Reduce the amount of reading
Avoid complicated art
Simplify tables and charts by removing irrelevant rows or columns
Box formulas to make them stand out

### 1.5 Test Development and Content Validity

Development of a test relies upon test specifications to guide the construction process. Content validity is determined by specifications in content standards and test blueprints. Content standards address the knowledge and skills that are to be measured through the test, and test blueprints outline the number of items and item types to be included in each content area. The degree of content validity of a test is based on how closely it adheres to the specifications set forth. The closer the test is to meeting all specifications, the higher degree of content validity. This section describes the measures taken during the test construction process to ensure high content validity.

## 1.5.a. Item Development and Selection

The OMAAP test design requires items to be pulled from two sources: anchor items selected from previously-used OMAAP items and non-anchor items selected from previously-used OCCT Grades 3-8 items. The previously-used OMAAP items have been modified from OCCT items when they were first used on the OMAAP. Since anchor items are selected from previously-used OMAAP items, they can be used directly on the new test form. The non-anchor items are modified following the Universal Design guidelines.

Teacher committees identified the cognitive level each item measured through the Norman Webb's depth of knowledge (DOK) framework of each OCCT item. The OCCT items were then simplified through modification techniques that did not alter the content standards or cognitive level. Item review committees then examined the modified items for alignment to the $O K C^{3}$ and item appropriateness. The OMAAP item pool consists of only those items which passed the review.

Though newly modified OCCT items are eligible for inclusion in the operational form, they do not have a statistical history for their modified format. Item statistical quality is evaluated after the test is administered. This allows for occasional items with poor psychometric properties to be removed from scoring. Item quality control during test construction is facilitated by a plan of field testing items. Since Spring 2011, field-test items were included in the OMAAP Grades 3-8 tests. Field-test items serve to fill the gap between content standards and item banks. However, field-test items are limited to five or eight items per the one subject test form in each administration; this is reasonable for the OMAAP population size. Field testing gradually improves the OMAAP test construction process and test quality since these items have known psychometric properties, in contrast to the newly modified OCCT items which lack OMAAP population-based statistics.

CTB/McGraw-Hill used an embedded field-test design to incorporate newly developed field-test items into the tests. This method improves the likelihood that test-takers would treat every item as a scored item. Before a field-tested item is eligible for operational use, it is approved by the item review committee and data review committee.

Additional measures were taken in the test construction process. Test blueprints and Universal Design were applied in addition to five test construction guidelines focused on aligning the test with the $O K C^{3}$ standards and objectives. (See Table 1.4).

Table 1.4. Criteria for Aligning the Test with the $O K C^{3}$ Standards and Objectives

| Type | Guidelines |
| :---: | :--- |
| 1. Categorical Concurrence | The test is constructed so that there are at least six items <br> measuring each $O K C^{3}$ standard. The number of items is <br> based on estimating the number of items that could <br> produce a reasonably reliable estimate of a student's <br> mastery of the content measured. |
| 2. Depth of Knowledge <br> Consistency | The test is constructed using items from a variety of Depth <br> of Knowledge levels that are consistent with the processes <br> students need in order to demonstrate proficiency for each <br> OK $C^{3}$ objective. |
| 3. Range of Knowledge | The test is constructed so that at least 75\% of the <br> objectives for an $O K C^{3}$ standard have at least one <br> corresponding assessment item. |
| 4. Balance of Representation | The test is constructed according to the Test Blueprint <br> which reflects the degree of representation given on the <br> test to each OK $C^{3}$ standard and/or objective in terms of the <br> percent of total test items measuring each standard and the <br> number of test items measuring each standard and/or <br> objective. The test construction shall yield a balance of <br> representation with an index of 0.7 or higher of assessed <br> objectives related to a standard. |
| 5. Source of Challenge | Each test item is constructed in such a way that the major <br> cognitive demand comes directly from the targeted $O K C^{3}$ <br> objective or concept being assessed, not from specialized <br> knowledge or cultural background that the test-taker may <br> bring to the testing situation. |

## 1.5.b. Configuration of the Tests

The number of operational and field-test items for the Spring 2013 OMAAP Grades 3-8 assessment is presented in Table 1.2. Unlike the Spring 2012 test, the Spring 2013 tests for Mathematics and Reading are comprised of only operational items. No field-test items appear on the tests. The Science test is comprised of operational items and a set of field-test items. The field-test items are embedded in the operational test to attain reliable item statistics for future use.

In test assemblage, content experts followed two specifications: the test blueprint and DOK targets. Tables 1.5.a-1.5.b provide the targets and empirical percentages of items at each DOK level. Tables 1.6.a-1.6.h shows the targets and empirical item counts of test blueprints of the OMAAP tests. Due to item bank limitations, some targets were short of the blueprint requirement.. This limitation is more noticeable in Reading tests that have passage-related
items.The Spring 2013 tests were constructed to have the maximum items possible-43 items for each subject and grade. After evaluating the item statistics, certain items were dropped from score reporting based on SDE's decision.

Table 1.5.a. Percentage of Items by DOK Level in Operational/Braille Forms

|  | DOK Level | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ |
| :---: | :---: | :---: | :---: | :---: |
| Subject | Target DOK | $\mathbf{2 0 - 2 5}$ | $\mathbf{6 0 - 6 5}$ | $\mathbf{1 0 - 1 5}$ |
|  | Grade |  |  |  |
| Math | $\mathbf{3}$ | 28 | 65 | 7 |
|  | $\mathbf{4}$ | 26 | 67 | 7 |
|  | $\mathbf{5}$ | 33 | 58 | 9 |
|  | $\mathbf{6}$ | 22 | 66 | 12 |
|  | $\mathbf{7}$ | 19 | 72 | 9 |
|  | $\mathbf{8}$ | 30 | 65 | 5 |
| Reading | $\mathbf{3}$ | 21 | 70 | 9 |
|  | $\mathbf{4}$ | 14 | 72 | 14 |
|  | $\mathbf{5}$ | 9 | 82 | 9 |
|  | $\mathbf{6}$ | 16 | 65 | 19 |
|  | $\mathbf{7}$ | 9 | 82 | 9 |
| Science | $\mathbf{8}$ | 7 | 79 | 14 |
|  | Target DOK | $\mathbf{2 0 - 2 5}$ | $\mathbf{6 5 - 7 0}$ | $\mathbf{5 - 1 5}$ |
| Science | $\mathbf{5}$ | 23 | 65 | 12 |
|  | Target DOK | $\mathbf{1 0 - 1 5}$ | $\mathbf{6 5 - 7 0}$ | $\mathbf{1 5 - 2 5}$ |

Table 1.5.b. Percentage of Items by DOK Level of Equivalent Forms

|  | DOK Level | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ |
| :---: | :---: | :---: | :---: | :---: |
| Subject | Target DOK | $\mathbf{2 0 - 2 5}$ | $\mathbf{6 0 - 6 5}$ | $\mathbf{1 0 - 1 5}$ |
|  | Grade |  |  |  |
| Math | $\mathbf{3}$ | 47 | 44 | 9 |
|  | $\mathbf{4}$ | 35 | 60 | 5 |
|  | $\mathbf{5}$ | 28 | 67 | 5 |
|  | $\mathbf{6}$ | 28 | 60 | 12 |
|  | $\mathbf{7}$ | 19 | 71 | 10 |
|  | $\mathbf{8}$ | 29 | 61 | 10 |
| Reading | $\mathbf{3}$ | 23 | 65 | 12 |
|  | $\mathbf{4}$ | 19 | 74 | 7 |
|  | $\mathbf{5}$ | 7 | 88 | 5 |
|  | $\mathbf{6}$ | 7 | 73 | 20 |
|  | $\mathbf{7}$ | 7 | 73 | 20 |
| Science | $\mathbf{8}$ | 10 | 83 | 7 |
|  | Target DOK | $\mathbf{2 0 - 2 5}$ | $\mathbf{6 5 - 7 0}$ | $\mathbf{5 - 1 5}$ |
| Science | $\mathbf{5}$ | 22 | 68 | 10 |
|  | Target DOK | $\mathbf{1 0 - 1 5}$ | $\mathbf{6 5 - 7 0}$ | $\mathbf{1 5 - 2 5}$ |
|  | $\mathbf{8}$ | 26 | 72 | 2 |

Table 1.6.a. Mathematics Blueprint (Number of Items by Standard)

|  | Grade |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Standard | 3 | 4 | 5 | 6 | 7 | 8 |
| Standard 1 | $6-7$ | $6-7$ | $10-11$ | $10-11$ | $12-13$ | $13-14$ |
| Standard 2 | $15-16$ | $14-15$ | $12-13$ | $12-13$ | $8-9$ | $8-9$ |
| Standard 3 | $6-7$ | $7-8$ | $6-7$ | $6-7$ | $6-7$ | $7-8$ |
| Standard 4 | $7-8$ | $7-8$ | $6-7$ | $6-7$ | $7-8$ | $6-7$ |
| Standard 5 | $6-7$ | $6-7$ | $6-7$ | $6-7$ | $6-7$ | $6-7$ |
| Total | $40-43$ | $40-43$ | $40-43$ | $40-43$ | $40-43$ | $40-43$ |

Table 1.6.b. Number of Items of Operational/Braille Forms by Content Standard for Mathematics

|  | Grade |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Standard | 3 | 4 | 5 | 6 | 7 | 8 |
| Standard 1 | 7 | 7 | 10 | 11 | 13 | 13 |
| Standard 2 | 15 | 15 | 13 | 13 | 9 | 9 |
| Standard 3 | 6 | 8 | 6 | 6 | 8 | 8 |
| Standard 4 | 8 | 6 | 7 | 4 | 7 | 6 |
| Standard 5 | 7 | 7 | 7 | 7 | 6 | 7 |
| Total | 43 | 43 | 43 | 41 | 43 | 43 |

Table 1.6.c. Number of Items of Equivalent Form by Content Standard for Mathematics

|  | Grade |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Standard | 3 | 4 | 5 | 6 | 7 | 8 |
| Standard 1 | 7 | 7 | 11 | 10 | 11 | 13 |
| Standard 2 | 16 | 13 | 12 | 12 | 9 | 9 |
| Standard 3 | 6 | 7 | 6 | 6 | 7 | 6 |
| Standard 4 | 8 | 7 | 6 | 5 | 8 | 6 |
| Standard 5 | 6 | 6 | 7 | 7 | 7 | 7 |
| Total | 43 | 40 | 42 | 40 | 42 | 41 |

Table 1.6.d. Reading Blueprint (Number of Items by Standard)

|  | Grade |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Standard* | 3 | 4 | 5 | 6 | 7 | 8 |
| Standard (2)1 | $9-11$ | $9-11$ | $9-11$ | $6-7$ | $6-8$ | $6-7$ |
| Standard (4)2 | $18-20$ | $17-19$ | $15-17$ | $15-17$ | $15-17$ | $16-18$ |
| Standard (5)4 | $6-7$ | $6-8$ | $9-11$ | $10-12$ | $9-11$ | $11-13$ |
| Standard (6)5 | $6-7$ | $6-7$ | $6-7$ | $6-7$ | $6-7$ | $6-7$ |
| Total | $40-43$ | $40-43$ | $40-43$ | $40-43$ | $40-43$ | $40-43$ |

*Values in parentheses are grade 3 content standards. The other set of values are content standards for grades 4 through 8.

Table 1.6.e. Number of Items of Operational/Braille Forms by Content Standard for Reading

|  | Grade |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Standard* | 3 | 4 | 5 | 6 | 7 | 8 |
| Standard (2)1 | 10 | 9 | 11 | 7 | 9 | 11 |
| Standard (4)2 | 20 | 18 | 17 | 20 | 18 | 17 |
| Standard (5)4 | 6 | 9 | 9 | 11 | 7 | 8 |
| Standard (6)5 | 7 | 7 | 6 | 5 | 9 | 7 |
| Total | 43 | 43 | 43 | 43 | 43 | 43 |

*Values in parentheses are grade 3 content standards. The other set of values are content standards for grades 4 through 8.

Table 1.6.f. Number of Items of Equivalent Form by Content Standard for Reading

|  | Grade |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Standard* | 3 | 4 | 5 | 6 | 7 | 8 |
| Standard (2)1 | 9 | 8 | 9 | 7 | 8 | 7 |
| Standard (4)2 | 18 | 17 | 15 | 15 | 17 | 16 |
| Standard (5)4 | 8 | 9 | 11 | 13 | 9 | 11 |
| Standard (6)5 | 8 | 8 | 7 | 8 | 7 | 8 |
| Total | 43 | 42 | 42 | 43 | 41 | 42 |

*Values in parentheses are grade 3 content standards. The other set of values are content standards for grades 4 through 8.

Table 1.6.g. Science Blueprint and Number of Items of Operational/Braille Forms Content Standards

|  | Grade |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Standard | Target | Grade 5 |  |  |
| Content | $15-17$ | 17 | Target | Grade 8 <br> Actual |
| Standard 1 | $10-12$ | 11 | $6-8$ | 6 |
| Standard 2 | $9-11$ | 11 | $6-8$ | 8 |
| Standard 3 |  |  | $7-9$ | 9 |
| Standard 4 |  |  | $6-8$ | 8 |
| Standard 5 | $37-40$ | 39 | $6-8$ | 8 |
| Total |  |  | $36-39$ | 39 |
|  | Target | Actual |  |  |
| Process | $8-10$ | 9 | Target | Actual |
| Standard 1 | $8-10$ | 10 | $6-8$ | 8 |
| Standard 2 | $9-11$ | 10 | $6-8$ | 9 |
| Standard 3 | $12-14$ | 14 | $13-15$ | 14 |
| Standard 4 | $40-43$ | 43 | $11-13$ | 12 |
| Total |  |  | $40-43$ | 43 |

Table 1.6.h. Science Blueprint and Number of Items of Equivalent Forms Content Standards

|  | Grade |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Standard | Target | Grade 5 <br> Actual | Target | Grade 8 <br> Actual |
| Standard 1 | $15-17$ | 14 | $6-8$ | 7 |
| Standard 2 | $10-12$ | 11 | $6-8$ | 8 |
| Standard 3 | $9-11$ | 8 | $7-9$ | 9 |
| Standard 4 |  |  | $6-8$ | 6 |
| Standard 5 | $37-40$ | 33 | $6-8$ | 7 |
| Total |  |  | $36-39$ | 37 |
|  |  | Grade 5 |  |  |
| Process | $8-10$ | 8 |  | Grade 8 |
| Standard 1 | $8-10$ | 8 | $6-8$ | Actual |
| Standard 2 | $9-11$ | 9 | $6-8$ | 8 |
| Standard 3 | $12-14$ | 12 | $13-15$ | 14 |
| Standard 4 | $40-43$ | 37 | $11-13$ | 12 |
| Total |  |  | $40-43$ | 42 |

## Section 2

## Administration of the OMAAP Grades 3-8 Assessments

To ensure a valid and reliable assessment, the OMAAP Grades 3-8 assessments are first constructed in alignment with the Oklahoma $C^{3}$ Standards (now Oklahoma Academic Standards) by the Oklahoma State Department of Education in collaboration with CTB. The tests are then administered and scored according to sound measurement principles for the purpose of evaluating validity. Additionally, best practices require that the test administering and scoring entities perform their tasks in a consistent manner throughout the state so that all students have a fair and equitable opportunity for a score that reflects their achievement in each subject.

Schools play a key role in administering the OMAAP Grades 3-8 assessments in a manner that is consistent with established procedures, monitoring the fair administration of the assessment, and working with the SDE office to address deviations from established assessment administration best practice procedures. School faculty members play a vital role in the success of OMAAP Grades 3-8 assessments by ensuring fairness in administration of the test.

### 2.1 Packaging and Shipping

In order to provide secure and dependable services for the shipping of the OMAAP Grades 3-8 assessment materials, CTB's Transportation Department maintains the quality and security of material distribution and return by hiring reputable carriers that possess the ability to trace shipments. CTB uses all available tracking capabilities to provide status information and early opportunities for corrective action.

Materials are packaged by school and delivered to the district test coordinators. Each shipment to a district contains a shipping document set that includes a packing list for each school's materials.

Materials are packaged using information provided by the test coordinators through the Oklahoma WAVE system. Oklahoma educators also use this system to provide CTB with the precode information needed to print student barcode labels, which are affixed on answer documents or consumable test books. The barcoding of all secure materials at the time of production allows for accurate tracking of these materials through the entire packing, delivery, and return process. Accurate tracking allows CTB to inventory all materials throughout the packaging and delivery process.

### 2.2 Materials Return

The Test Preparation Manual and Materials Return poster provides clear instructions on how to assemble, box, label, and return testing materials after test administration. CTB utilizes doublecolumn boxes to distribute and collect test materials, and makes additional cartons available for order to meet the various return needs of the districts.

Stack cards and paper bands are provided to group and secure used student response booklets for scoring. Color-coded return labels with pre-printed return information are also provided. These
labels facilitate the sorting of each carton and its contents upon receipt at CTB's Data Processing Facility.

### 2.3 Materials Discrepancies Process

The scanning process allows CTB to capture multiple-choice responses and student writing images. Test security form information is also captured electronically via a secure database. All scorable material discrepancies are captured, investigated by the CTB Oklahoma Help Desk, and reported. The results are subsequently reported to the Oklahoma State Department of Education (SDE).

A pre-determined date is set by SDE and CTB in order to account for any materials that arrive after the scheduled deadline. Late arriving material is processed up to the agreed upon date, at which point the Oklahoma SDE must be notified of any late arriving documents and render a processing decision. Following an initial call campaign to all districts with outstanding secure material, the CTB Oklahoma Program Management team notifies the SDE regarding unresolved material discrepancies presented in a preliminary file. A subsequent call or email campaign may be conducted based on the results of the initial effort. Final missing inventory reports are then provided to the SDE. CTB takes test security seriously and makes every effort to recover missing material.

## Section 3

## Classical Item Analysis and Results

Analyses presented in Sections 3, 4, and 5 focused on the Spring operational forms. This section used the student data for final score reporting. Invalid cases or second-time test-takers were excluded in these analyses.

### 3.1 Data Quality Check and Clean-Up

After all tests were scanned and scored, a data clean-up process was implemented to remove invalid cases, ineligible responses, absent students, and repeat test-takers. A statistical key check was also performed at this time. This 'cleaned' data was used for classical item analyses.

Exclusion Rules. Exclusionary rules were applied to form the final sample that was used for classical item analyses, calibration, and equating. Any student who had attempted at least five responses was included in the data analyses. However, students who: took the Braille form, were second-time test-takers, had invalidated codes, or attended a private school were not included in the equating and scaling processes. The demographic breakdown of the students in the item analysis and calibration sample is given in Table 3.1 and 3.1.a.

Table 3.1. Demographic Breakdowns by Gender, ELL, and Social Economic Status

| Subject | Grade | Total | Female | Male | English <br> Language <br> Learner | Economically <br> Disadvantaged |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Mathematics | 3 | 2679 | 947 | 1725 | 340 | 2087 |
|  | 4 | 3076 | 1154 | 1917 | 380 | 2369 |
|  | 5 | 3615 | 1435 | 2173 | 532 | 2800 |
|  | 6 | 3447 | 1264 | 2175 | 408 | 2581 |
|  | 7 | 3588 | 1315 | 2263 | 341 | 2649 |
|  | 8 | 3639 | 1392 | 2231 | 284 | 2600 |
| Reading | 3 | 3221 | 1106 | 2106 | 409 | 2476 |
|  | 4 | 3647 | 1289 | 2354 | 412 | 2787 |
|  | 5 | 4053 | 1534 | 2513 | 585 | 3151 |
|  | 6 | 3626 | 1273 | 2344 | 434 | 2746 |
|  | 7 | 3576 | 1253 | 2312 | 368 | 2654 |
|  | 8 | 3528 | 1276 | 2239 | 305 | 2600 |

Table 3.1.a. Demographic Breakdown by Ethnicity

| Subject | Grade | African | Native | Pacific |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 3 | 399 | 467 | 401 | 13 | 4 | 1211 | 177 |
|  | 4 | 418 | 517 | 449 | 14 | 7 | 1461 | 205 |
|  | 5 | 528 | 604 | 561 | 11 | 4 | 1674 | 226 |
| Mathematics | 5 | 470 | 647 | 474 | 19 | 4 | 1584 | 241 |
|  | 6 | 503 | 664 | 466 | 11 | 6 | 1706 | 222 |
|  | 7 | 5 | 499 | 710 | 410 | 11 | 5 | 1783 |
|  | 5 | 450 | 559 | 495 | 16 | 5 | 1478 | 205 |
|  | 3 | 476 | 611 | 536 | 17 | 6 | 1751 | 246 |
|  | 6 | 580 | 684 | 654 | 14 | 5 | 1867 | 243 |
|  | 7 | 499 | 654 | 528 | 22 | 5 | 1648 | 261 |
|  | 8 | 466 | 672 | 501 | 10 | 5 | 1687 | 224 |
|  | 489 | 683 | 451 | 10 | 6 | 1692 | 184 |  |
| Science | 5 | 426 | 520 | 488 | 9 | 5 | 1418 | 187 |
|  | 8 | 344 | 500 | 302 | 6 | 3 | 1243 | 131 |

Statistical Key Check. To screen for potentially problematic items and to confirm multiplechoice items were accurately scored, a statistical item answer key check was conducted and items were flagged if:

- Less than 200 students responded to the item
- Correct response $p$-value was less than 0.20
- Correct response point-biserial correlation was less than 0.20
- Distractor $p$-value was greater than or equal to 0.40
- Distractor point-biserial correlation was greater than or equal to 0.05

Flagged operational items were submitted for answer key review by a CTB/McGraw-Hill content specialist. Any flagged items that were identified by content experts as mis-keyed would be corrected prior to further data analysis. Once the keys were verified, a secondary statistical key check and evaluation of items was conducted for the potential of removing items from scoring. There were no items identified as having a key issue for the 2013 tests.

Removal of operational items. Once the statistical key check was complete, all items were screened using the criteria defined in Table 3.2. This procedure identified items with poor statistics for potential removal from scoring. The CTB/McGraw-Hill research scientists and content specialists reviewed the flagged items and proposed suggestions to the SDE. The SDE then evaluated and decided any exclusion of the items.

Table 3.2. Secondary Statistical Key Check Criteria

| Key Validation Item-Flagging Criteria |  |
| :--- | :--- |
| If p value of keyed response $<0.35$ | Difficult item |
| If p value of keyed response $<0.05$ or $>0.95$ | Extreme item |
| If p value of keyed response $<$ p value of distracter | Possible mis-key |
| If p value of distracter $>0.35$ | Possible second correct option |
| If point-biserial of keyed response $<0.20$ | Poorly discriminating item |
| If point-biserial of distracter $>0.05$ | Possible second correct option |
| If point-biserial of keyed response $<$ point-biserial of <br> distracter | Possible mis-key |

The SDE's decision on the 2013 tests is listed by subject in Table 3.3. These items were removed from operational scoring for the current operational and Braille forms and also removed from the OMAAP Grades 3-8 item bank. Table 3.3 also presents the final number of points possible on the 2013 OMAAP Grades 3-8 after the removal of the items.

Table 3.3. Number of Items Removed and Final Maximum Score Point Possible

| Subject | Grade | Number of Items <br> Dropped | Final Max. Score Point <br> Possible |
| :---: | :---: | :---: | :---: |
| Mathematics | 3 | 0 | 43 |
|  | 4 | 0 | 43 |
|  | 5 | 0 | 43 |
|  | 6 | 2 | 41 |
|  | 7 | 0 | 43 |
| Reading | 8 | 0 | 43 |
|  | 3 | 0 | 43 |
|  | 4 | 0 | 43 |
|  | 6 | 0 | 43 |
|  | 7 | 0 | 43 |
|  | 8 | 0 | 43 |
| Science | 5 | 0 | 43 |

### 3.2 Classical Item Analyses

The following classical item analysis statistics were produced for operational test items:

- Percentage of students endorsing each multiple-choice option (overall and broken down by gender and ethnicity)
- Overall p-value for each item
- Point-biserial correlation (overall and broken down by gender and ethnicity)
- Point-biserial for non-key response options (overall and broken down by gender and ethnicity)
- Omit percentage per item
- Mean score by response option (overall and broken down by gender and ethnicity)


## 3.2.a. Test-Level Summaries of Classical Item Analyses

The test-level raw score descriptive statistics for the calibration samples are shown in Table 3.4. Note that students whose tests were invalidated and those students taking the test for a second time were excluded. The test difficulty ranged between 0.47 and 0.60 , median point biserials were above 0.30 in most cases, and omit rates were smaller than $3 \%$ for all subjects.

Table 3.4. Test-Level Summaries of Classical Item Analyses

| Subject | Grade | Sample <br> Size | Mean <br> Raw Score | Items <br> Points | Mean <br> P-value | Median <br> rpb | Omit <br> Min | Omit <br> Max |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Mathematics | 3 | 2679 | 24.8 | 43 | 0.58 | 0.42 | 0.00 | 1.38 |
|  | 4 | 3076 | 25.9 | 43 | 0.60 | 0.39 | 0.03 | 0.39 |
|  | 5 | 3615 | 21.3 | 43 | 0.50 | 0.37 | 0.00 | 0.41 |
|  | 6 | 3447 | 20.6 | 41 | 0.48 | 0.33 | 0.06 | 0.58 |
|  | 7 | 3588 | 20.2 | 43 | 0.47 | 0.29 | 0.08 | 0.89 |
|  | 8 | 3639 | 21.7 | 43 | 0.50 | 0.32 | 0.00 | 0.74 |
|  | 3 | 3221 | 21.4 | 43 | 0.50 | 0.42 | 0.16 | 2.36 |
|  | 4 | 3647 | 22.3 | 43 | 0.52 | 0.38 | 0.14 | 1.81 |
|  | 5 | 4053 | 23.5 | 43 | 0.55 | 0.38 | 0.25 | 2.20 |
|  | 6 | 3626 | 22.3 | 43 | 0.52 | 0.32 | 0.11 | 1.19 |
|  | 7 | 3576 | 22.3 | 43 | 0.52 | 0.33 | 0.25 | 2.04 |
|  | 8 | 3528 | 23.8 | 43 | 0.55 | 0.35 | 0.20 | 1.50 |
| Science | 5 | 3057 | 25.1 | 43 | 0.58 | 0.35 | 0.00 | 0.72 |
|  | 8 | 2535 | 26.0 | 43 | 0.60 | 0.36 | 0.04 | 1.26 |

[^0]
### 3.3 Procedures for Detecting Item Bias

One of the goals of the OMAAP Grades 3-8 assessments is to assemble a set of items that provides a measure of a student's ability that is as fair and accurate as possible for all subgroups within the population. Differential item functioning (DIF) analysis refers to statistical procedures that assess whether items are differentially difficult for different groups of examinees. DIF procedures typically control for overall between-group differences on a criterion, usually total test scores. Between-group performance on each item is then compared within sets of examinees having the same total test scores. If the item is differentially more difficult for an identifiable subgroup when conditioned on ability, the item may be measuring something different from the intended construct. However, it is important to recognize that DIF-flagged items might be related to actual differences in relevant knowledge or skills or statistical Type I error. As a result, DIF statistics are used only to identify potential sources of item bias. Subsequent review by content experts and bias committees are required to determine the source and meaning of performance differences. For the OMAAP Grades 3-8 test DIF analyses, DIF statistics were estimated for race and gender. Items with statistically-significant differences in performance were flagged so that items could be carefully examined for possible biased or unfair content that was undetected in earlier fairness and bias content review meetings held prior to form construction.

CTB/McGraw-Hill used the Mantel-Haenszel (MH) approach for detecting DIF in items. The student group of interest is the focal group, and the group to which performance on the item is being compared is the reference group. The reference groups for these DIF analyses were White for race and male for gender. The focal groups for race were African American, Native American, and Hispanic students. The focal group for gender was female students.

Items were classified into three categories on the basis of the MH D-DIF chi-square statistics and the MH delta ( $\Delta$ ) value (Holland and Thayer 1988; Dorans and Holland 1993): negligible DIF (category A), intermediate DIF (category B), and large DIF (category C). The items in category C, which exhibit significant DIF, are of primary concern. Positive values of delta indicate that the item is easier for the focal group, and a negative value of delta indicates that the item is more difficult for the focal group. The item classifications are made as follows (Michaelides, 2008):

- Classification C: $|\Delta| \geq 1.5$ and MH D-DIF chi-square $<0.05$
- Classification B: $1 \leq|\Delta| \leq 1.5$ and MH D-DIF chi-square $<0.05$
- Classification A: Otherwise


## 3.3.a. Differential Item Functioning Results

During field-test stage, items flagged for DIF were reviewed by expert content specialists from SDE and CTB/McGraw-Hill prior to inclusion as part of the operational scored set. The panel reviewed the item content, the percentage of students selecting each response option and the point-biserial correlation for each response option by gender and race for all items flagged for DIF. The data review panel was then asked if there was context (for example, cultural barriers) or language in an item that might result in bias (i.e., an explanation for the existence of the statistical DIF flag). Items that were found to exhibit bias as a result of the content of the item
would be removed from scoring and the item bank, excluding them from future use. This section presents DIF analysis results of the operational items to evaluate the performance of each item.

Table 3.5. DIF Flag Incidence by Subject and Grade

| Subject | Grade | Total Items | Female/ <br> Male |  | African American/ White |  | Native American/ White |  | Hispanic/ White |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | B | C | B | C | B | C | B | C |
| Mathematics | 3 | 43 | 1 | 0 | 2 | 0 | 0 | 0 | 3 | 0 |
|  | 4 | 43 | 1 | 0 | 2 | 0 | 0 | 0 | 2 | 0 |
|  | 5 | 43 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | 6 | 41 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
|  | 7 | 43 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
|  | 8 | 43 | 2 | 0 | 4 | 0 | 0 | 0 | 1 | 0 |
| Reading | 3 | 43 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | 4 | 43 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
|  | 5 | 43 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
|  | 6 | 43 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
|  | 7 | 43 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
|  | 8 | 43 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Science | 5 | 43 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
|  | 8 | 43 | 2 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

*Classification C: $|\Delta| \geq 1.5$ and MH D-DIF chi-square $<0.05$;
Classification B: $1 \leq|\Delta| \leq 1.5$ and MH D-DIF chi-square $<0.05$

### 3.4 Test Reliability

## 3.4.a. Overall Test Reliability

The reliability of a test provides an estimate of the extent to which an assessment will yield the same results when administered in different times, locations, or samples, assuming the repeated administrations are not affected by external factors. The reliability coefficient is an index of consistency of test results. Reliability coefficients are usually forms of correlation coefficients and must be interpreted within the context and design of the assessment and of the reliability study. Cronbach's Alpha is a commonly used internal consistency measure, which is derived from analysis of the consistency of the performance of individuals on items in a test administration. Cronbach's Alpha is calculated as shown in equation (1). In this formula, $s_{i}{ }^{2}$ denotes the estimated variance for each item, with items indexed $i=1,2, \ldots, k$, and $s^{2}$ sum denotes the variance for the sum of all $k$ items:

$$
\begin{equation*}
\alpha=\left(\frac{k}{k-1}\right)\left(1-\frac{\sum_{i=1}^{k} s_{i}^{2}}{s_{\text {sum }}^{2}}\right) . \tag{1}
\end{equation*}
$$

Cronbach's Alpha of all operational items was estimated for each subject and grade. Table 3.6 shows that the reliability coefficients are above 0.75 in all cases. The values indicate that the OMAAP Grades 3-8 assessments had adequate internal consistency and that the tests produce relatively stable scores.

Table 3.6. Cronbach's Alpha by Subject and Grade

| Subject | Grade | Number of Items | Alpha |
| :---: | :---: | :---: | :---: |
|  | 3 | 43 | 0.89 |
|  | 4 | 43 | 0.87 |
| Mathematics | 5 | 43 | 0.84 |
|  | 6 | 41 | 0.76 |
|  | 7 | 43 | 0.75 |
|  | 8 | 43 | 0.81 |
|  | 3 | 43 | 0.87 |
|  | 4 | 43 | 0.85 |
| Reading | 5 | 43 | 0.85 |
|  | 6 | 43 | 0.80 |
|  | 7 | 43 | 0.81 |
|  | 8 | 43 | 0.83 |
| Science | 5 | 43 | 0.82 |
|  | 8 | 43 | 0.84 |

## 3.4.b. Test Reliability by Subgroup

Table 3.7 shows the reliability analysis results by reporting subgroups for the OMAAP assessments. This table illustrates the subject, subgroups, and Cronbach's Alpha reliability coefficients. In most cases, the reliability coefficients are well above the accepted lower limit of . 70 .

Table 3.7. Test Reliability by Subgroup

| Subject | Grade | Male | Female | American | Native |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| American | Hispanic | Asian | White |  |  |  |  |  |
| Mathematics | 3 | 0.90 | 0.87 | 2.63 | 0.88 | 0.89 | 0.89 | 0.89 |
|  | 4 | 0.87 | 0.86 | 2.57 | 0.86 | 0.86 | 0.90 | 0.87 |
|  | 5 | 0.85 | 0.84 | 2.49 | 0.84 | 0.84 | 0.93 | 0.85 |
|  | 6 | 0.76 | 0.76 | 2.15 | 0.77 | 0.73 | 0.85 | 0.77 |
|  | 7 | 0.75 | 0.75 | 2.12 | 0.75 | 0.72 | 0.76 | 0.77 |
|  | 8 | 0.81 | 0.81 | 2.36 | 0.82 | 0.78 | 0.69 | 0.81 |
|  | 3 | 0.87 | 0.86 | 2.53 | 0.86 | 0.85 | 0.91 | 0.88 |
|  | 4 | 0.85 | 0.85 | 2.46 | 0.85 | 0.82 | 0.85 | 0.86 |
|  | 5 | 0.85 | 0.84 | 2.50 | 0.85 | 0.84 | 0.81 | 0.85 |
|  | 6 | 0.79 | 0.80 | 2.26 | 0.78 | 0.75 | 0.84 | 0.82 |
|  | 7 | 0.81 | 0.81 | 2.34 | 0.80 | 0.77 | 0.77 | 0.82 |
|  | 8 | 0.83 | 0.83 | 2.44 | 0.84 | 0.81 | 0.87 | 0.83 |
| Science | 5 | 0.83 | 0.81 | 2.42 | 0.81 | 0.80 | 0.92 | 0.83 |
|  | 8 | 0.85 | 0.82 | 2.43 | 0.84 | 0.82 | 0.54 | 0.85 |

Table 3.7.a. Test Reliability by Subgroup (continued)

| Subject | Grade | English <br> Language <br> Learner | Economically <br> Disadvantaged |
| :---: | :---: | :---: | :---: |
|  | 3 | 0.87 | 0.89 |
|  | 4 | 0.87 | 0.87 |
| Mathematics | 5 | 0.84 | 0.84 |
|  | 6 | 0.71 | 0.75 |
|  | 7 | 0.73 | 0.74 |
|  | 8 | 0.79 | 0.80 |
|  | 3 | 0.83 | 0.86 |
| Reading | 4 | 0.80 | 0.84 |
|  | 5 | 0.83 | 0.84 |
|  | 6 | 0.73 | 0.79 |
|  | 7 | 0.76 | 0.80 |
| Science | 8 | 0.81 | 0.83 |
|  | 5 | 0.80 | 0.82 |
|  | 8 | 0.81 | 0.84 |

## Section 4

## Calibration, Equating, and Scaling

### 4.1 Item Response Theory (IRT) Models

Rasch Model. The Rasch model (Rasch, 1960) was used for calibrating all OMAAP Grades 3-8 items. In the Rasch model, the probability that a student with an ability level of $\theta$ responds correctly to item $i$ is

$$
\begin{equation*}
P_{i}(\theta)=\frac{e^{\left(\theta-b_{i}\right)}}{1+e^{\left(\theta-b_{i}\right)}} \tag{2}
\end{equation*}
$$

where $b_{i}$ is the item difficulty parameter.

### 4.2 Calibration and Equating

The Rasch model was used for all OMAAP Grades 3-8 assessments. Due to low student sample sizes, the traditional post-equating design could not be applied this year, pre-equating was used in this year's equating instead. All item parameters from previous (before Spring 2013) equating results were used for generating raw score to scale score relationships (scoring tables) directly.

### 4.3 Scaling and Scoring Results

The Lowest Obtainable Scale Score (LOSS), Highest Obtainable Scale Score (HOSS), and final scaling constants for each of the subjects are shown in Table 4.1. The scaling constants, M1 (multiplicative) and $M 2$ (additive), place the true scores associated with each raw score point onto the reporting or operational scale using a straightforward linear transformation:

$$
\begin{equation*}
\text { Scale Score }=(\hat{\tau} \times M 1)+M 2 \tag{3}
\end{equation*}
$$

where, $\hat{\tau}=$ true score.
Also shown in Table 4.1 are the 3 cut scores for each subject and grade. The 3 cut scores divide scores into 4 performance levels: 1 - Unsatisfactory, 2 - Limited Knowledge, 3 - Satisfactory, and 4 - Advanced. The raw score to number-correct scale score conversion tables were generated using WINSTEPS Rasch model. The results are shown in Tables 4.2 through 4.6, along with the conditional standard error of measurement (CSEM; please see Section 6.3 for the computation of CSEM) associated with each of the scale score.

Table 4.1. OMAAP Scaling Constants, Scale Range, and Cut Scores by Subject and Grade

|  |  | Scaling <br> Constants |  | Scale Range |  | Cut Score |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Subject | Grade | Slope | Mean | LOSS | HOSS | Limited <br> Knowledge | Satisfactory | Advanced |
| Mathematics | 3 | 19.94 | 244.59 | 100 | 350 | 233 | 250 | 277 |
|  | 4 | 20.09 | 247.68 | 100 | 350 | 238 | 250 | 277 |
|  | 5 | 20.31 | 243.66 | 100 | 350 | 240 | 250 | 271 |
|  | 6 | 19.36 | 245.86 | 100 | 350 | 237 | 250 | 272 |
|  | 7 | 20.53 | 240.05 | 100 | 350 | 232 | 250 | 265 |
|  | 8 | 20.15 | 244.33 | 100 | 350 | 235 | 250 | 271 |
| Reading | 3 | 20.89 | 247.50 | 100 | 350 | 238 | 250 | 269 |
|  | 4 | 20.75 | 247.42 | 100 | 350 | 237 | 250 | 266 |
|  | 5 | 20.73 | 248.66 | 100 | 350 | 231 | 250 | 269 |
|  | 6 | 21.77 | 242.02 | 100 | 350 | 229 | 250 | 261 |
|  | 7 | 21.82 | 242.05 | 100 | 350 | 229 | 250 | 271 |
|  | 8 | 21.31 | 241.48 | 100 | 350 | 236 | 250 | 276 |

*LOSS = Lowest Obtainable Scale Score; HOSS = Highest Obtainable Scale Score

Table 4.2. Raw Score to Scale Score Conversion Table for Mathematics-Grades 3-5

|  | 3 |  |  |  |  | 4 |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Raw | Scale | Perf. |  | Scale | Perf. |  | Scale | Perf. |  |
| Score | Score | Level | CSEM | Score | Level | CSEM | Score | Level | CSEM |
| 0 | 148 | 1 | 37 | 147 | 1 | 37 | 152 | 1 | 37 |
| 1 | 172 | 1 | 20 | 172 | 1 | 20 | 177 | 1 | 21 |
| 2 | 187 | 1 | 15 | 186 | 1 | 15 | 192 | 1 | 15 |
| 3 | 196 | 1 | 12 | 195 | 1 | 12 | 201 | 1 | 12 |
| 4 | 202 | 1 | 11 | 202 | 1 | 11 | 208 | 1 | 11 |
| 5 | 207 | 1 | 10 | 207 | 1 | 10 | 213 | 1 | 10 |
| 6 | 212 | 1 | 9 | 211 | 1 | 9 | 217 | 1 | 9 |
| 7 | 216 | 1 | 9 | 215 | 1 | 9 | 221 | 1 | 9 |
| 8 | 219 | 1 | 8 | 219 | 1 | 8 | 225 | 1 | 8 |
| 9 | 223 | 1 | 8 | 222 | 1 | 8 | 228 | 1 | 8 |
| 10 | 226 | 1 | 8 | 225 | 1 | 8 | 231 | 1 | 8 |
| 11 | 228 | 1 | 7 | 228 | 1 | 7 | 234 | 1 | 7 |
| 12 | 231 | 1 | 7 | 230 | 1 | 7 | 236 | 1 | 7 |
| 13 | 234 | 2 | 7 | 233 | 1 | 7 | 239 | 1 | 7 |
| 14 | 236 | 2 | 7 | 235 | 1 | 7 | 241 | 2 | 7 |
| 15 | 238 | 2 | 7 | 237 | 1 | 7 | 244 | 2 | 7 |
| 16 | 241 | 2 | 7 | 240 | 2 | 7 | 246 | 2 | 7 |
| 17 | 243 | 2 | 7 | 242 | 2 | 7 | 248 | 2 | 7 |
| 18 | 245 | 2 | 7 | 244 | 2 | 7 | 250 | 3 | 7 |
| 19 | 247 | 2 | 7 | 246 | 2 | 6 | 252 | 3 | 7 |
| 20 | 249 | 2 | 7 | 248 | 2 | 6 | 255 | 3 | 7 |
| 21 | 252 | 3 | 7 | 250 | 3 | $\mathbf{6}$ | 257 | 3 | 6 |
| 22 | 254 | 3 | 7 | 252 | 3 | 6 | 259 | 3 | 6 |
| 23 | 256 | 3 | 7 | 254 | 3 | 6 | 261 | 3 | 7 |
| 24 | 258 | 3 | 7 | 256 | 3 | 6 | 263 | 3 | 7 |
| 25 | 260 | 3 | 7 | 258 | 3 | 7 | 265 | 3 | 7 |
| 26 | 262 | 3 | 7 | 261 | 3 | 7 | 267 | 3 | 7 |
| 27 | 265 | 3 | 7 | 263 | 3 | 7 | 269 | 3 | 7 |
| 28 | 267 | 3 | 7 | 265 | 3 | 7 | 271 | 4 | 7 |
| 29 | 269 | 3 | 7 | 267 | 3 | 7 | 274 | 4 | 7 |
| 30 | 272 | 3 | 7 | 270 | 3 | 7 | 276 | 4 | 7 |
| 31 | 274 | 3 | 7 | 272 | 3 | 7 | 279 | 4 | 7 |
| 32 | 277 | 4 | 7 | 275 | 3 | 7 | 281 | 4 | 7 |
| 33 | 280 | 4 | 8 | 278 | 4 | 8 | 284 | 4 | 8 |
| 34 | 283 | 4 | 8 | 280 | 4 | 8 | 287 | 4 | 8 |
| 35 | 286 | 4 | 8 | 284 | 4 | 8 | 290 | 4 | 8 |
| 36 | 290 | 4 | 9 | 287 | 4 | 9 | 293 | 4 | 9 |
| 37 | 294 | 4 | 9 | 291 | 4 | 9 | 297 | 4 | 9 |
| 38 | 298 | 4 | 10 | 295 | 4 | 10 | 302 | 4 | 10 |
| 39 | 303 | 4 | 11 | 301 | 4 | 11 | 307 | 4 | 11 |
| 40 | 310 | 4 | 12 | 307 | 4 | 12 | 313 | 4 | 12 |
| 41 | 319 | 4 | 15 | 316 | 4 | 15 | 322 | 4 | 15 |
| 42 | 4 | 20 | 331 | 4 | 20 | 337 | 4 | 21 |  |
|  |  |  |  |  |  |  |  |  |  |


| 43 | 350 | 4 | 30 | 350 | 4 | 32 | 350 | 4 | 28 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Table 4.3. Raw Score to Scale Score Conversion Table for Mathematics-Grade 6-8 |  |  |  |  |  |  |  |  |  |
|  |  | 6 |  |  | 7 |  |  | 8 |  |
| Raw | Scale | Perf. |  | Scale | Perf. |  | Scale | Perf. |  |
| Score | Score | Level | CSEM | Score | Level | CSEM | Score | Level | CSEM |
| 0 | 157 | 1 | 36 | 146 | 1 | 38 | 151 | 1 | 37 |
| 1 | 181 | 1 | 20 | 172 | 1 | 21 | 176 | 1 | 20 |
| 2 | 195 | 1 | 14 | 187 | 1 | 15 | 190 | 1 | 15 |
| 3 | 204 | 1 | 12 | 196 | 1 | 12 | 199 | 1 | 12 |
| 4 | 211 | 1 | 10 | 202 | 1 | 11 | 205 | 1 | 11 |
| 5 | 216 | 1 | 10 | 208 | 1 | 10 | 211 | 1 | 10 |
| 6 | 220 | 1 | 9 | 212 | 1 | 9 | 215 | 1 | 9 |
| 7 | 224 | 1 | 8 | 216 | 1 | 9 | 219 | 1 | 8 |
| 8 | 227 | 1 | 8 | 220 | 1 | 8 | 222 | 1 | 8 |
| 9 | 230 | 1 | 8 | 223 | 1 | 8 | 225 | 1 | 8 |
| 10 | 233 | 1 | 7 | 226 | 1 | 8 | 228 | 1 | 7 |
| 11 | 236 | 1 | 7 | 229 | 1 | 7 | 231 | 1 | 7 |
| 12 | 238 | 2 | 7 | 231 | 1 | 7 | 233 | 1 | 7 |
| 13 | 241 | 2 | 7 | 234 | 2 | 7 | 236 | 2 | 7 |
| 14 | 243 | 2 | 7 | 236 | 2 | 7 | 238 | 2 | 7 |
| 15 | 245 | 2 | 7 | 238 | 2 | 7 | 240 | 2 | 7 |
| 16 | 248 | 2 | 6 | 241 | 2 | 7 | 242 | 2 | 7 |
| 17 | 250 | 3 | 6 | 243 | 2 | 7 | 244 | 2 | 6 |
| 18 | 252 | 3 | 6 | 245 | 2 | 7 | 246 | 2 | 6 |
| 19 | 254 | 3 | 6 | 247 | 2 | 7 | 249 | 2 | 6 |
| 20 | 256 | 3 | 6 | 249 | 2 | 7 | 251 | 3 | 6 |
| 21 | 258 | 3 | 6 | 251 | 3 | 7 | 253 | 3 | 6 |
| 22 | 260 | 3 | 6 | 253 | 3 | 7 | 255 | 3 | 6 |
| 23 | 262 | 3 | 6 | 255 | 3 | 7 | 257 | 3 | 6 |
| 24 | 264 | 3 | 6 | 258 | 3 | 7 | 259 | 3 | 6 |
| 25 | 266 | 3 | 6 | 260 | 3 | 7 | 261 | 3 | 6 |
| 26 | 268 | 3 | 6 | 262 | 3 | 7 | 263 | 3 | 6 |
| 27 | 271 | 3 | 7 | 264 | 3 | 7 | 265 | 3 | 7 |
| 28 | 273 | 4 | 7 | 266 | 4 | 7 | 267 | 3 | 7 |
| 29 | 275 | 4 | 7 | 268 | 4 | 7 | 269 | 3 | 7 |
| 30 | 278 | 4 | 7 | 271 | 4 | 7 | 271 | 4 | 7 |
| 31 | 280 | 4 | 7 | 273 | 4 | 7 | 274 | 4 | 7 |
| 32 | 283 | 4 | 7 | 276 | 4 | 7 | 276 | 4 | 7 |
| 33 | 286 | 4 | 8 | 279 | 4 | 8 | 279 | 4 | 7 |
| 34 | 289 | 4 | 8 | 282 | 4 | 8 | 282 | 4 | 8 |
| 35 | 293 | 4 | 9 | 285 | 4 | 8 | 285 | 4 | 8 |
| 36 | 297 | 4 | 9 | 288 | 4 | 9 | 288 | 4 | 8 |
| 37 | 302 | 4 | 10 | 292 | 4 | 9 | 292 | 4 | 9 |
| 38 | 309 | 4 | 12 | 296 | 4 | 10 | 297 | 4 | 10 |
| 39 | 317 | 4 | 14 | 302 | 4 | 11 | 302 | 4 | 11 |
| 40 | 331 | 4 | 20 | 308 | 4 | 12 | 308 | 4 | 12 |
| 41 | 350 | 4 | 31 | 317 | 4 | 15 | 317 | 4 | 15 |
| 42 |  | . |  | 332 | 4 | 21 | 332 | 4 | 20 |
| 43 |  | . |  | 350 | 4 | 32 | 350 | 4 | 32 |

Table 4.4. Raw Score to Scale Score Conversion Table for Reading-Grades 3-5

| Raw <br> Score | 3 |  |  | 4 |  |  | 5 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Scale Score | Perf. Level | CSEM | Scale Score | Perf. <br> Level | CSEM | Scale Score | Perf. Level | CSEM |
| 0 | 150 | 1 | 38 | 155 | 1 | 38 | 147 | 1 | 38 |
| 1 | 176 | 1 | 21 | 180 | 1 | 21 | 173 | 1 | 21 |
| 2 | 191 | 1 | 15 | 195 | 1 | 15 | 188 | 1 | 15 |
| 3 | 200 | 1 | 13 | 204 | 1 | 12 | 197 | 1 | 12 |
| 4 | 207 | 1 | 11 | 210 | 1 | 11 | 203 | 1 | 11 |
| 5 | 212 | 1 | 10 | 216 | 1 | 10 | 209 | 1 | 10 |
| 6 | 216 | 1 | 9 | 220 | 1 | 9 | 213 | 1 | 9 |
| 7 | 220 | 1 | 9 | 224 | 1 | 9 | 217 | 1 | 9 |
| 8 | 224 | 1 | 8 | 227 | 1 | 8 | 220 | 1 | 8 |
| 9 | 227 | 1 | 8 | 231 | 1 | 8 | 223 | 1 | 8 |
| 10 | 230 | 1 | 8 | 234 | 1 | 8 | 226 | 1 | 8 |
| 11 | 232 | 1 | 7 | 236 | 1 | 7 | 229 | 1 | 7 |
| 12 | 235 | 1 | 7 | 239 | 2 | 7 | 232 | 2 | 7 |
| 13 | 237 | 1 | 7 | 241 | 2 | 7 | 234 | 2 | 7 |
| 14 | 240 | 2 | 7 | 244 | 2 | 7 | 236 | 2 | 7 |
| 15 | 242 | 2 | 7 | 246 | 2 | 7 | 239 | 2 | 7 |
| 16 | 244 | 2 | 7 | 248 | 2 | 7 | 241 | 2 | 7 |
| 17 | 246 | 2 | 7 | 250 | 3 | 7 | 243 | 2 | 7 |
| 18 | 248 | 2 | 7 | 252 | 3 | 7 | 245 | 2 | 7 |
| 19 | 250 | 3 | 7 | 254 | 3 | 7 | 247 | 2 | 7 |
| 20 | 252 | 3 | 6 | 256 | 3 | 6 | 249 | 2 | 6 |
| 21 | 254 | 3 | 6 | 258 | 3 | 6 | 251 | 3 | 6 |
| 22 | 256 | 3 | 6 | 260 | 3 | 6 | 253 | 3 | 6 |
| 23 | 258 | 3 | 6 | 262 | 3 | 6 | 255 | 3 | 6 |
| 24 | 260 | 3 | 7 | 264 | 3 | 7 | 257 | 3 | 7 |
| 25 | 262 | 3 | 7 | 266 | 4 | 7 | 259 | 3 | 7 |
| 26 | 264 | 3 | 7 | 269 | 4 | 7 | 261 | 3 | 7 |
| 27 | 267 | 3 | 7 | 271 | 4 | 7 | 264 | 3 | 7 |
| 28 | 269 | 4 | 7 | 273 | 4 | 7 | 266 | 3 | 7 |
| 29 | 271 | 4 | 7 | 275 | 4 | 7 | 268 | 3 | 7 |
| 30 | 273 | 4 | 7 | 277 | 4 | 7 | 270 | 4 | 7 |
| 31 | 276 | 4 | 7 | 280 | 4 | 7 | 273 | 4 | 7 |
| 32 | 278 | 4 | 7 | 282 | 4 | 7 | 275 | 4 | 7 |
| 33 | 281 | 4 | 8 | 285 | 4 | 8 | 278 | 4 | 8 |
| 34 | 284 | 4 | 8 | 288 | 4 | 8 | 281 | 4 | 8 |
| 35 | 287 | 4 | 8 | 291 | 4 | 8 | 284 | 4 | 8 |
| 36 | 290 | 4 | 9 | 295 | 4 | 9 | 287 | 4 | 9 |
| 37 | 294 | 4 | 9 | 299 | 4 | 9 | 291 | 4 | 9 |
| 38 | 299 | 4 | 10 | 303 | 4 | 10 | 296 | 4 | 10 |
| 39 | 304 | 4 | 11 | 308 | 4 | 11 | 301 | 4 | 11 |
| 40 | 311 | 4 | 13 | 315 | 4 | 13 | 308 | 4 | 12 |
| 41 | 320 | 4 | 15 | 324 | 4 | 15 | 317 | 4 | 15 |
| 42 | 335 | 4 | 21 | 339 | 4 | 21 | 332 | 4 | 21 |
| 43 | 350 | 4 | 30 | 350 | 4 | 27 | 350 | 4 | 32 |

Table 4.5. Raw Score to Scale Score Conversion Table for Reading-Grades 6-8

|  | 6 |  |  |  | 6 |  | 7 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Raw |  |  |  |  |  |  |  |  |  |
| Score | Scale | Pcore | Level | CSEM | Scale | Score | Level | CSEM | Scale |
| Score | Perf. |  |  |  |  |  |  |  |  |
| Level | CSEM |  |  |  |  |  |  |  |  |
| 0 | 143 | 1 | 40 | 141 | 1 | 40 | 145 | 1 | 39 |
| 1 | 170 | 1 | 22 | 168 | 1 | 22 | 171 | 1 | 22 |
| 2 | 186 | 1 | 16 | 184 | 1 | 16 | 186 | 1 | 16 |
| 3 | 196 | 1 | 13 | 193 | 1 | 13 | 195 | 1 | 13 |
| 4 | 203 | 1 | 12 | 200 | 1 | 12 | 202 | 1 | 11 |
| 5 | 208 | 1 | 11 | 206 | 1 | 11 | 208 | 1 | 10 |
| 6 | 213 | 1 | 10 | 210 | 1 | 10 | 212 | 1 | 10 |
| 7 | 217 | 1 | 9 | 214 | 1 | 9 | 216 | 1 | 9 |
| 8 | 221 | 1 | 9 | 218 | 1 | 9 | 220 | 1 | 9 |
| 9 | 224 | 1 | 8 | 221 | 1 | 8 | 223 | 1 | 8 |
| 10 | 227 | 1 | 8 | 224 | 1 | 8 | 226 | 1 | 8 |
| 11 | 230 | 2 | 8 | 227 | 1 | 8 | 229 | 1 | 8 |
| 12 | 233 | 2 | 8 | 230 | 2 | 8 | 231 | 1 | 7 |
| 13 | 236 | 2 | 7 | 233 | 2 | 7 | 234 | 1 | 7 |
| 14 | 238 | 2 | 7 | 235 | 2 | 7 | 236 | 2 | 7 |
| 15 | 241 | 2 | 7 | 237 | 2 | 7 | 239 | 2 | 7 |
| 16 | 243 | 2 | 7 | 240 | 2 | 7 | 241 | 2 | 7 |
| 17 | 245 | 2 | 7 | 242 | 2 | 7 | 243 | 2 | 7 |
| 18 | 247 | 2 | 7 | 244 | 2 | 7 | 245 | 2 | 7 |
| 19 | 250 | 3 | 7 | 246 | 2 | 7 | 247 | 2 | 7 |
| 20 | 252 | 3 | 7 | 249 | 2 | 7 | 250 | 3 | 7 |
| 21 | 254 | 3 | 7 | 251 | 3 | 7 | 252 | 3 | 7 |
| 22 | 256 | 3 | 7 | 253 | 3 | 7 | 254 | 3 | 7 |
| 23 | 258 | 3 | 7 | 255 | 3 | 7 | 256 | 3 | 7 |
| 24 | 260 | 3 | 7 | 257 | 3 | 7 | 258 | 3 | 7 |
| 25 | 262 | 4 | 7 | 259 | 3 | 7 | 260 | 3 | 7 |
| 26 | 265 | 4 | 7 | 262 | 3 | 7 | 262 | 3 | 7 |
| 27 | 267 | 4 | 7 | 264 | 3 | 7 | 264 | 3 | 7 |
| 28 | 269 | 4 | 7 | 266 | 3 | 7 | 267 | 3 | 7 |
| 29 | 272 | 4 | 7 | 269 | 3 | 7 | 269 | 3 | 7 |
| 30 | 274 | 4 | 7 | 271 | 4 | 7 | 271 | 3 | 7 |
| 31 | 277 | 4 | 8 | 274 | 4 | 8 | 274 | 3 | 7 |
| 32 | 279 | 4 | 8 | 276 | 4 | 8 | 277 | 4 | 8 |
| 33 | 282 | 4 | 8 | 279 | 4 | 8 | 279 | 4 | 8 |
| 34 | 285 | 4 | 8 | 282 | 4 | 8 | 282 | 4 | 8 |
| 35 | 289 | 4 | 9 | 286 | 4 | 9 | 286 | 4 | 8 |
| 36 | 292 | 4 | 9 | 289 | 4 | 9 | 289 | 4 | 9 |
| 37 | 296 | 4 | 10 | 293 | 4 | 10 | 293 | 4 | 9 |
| 38 | 301 | 4 | 10 | 298 | 4 | 11 | 298 | 4 | 10 |
| 39 | 306 | 4 | 12 | 304 | 4 | 12 | 303 | 4 | 11 |
| 40 | 313 | 4 | 13 | 310 | 4 | 13 | 310 | 4 | 13 |
| 41 | 323 | 4 | 16 | 320 | 4 | 16 | 319 | 4 | 16 |
| 42 | 339 | 4 | 22 | 336 | 4 | 22 | 334 | 4 | 22 |
| 43 | 350 | 4 | 28 | 350 | 4 | 30 | 350 | 4 | 31 |
|  |  |  |  |  |  |  |  |  |  |

Table 4.6. Raw Score to Scale Score Conversion Table for Science-Grades 5 and 8

| Raw <br> Score | 5 |  |  | 8 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Scale <br> Score | Perf. <br> Level | CSEM | Scale <br> Score | Perf. <br> Level | CSEM |
| 0 | 144 | 1 | 38 | 155 | 1 | 37 |
| 1 | 170 | 1 | 21 | 180 | 1 | 20 |
| 2 | 185 | 1 | 15 | 195 | 1 | 15 |
| 3 | 194 | 1 | 13 | 204 | 1 | 12 |
| 4 | 201 | 1 | 11 | 210 | 1 | 11 |
| 5 | 206 | 1 | 10 | 215 | 1 | 10 |
| 6 | 211 | 1 | 9 | 220 | 1 | 9 |
| 7 | 215 | 1 | 9 | 224 | 1 | 9 |
| 8 | 219 | 1 | 8 | 227 | 1 | 8 |
| 9 | 222 | 1 | 8 | 230 | 1 | 8 |
| 10 | 225 | 1 | 8 | 233 | 1 | 8 |
| 11 | 228 | 1 | 8 | 236 | 1 | 7 |
| 12 | 230 | 1 | 7 | 239 | 1 | 7 |
| 13 | 233 | 1 | 7 | 241 | 2 | 7 |
| 14 | 235 | 1 | 7 | 243 | 2 | 7 |
| 15 | 238 | 2 | 7 | 246 | 2 | 7 |
| 16 | 240 | 2 | 7 | 248 | 2 | 7 |
| 17 | 242 | 2 | 7 | 250 | 3 | 7 |
| 18 | 245 | 2 | 7 | 252 | 3 | 7 |
| 19 | 247 | 2 | 7 | 254 | 3 | 6 |
| 20 | 249 | 2 | 7 | 256 | 3 | 6 |
| 21 | 251 | 3 | 7 | 258 | 3 | 6 |
| 22 | 253 | 3 | 7 | 261 | 3 | 6 |
| 23 | 255 | 3 | 7 | 263 | 3 | 6 |
| 24 | 257 | 3 | 7 | 265 | 3 | 6 |
| 25 | 260 | 3 | 7 | 267 | 3 | 6 |
| 26 | 262 | 3 | 7 | 269 | 3 | 7 |
| 27 | 264 | 3 | 7 | 271 | 3 | 7 |
| 28 | 266 | 3 | 7 | 273 | 3 | 7 |
| 29 | 269 | 3 | 7 | 275 | 3 | 7 |
| 30 | 271 | 3 | 7 | 278 | 3 | 7 |
| 31 | 274 | 3 | 7 | 280 | 3 | 7 |
| 32 | 276 | 3 | 8 | 283 | 3 | 7 |
| 33 | 279 | 4 | 8 | 285 | 3 | 7 |
| 34 | 282 | 4 | 8 | 288 | 4 | 8 |
| 35 | 285 | 4 | 8 | 291 | 4 | 8 |
| 36 | 289 | 4 | 9 | 295 | 4 | 9 |
| 37 | 293 | 4 | 9 | 299 | 4 | 9 |
| 38 | 297 | 4 | 10 | 303 | 4 | 10 |
| 39 | 303 | 4 | 11 | 308 | 4 | 11 |
| 40 | 309 | 4 | 13 | 315 | 4 | 12 |
| 41 | 319 | 4 | 15 | 323 | 4 | 15 |
| 42 | 334 | 4 | 21 | 338 | 4 | 20 |
| 43 | 350 | 4 | 31 | 350 | 4 | 27 |

## Section 5

## Classification Consistency and Accuracy Studies

### 5.1 Classification Consistency and Accuracy

The concept of the standard error of measurement (SEM) has implications for the interpretation of cut scores used to classify students into different performance levels. For example, a given student may have a true performance level greater than a cut score; however, due to random variations (measurement error), the student's observed test score may be below the cut score. As a result, the student may be classified as having a lower performance level. The opposite situation could also happen; where a student's true ability is lower than the cut score but is classified as passing. As discussed in Section 6.4, a student's observed score is most likely to fall within a standard error band around his or her true score. Thus, the classification of students into different performance levels can be imperfect; especially for the borderline students whose true scores lie close to the performance level cut scores.

According to Livingston and Lewis (1995, p. 180), the accuracy of a classification is "the extent to which the actual classifications of the test takers... agree with those that would be made on the basis of their true score" and are calculated from cross-tabulations between "classifications based on an observable variable and classifications based on an unobservable variable." Since the unobservable variable-the true score-is not available, Livingston and Lewis provide a method to estimate the true score distribution of a test and create the cross-tabulation of the true score and observed variable (raw score) classifications. Consistency is "the agreement between classifications based on two non-overlapping, equally-difficult forms of the test" (p. 180). Consistency is estimated using actual response data from a test and the test's reliability to statistically model two parallel forms of the test and compare the classifications on those alternate forms. There are three types of accuracy and consistency indices that can be generated using Livingston and Lewis’ approach: overall, conditional on level, and cut score.

The overall accuracy of performance level classifications is computed as a sum of the proportions on the diagonal of the joint distribution of true score and observed score levels. Essentially, overall accuracy is a proportion (or percentage) of correct classifications across all levels. The overall consistency index is computed as the sum of the diagonal cells in a consistency table. Another way to express overall consistency is to use the kappa coefficient, which is commonly used to assess inter-rater reliability. Like the inter-rater reliability studies, kappa provides an estimate of agreement or the proportion of consistent classifications between two different tests after taking into account chance.

Consistency conditional on performance level is computed as the ratio between the proportion of correct classifications at the selected performance level (for example, students with satisfactory true ability levels who were classified as satisfactory by the test) and the proportion of all the students classified into that level (total proportion of students who were classified as satisfactory). Accuracy conditional on performance level is computed in a similar manner except that in the consistency table where both row and column marginal sums are the same, the accuracy table uses the sum based on estimated status as the total for computing accuracy conditional on performance level.

To evaluate decisions at specific cut scores, the joint distribution of all the performance levels are collapsed into dichotomized distributions around that specific cut score (for example collapsing Unsatisfactory and Limited Knowledge and then Satisfactory and Advanced to assess decisions at the Satisfactory cut score). The accuracy index at cut score is computed as the sum of the proportions of correct classifications around this selected cut score. The consistency at a specific cut score is obtained in a similar way, but by dichotomizing the distributions at the cut score performance level and between all other performance levels combined. Table 5.1 presents the overall accuracy and consistency indices for the OMAAP Grades 3-8 assessments.

Table 5.1. Estimates of Accuracy and Consistency of Performance Classification

|  |  |  | False |  |  | False |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Subject | Grade | Accuracy | Consistency | Positive | Negative | Kappa |
| Mathematics | 3 | 0.77 | 0.69 | 0.11 | 0.12 | 0.54 |
|  | 4 | 0.76 | 0.67 | 0.11 | 0.13 | 0.51 |
|  | 5 | 0.72 | 0.62 | 0.14 | 0.15 | 0.46 |
|  | 6 | 0.72 | 0.61 | 0.13 | 0.15 | 0.36 |
|  | 7 | 0.68 | 0.57 | 0.16 | 0.16 | 0.36 |
|  | 8 | 0.72 | 0.62 | 0.13 | 0.14 | 0.43 |
| Reading | 3 | 0.72 | 0.63 | 0.14 | 0.14 | 0.49 |
|  | 4 | 0.73 | 0.64 | 0.12 | 0.15 | 0.47 |
|  | 5 | 0.74 | 0.64 | 0.13 | 0.14 | 0.48 |
|  | 7 | 0.7 | 0.61 | 0.14 | 0.16 | 0.42 |
|  | 8 | 0.73 | 0.63 | 0.13 | 0.14 | 0.44 |
|  | 0.75 | 0.65 | 0.12 | 0.13 | 0.46 |  |
| Science | 5 | 0.75 | 0.65 | 0.12 | 0.13 | 0.45 |
|  | 8 | 0.83 | 0.76 | 0.08 | 0.09 | 0.49 |

As shown in Table 5.1, the overall accuracy indices range between 68 and 83 percent and overall consistency ranges between 57 and 76 percent. Kappa coefficients range from 36 and 54 percent. The rate of false positives range from 8 to 16 percent. The false negative rates range from 9 to 16 percent.

Table 5.2 provides the accuracy, consistency, false positive, and false negative rates by cut-score. The data in these tables reveal that the level of agreement for both accuracy and consistency is above 70 percent in all cases, with most cases above 80 percent. In general, the high rates of accuracy and consistency support the cut decisions made using these assessments. The false positive and false negative rates are low compared to Table 5.1.

The importance of the dichotomous categorization is particularly notable when they map onto pass/fail decisions for the assessments. For the OMAAP Grades $3-8$ tests, the U+L/S + A is the important dichotomization because it directly translates to the pass/fail decision point. Similar to other dichotomization distinctions, there are three main scenarios at this cut point: 1) observed performance is accurately reflective of the true ability level (i.e., the examinee passed and should
have passed); 2) the true ability level is below the standard, but the observed test score is above the standard (i.e., a false positive); and 3) the true ability level is above the standard, but the observed test score is below the standard (i.e., a false negative). In examining Table 5.2/5.2.a, Math Grade 3, for example, 91 percent of students are correctly classified as pass or fail based on their performance (scenario 1), 4 percent passed, but their true ability is below the standard (scenario 2), and 5 percent failed although their true ability is above the standard (scenario 3 ). Overall, the accuracy rates for accurate classification are above $80 \%$ for all tests - students are appropriately (more than $80 \%$ of the time) categorized into pass/fail classifications based on their true ability using their observed score (raw score) as their classification score.

Table 5.2. Accuracy and Consistency Estimates by Cut Score, False Positive and False Negative Rates

|  |  | Accuracy |  |  | Consistency |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | U | $\mathrm{U}+\mathrm{L}$ | $\mathrm{U}+\mathrm{L}+\mathrm{S}$ | U | $\mathrm{U}+\mathrm{L}$ | $\mathrm{U}+\mathrm{L}+\mathrm{S}$ |
| Subject | Grade | $\mathrm{L}+\mathrm{S}+\mathrm{A}$ | $\mathrm{S}+\mathrm{A}$ | A | $\mathrm{L}+\mathrm{S}+\mathrm{A}$ | $\mathrm{S}+\mathrm{A}$ | A |
| Mathematics | 3 | 0.95 | 0.91 | 0.91 | 0.93 | 0.87 | 0.88 |
|  | 4 | 0.94 | 0.90 | 0.91 | 0.92 | 0.87 | 0.87 |
|  | 5 | 0.92 | 0.88 | 0.90 | 0.89 | 0.84 | 0.86 |
|  | 6 | 0.95 | 0.86 | 0.91 | 0.92 | 0.80 | 0.87 |
|  | 7 | 0.93 | 0.83 | 0.92 | 0.90 | 0.77 | 0.88 |
|  | 8 | 0.94 | 0.86 | 0.92 | 0.91 | 0.81 | 0.89 |
| Reading | 3 | 0.92 | 0.89 | 0.90 | 0.89 | 0.84 | 0.87 |
|  | 4 | 0.95 | 0.90 | 0.88 | 0.93 | 0.86 | 0.83 |
|  | 5 | 0.95 | 0.88 | 0.90 | 0.94 | 0.84 | 0.85 |
|  | 6 | 0.97 | 0.87 | 0.85 | 0.95 | 0.82 | 0.80 |
|  | 7 | 0.95 | 0.86 | 0.91 | 0.93 | 0.81 | 0.88 |
|  | 8 | 0.94 | 0.88 | 0.92 | 0.92 | 0.84 | 0.89 |
|  | 5 | 0.94 | 0.89 | 0.91 | 0.92 | 0.85 | 0.87 |
|  | 8 | 0.97 | 0.93 | 0.92 | 0.95 | 0.90 | 0.89 |

* U =Unsatisfactory; L = Limited Knowledge; S = Satisfactory; and A = Advanced.

Table 5.2.a. Accuracy and Consistency Estimates by Cut Score, False Positive and False Negative Rates (continued)

|  |  | $\mathrm{U} / \mathrm{L}+\mathrm{S}+\mathrm{A}$ |  | $\mathrm{U}+\mathrm{L} / \mathrm{S}+\mathrm{A}$ |  | $\mathrm{U}+\mathrm{L}+\mathrm{S} / \mathrm{A}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Fubject | Grade | Positive | Negative | Positive | Fegative |
| Salse | Positive | Negative |  |  |  |  |  |
| Mathematics | 3 | 0.02 | 0.03 | 0.04 | 0.05 | 0.05 | 0.04 |
|  | 4 | 0.02 | 0.04 | 0.04 | 0.05 | 0.06 | 0.04 |
|  | 5 | 0.03 | 0.05 | 0.05 | 0.06 | 0.06 | 0.04 |
|  | 6 | 0.01 | 0.04 | 0.06 | 0.09 | 0.06 | 0.03 |
|  | 7 | 0.02 | 0.05 | 0.08 | 0.08 | 0.06 | 0.02 |
|  | 8 | 0.02 | 0.04 | 0.06 | 0.07 | 0.05 | 0.03 |
|  | 3 | 0.03 | 0.05 | 0.05 | 0.06 | 0.06 | 0.04 |
|  | 4 | 0.02 | 0.03 | 0.04 | 0.06 | 0.07 | 0.06 |
|  | 5 | 0.01 | 0.03 | 0.05 | 0.06 | 0.06 | 0.04 |
|  | 6 | 0.01 | 0.02 | 0.06 | 0.08 | 0.08 | 0.07 |
|  | 7 | 0.01 | 0.03 | 0.06 | 0.07 | 0.06 | 0.03 |
|  | 8 | 0.02 | 0.04 | 0.05 | 0.07 | 0.05 | 0.03 |
| Science | 5 | 0.02 | 0.04 | 0.05 | 0.06 | 0.06 | 0.03 |
|  | 8 | 0.01 | 0.02 | 0.02 | 0.04 | 0.05 | 0.03 |

* U =Unsatisfactory; L = Limited Knowledge; S = Satisfactory; and A = Advanced.


## Section 6

## Summary Statistics

### 6.1 Descriptive Statistics

Descriptive statistics were calculated on the student data in the final score reporting.
Table 6.1. Scale Score Descriptive Statistics-Overall

| Subject | Grade | Total |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | N | Mean | SD | Med. |
| Mathematics | 3 | 2679 | 261.8 | 22.5 | 260 |
|  | 4 | 3076 | 262.5 | 20.4 | 261 |
|  | 5 | 3615 | 257.6 | 17.9 | 255 |
|  | 6 | 3447 | 257.3 | 13.8 | 256 |
|  | 7 | 3588 | 249.5 | 13.8 | 247 |
|  | 8 | 3639 | 254.3 | 15.4 | 253 |
| Reading | 3 | 3221 | 255.9 | 19.6 | 250 |
|  | 4 | 3647 | 261.6 | 18.5 | 260 |
|  | 5 | 4053 | 257.1 | 18.3 | 255 |
|  | 6 | 3626 | 257.2 | 16.3 | 254 |
|  | 7 | 3576 | 254.0 | 17.1 | 253 |
|  | 8 | 3528 | 258.3 | 17.6 | 258 |
| Science | 5 | 3057 | 261.0 | 17.9 | 260 |
|  | 8 | 2535 | 270.2 | 18.0 | 269 |

*SD = standard deviation; Med. = median

Table 6.2. Scale Score Descriptive Statistics by Gender

| Subject | Grade | Female |  |  |  | Male |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 3 | N | Mean | SD | Med. | N | Mean | SD | Med. |
|  | 3 | 947 | 259.4 | 20.3 | 258 | 1725 | 263.1 | 23.5 | 260 |
|  | 4 | 1154 | 261.1 | 19.7 | 261 | 1917 | 263.3 | 20.8 | 263 |
|  | 5 | 1435 | 256.6 | 17.3 | 255 | 2173 | 258.3 | 18.3 | 255 |
|  | 7 | 1264 | 258.2 | 13.7 | 256 | 2175 | 256.8 | 13.8 | 256 |
|  | 7 | 1315 | 249.1 | 13.9 | 247 | 2263 | 249.8 | 13.8 | 247 |
|  | 8 | 1392 | 254.7 | 15.4 | 253 | 2231 | 254.1 | 15.4 | 253 |
| Reading | 3 | 1106 | 256.9 | 19.3 | 252 | 2106 | 255.3 | 19.8 | 250 |
|  | 4 | 1289 | 262.8 | 18.3 | 260 | 2354 | 261.0 | 18.6 | 258 |
|  | 5 | 1534 | 258.8 | 17.7 | 257 | 2513 | 256.1 | 18.6 | 253 |
|  | 6 | 1273 | 259.0 | 16.6 | 256 | 2344 | 256.2 | 16.1 | 254 |
|  | 7 | 1253 | 256.6 | 17.2 | 255 | 2312 | 252.5 | 16.8 | 251 |
|  | 8 | 1276 | 260.5 | 17.7 | 260 | 2239 | 257.1 | 17.4 | 256 |
|  | 5 | 1163 | 260.5 | 16.9 | 260 | 1890 | 261.4 | 18.4 | 260 |
|  | 8 | 909 | 268.8 | 17.1 | 267 | 1620 | 271.0 | 18.4 | 271 |

*SD = standard deviation; Med. $=$ median
Table 6.3. Scale Score Descriptive Statistics by Race/Ethnicity

| Subject | Grade | African American |  |  |  | Native American |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | N | Mean | SD | Med. | N | Mean | SD | Med. |
| Mathematics | 3 | 399 | 254.3 | 19.6 | 252 | 470 | 260.7 | 21.4 | 258 |
|  | 4 | 419 | 255.7 | 18.1 | 254 | 517 | 263.4 | 20.3 | 263 |
|  | 5 | 528 | 253.7 | 16.1 | 250 | 606 | 257.3 | 18.3 | 255 |
|  | 6 | 473 | 252.8 | 11.9 | 252 | 649 | 257.1 | 13.9 | 256 |
|  | 7 | 503 | 245.2 | 11.5 | 245 | 664 | 249.9 | 13.9 | 247 |
|  | 8 | 501 | 250.5 | 14.0 | 251 | 710 | 254.3 | 16.3 | 255 |
| Reading | 3 | 451 | 251.7 | 17.8 | 246 | 561 | 255.4 | 18.8 | 252 |
|  | 4 | 477 | 256.8 | 16.6 | 254 | 611 | 261.5 | 18.1 | 260 |
|  | 5 | 581 | 253.3 | 17.2 | 251 | 684 | 257.3 | 18.6 | 255 |
|  | 6 | 499 | 253.3 | 14.4 | 252 | 656 | 256.7 | 15.5 | 254 |
|  | 7 | 469 | 249.4 | 15.5 | 246 | 673 | 254.0 | 16.6 | 253 |
|  | 8 | 489 | 252.6 | 15.9 | 252 | 687 | 260.1 | 18.2 | 260 |
| Science | 5 | 426 | 256.7 | 16.9 | 255 | 520 | 262.0 | 17.3 | 262 |
|  | 8 | 344 | 261.2 | 14.5 | 261 | 500 | 272.0 | 17.9 | 271 |

*SD = standard deviation; Med. $=$ median

Table 6.3.a. Scale Score Descriptive Statistics by Race/Ethnicity (continued)

| Subject | Grade | Hispanic |  |  |  | Asian |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 3 | N | Mean | SD | Med. | N | Mean | SD | Med. |
| Mathematics | 402 | 261.4 | 23.4 | 258 | 13 | 262.0 | 21.8 | 260 |  |
|  | 4 | 449 | 262.3 | 19.8 | 261 | 14 | 273.2 | 21.2 | 276.5 |
|  | 6 | 562 | 258.1 | 17.8 | 255 | 11 | 261.4 | 25.5 | 255 |
|  | 7 | 475 | 256.5 | 13.0 | 256 | 19 | 257.2 | 16.7 | 254 |
|  | 8 | 467 | 248.6 | 13.4 | 247 | 11 | 246.6 | 13.9 | 243 |
|  | 3 | 495 | 252.8 | 14.2 | 251 | 11 | 264.7 | 11.4 | 265 |
|  | 4 | 536 | 258.8 | 16.2 | 250 | 16 | 260.6 | 22.8 | 250 |
|  | 5 | 654 | 255.9 | 17.6 | 256 | 18 | 262.8 | 17.5 | 263 |
|  | 6 | 529 | 254.8 | 14.7 | 254 | 14 | 259.4 | 14.9 | 263.5 |
|  | 7 | 501 | 251.2 | 15.1 | 249 | 10 | 258.0 | 18.1 | 254 |
|  | 8 | 452 | 256.3 | 17.1 | 254 | 10 | 255.6 | 16.0 | 252 |
| Science | 5 | 488 | 257.9 | 16.5 | 255 | 9 | 258.8 | 25.6 | 249 |
|  | 8 | 303 | 268.1 | 16.4 | 267 | 6 | 251.0 | 9.8 | 250 |

*SD = standard deviation; Med. = median
Table 6.3.b. Scale Score Descriptive Statistics by Race/Ethnicity (continued)

| Subject | Grade | White |  |  |  | Other |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 3 | N | Mean | SD | Med. | N | Mean | SD | Med. |
| Mathematics | 4 | 264.9 | 23.1 | 265 | 179 | 260.7 | 21.4 | 258 |  |
|  | 4 | 1464 | 263.9 | 20.9 | 263 | 206 | 263.6 | 20.9 | 263 |
|  | 6 | 1675 | 258.9 | 18.2 | 257 | 229 | 256.6 | 17.0 | 252 |
|  | 7 | 1586 | 259.1 | 14.2 | 258 | 241 | 256.6 | 13.3 | 256 |
|  | 8 | 1785 | 250.8 | 14.4 | 245.6 | 15.3 | 255 | 225 | 250.7 |
|  | 249 | 255.1 | 16.7 | 254 |  |  |  |  |  |
|  | 3 | 1479 | 258.2 | 20.5 | 254 | 214 | 253.6 | 19.6 | 248 |
|  | 4 | 1751 | 263.7 | 19.3 | 262 | 247 | 263.4 | 19.8 | 262 |
|  | 5 | 1869 | 258.8 | 18.7 | 257 | 246 | 256.0 | 18.4 | 252 |
|  | 6 | 1651 | 259.4 | 17.2 | 258 | 264 | 256.9 | 17.1 | 254 |
|  | 7 | 1688 | 255.9 | 17.8 | 255 | 230 | 256.4 | 17.7 | 254 |
|  | 8 | 1697 | 259.7 | 17.6 | 260 | 187 | 258.9 | 17.4 | 258 |
| Science | 5 | 1418 | 263.1 | 18.5 | 262 | 191 | 261.6 | 17.4 | 260 |
|  | 8 | 1245 | 272.4 | 18.3 | 271 | 134 | 271.8 | 19.0 | 270 |

[^1]Table 6.4. Scale Score Descriptive Statistics by Free/Reduced Lunch Status

| Subject | Grade | Free/Reduced Lunch = Yes |  |  |  | Free/Reduced Lunch = No |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | N | Mean | SD | Med. | N | Mean | SD | Med. |
| Mathematics | 3 | 2089 | 260.6 | 22.0 | 258 | 590 | 266.0 | 23.6 | 265 |
|  | 4 | 2371 | 261.8 | 20.4 | 261 | 705 | 264.8 | 20.4 | 265 |
|  | 5 | 2803 | 256.9 | 17.4 | 255 | 812 | 260.2 | 19.2 | 257 |
|  | 6 | 2584 | 256.4 | 13.6 | 256 | 863 | 260.0 | 13.9 | 258 |
|  | 7 | 2651 | 248.8 | 13.6 | 247 | 937 | 251.6 | 14.4 | 251 |
|  | 8 | 2603 | 253.4 | 14.9 | 253 | 1036 | 256.8 | 16.4 | 257 |
| Reading | 3 | 2479 | 254.3 | 18.7 | 250 | 742 | 260.9 | 21.4 | 258 |
|  | 4 | 2788 | 260.3 | 17.9 | 258 | 859 | 266.1 | 19.8 | 264 |
|  | 5 | 3153 | 256.0 | 17.9 | 253 | 900 | 261.0 | 19.3 | 259 |
|  | 6 | 2748 | 256.0 | 16.1 | 254 | 878 | 260.9 | 16.6 | 258 |
|  | 7 | 2660 | 252.7 | 16.5 | 251 | 916 | 258.0 | 18.2 | 257 |
|  | 8 | 2610 | 257.3 | 17.6 | 256 | 918 | 261.1 | 17.2 | 260 |
| Science | 5 | 2380 | 260.4 | 17.4 | 260 | 677 | 263.3 | 19.2 | 262 |
|  | 8 | 1856 | 269.3 | 17.8 | 269 | 679 | 272.7 | 18.4 | 273 |

*SD = standard deviation; Med. $=$ median

### 6.2 Performance Level Distribution

The distributions of students in the four performance levels are presented in Table 6.5. (Please see Appendix B for distributions by scale score).

Table 6.5. Percentage of Students by Performance Level

| Subject | Grade | N | Unsatisfactory | Knowledge | Satisfactory | Advanced |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Mathematics | 3 | 2679 | $7.2 \%$ | $26.7 \%$ | $41.8 \%$ | $24.1 \%$ |
|  | 4 | 3076 | $11.3 \%$ | $16.9 \%$ | $48.6 \%$ | $23.0 \%$ |
|  | 5 | 3615 | $14.5 \%$ | $22.1 \%$ | $41.1 \%$ | $22.1 \%$ |
|  | 6 | 3447 | $4.9 \%$ | $22.5 \%$ | $57.8 \%$ | $14.6 \%$ |
|  | 7 | 3588 | $7.0 \%$ | $50.8 \%$ | $28.8 \%$ | $13.2 \%$ |
|  | 8 | 3639 | $8.8 \%$ | $32.0 \%$ | $43.7 \%$ | $15.2 \%$ |
| Reading | 3 | 3221 | $17.4 \%$ | $28.1 \%$ | $28.1 \%$ | $26.1 \%$ |
|  | 4 | 3647 | $6.4 \%$ | $21.0 \%$ | $34.5 \%$ | $37.8 \%$ |
|  | 5 | 4053 | $4.2 \%$ | $35.3 \%$ | $35.8 \%$ | $24.5 \%$ |
|  | 6 | 3626 | $1.3 \%$ | $31.9 \%$ | $31.3 \%$ | $35.3 \%$ |
|  | 7 | 3576 | $4.1 \%$ | $39.7 \%$ | $37.9 \%$ | $18.1 \%$ |
|  | 8 | 3528 | $8.1 \%$ | $22.9 \%$ | $50.9 \%$ | $17.8 \%$ |
| Science | 5 | 3057 | $6.6 \%$ | $21.7 \%$ | $54.7 \%$ | $16.8 \%$ |
|  | 8 | 2535 | $2.4 \%$ | $9.4 \%$ | $70.8 \%$ | $17.2 \%$ |

### 6.3 Conditional Standard Error of Measurement

The Rasch model standard error (SE) for ability estimate $(\hat{\beta})$ is as follows (Andrich \& Luo, 2004):

$$
\begin{equation*}
\sigma_{\hat{\beta}=} \frac{1}{\sqrt{\sum_{i=1}^{L} p_{v i}\left(1-p_{v i}\right)}}, \tag{4}
\end{equation*}
$$

where
$v=$ subscript for a person,
$i=$ subscript for an item,
$L=$ length of the test,
$\hat{\beta}=$ ability estimate, and
$p_{v i}=$ the probability that a person answers an item correctly and defined as follows:

$$
\begin{equation*}
p_{v i}=\frac{e^{\beta_{v}-\delta_{i}}}{1+e^{\beta_{v}-\delta_{i}}}, \tag{5}
\end{equation*}
$$

where $\beta_{v}$ is person's ability and $\delta_{i}$ is item's difficulty.

A confidence band can be found for use in interpreting the ability estimate. For example, an approximate $68 \%$ confidence interval for $\hat{\beta}$ is given by $\hat{\beta} \pm$ SE. Because different ability estimates ( $\hat{\beta}$ ) have different SE , Rasch SE is generally referred to as the conditional standard error of measurement (CSEM) to differentiate from the standard error of measurement of the classical measurement model. The CSEMs by subject are reported in Tables 4.3 through 4.7.

### 6.4 Standard Error of Measurement

From the classical measurement theory aspect, the observed score (raw score) has two components; true score and error. A student's true score is the hypothetical average score that would result if the student took the test repeatedly under similar conditions. The error is the difference between true score and observed score. Among the three scores, only the observed score is known; the true score and error are derived from theory.

The standard error of measurement (SEM), as an overall test-level measure of error, is the average of all errors associated with student scores. Instead of using errors of student scores, the classical SEM is derived using test reliability:

$$
\begin{equation*}
S E M=S D \sqrt{(1-r)} \tag{6}
\end{equation*}
$$

where,
SEM = test Standard Error of Measurement of classical theory,
$S D=$ standard deviation of raw score, and
$r=$ test reliability, Cronbach's Alpha in this case.
The equation indicates that test reliability and SEM are in reverse relation; while test reliability increases, the SEM decreases. Table 6.6 presents the overall estimates of SEM for each of the content areas.

Table 6.6. Overall Estimates of SEM by Subject and Grade

| Subject | Grade | SEM |
| :---: | :---: | :---: |
|  | 3 | 2.83 |
|  | 4 | 2.88 |
| Mathematics | 5 | 2.98 |
|  | 6 | 2.98 |
|  | 7 | 3.04 |
|  | 8 | 3.03 |
|  | 3 | 3.02 |
|  | 4 | 3.03 |
| Reading | 5 | 3.00 |
|  | 6 | 3.07 |
|  | 7 | 3.06 |
|  | 8 | 3.01 |
| Science | 5 | 2.98 |
|  | 8 | 2.93 |

*SEM $=$ Standard Error of Measurement

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## Appendix A

Standards, Objectives/Skills, and Processes Assessed by Subject

| OKC ${ }^{3}$ Standard and Objective | Ideal <br> Number of <br> Items for <br> Alignment to OKC ${ }^{3}$ | Actual <br> Number of <br> Items on <br> 2013 Test |
| :---: | :---: | :---: |
| Algebraic Reasoning: Patterns and Relationships | 6-7 |  |
| Algebra Patterns (1.1) | 1-3 |  |
| Equations (1.2) | 1-3 |  |
| Number Properties (1.3) | 1-3 | 2 |
| Number Sense and Operation | 15-16 | 15 |
| Number Sense (2.1) | 7-8 | 8 |
| Number Operations (2.2) | 7-8 | 7 |
| Geometry | 6-7 | 6 |
| Properties of shapes (3.1) | 1-3 | 1 |
| Spatial Reasoning (3.2) | 1-3 | 1 |
| Coordinate Geometry (3.3) | 1-3 | 4 |
| Measurement | 7-8 | 8 |
| Measurement (4.1) | 2-4 | 3 |
| Time and Temperature (4.2) | 1-3 | 3 |
| Money (4.3) | 1-3 | 2 |
| Data Analysis | 6-7 | 7 |
| Data Analysis (5.1) | 2-4 | 4 |
| Probability (5.2) | 2-4 | 3 |
| Total Test | 40-43 | 43 |

OMAAP Test Blueprint and Actual Item Counts: Grade 4 Mathematics

|  | Ideal <br> Number of <br> Items for <br> Alignment to <br> $\mathbf{O K C}^{3}$ | Actual <br> Number of <br> Items on <br> 2013 Test |
| :--- | :---: | :---: |
| OKC $^{3}$ Standard and Objective | $\mathbf{6 - 7}$ | $\mathbf{7}$ |
| Algebraic Reasoning: Patterns and Relationships | $1-3$ | 3 |
| Algebra Patterns (1.1) | $1-3$ | 2 |
| Equations (1.2) | $1-3$ | 2 |
| Number Properties (1.3) | $\mathbf{1 4 - 1 5}$ | $\mathbf{1 5}$ |
| Number Sense and Operation | $6-7$ | 8 |
| Number Sense (2.1) | $7-8$ | 7 |
| Number Operations (2.2) | $7-\mathbf{8}$ | $\mathbf{8}$ |
| Geometry | $1-2$ | 2 |
| Lines (3.1) | $1-2$ | 3 |
| Angles (3.2) | $1-2$ | 1 |
| Polygons (3.3) | $1-2$ | 2 |
| Transformations (3.4) | $\mathbf{7 - 8}$ | $\mathbf{6}$ |
| Measurement | $2-4$ | 3 |
| Measurement (4.1) | $1-3$ | 1 |
| Time and Temperature (4.2) | $1-3$ | 2 |
| Money (4.3) | $\mathbf{6 - 7}$ | $\mathbf{7}$ |
| Data Analysis | $1-3$ | 5 |
| Data Analysis (5.1) | $1-3$ | 1 |
| Probability (5.2) | $\mathbf{1 - 3}$ | 1 |
| Central Tendency (5.3) | $\mathbf{4 0 - 4 3}$ | $\mathbf{4 3}$ |
| Total Test |  |  |


| OMAAP Test Blueprint and Actual Item Counts: Grade 5 Mathematics |  |  |
| :--- | :---: | :---: |
|  | Ideal <br> Number of <br> Items for <br> Alignment to <br> $\mathbf{O K C}^{3}$ | Actual <br> Number of <br> Items on <br> 2013 Test |
| OKC $^{3}$ Standard and Objective | $\mathbf{1 0 - 1 1}$ | $\mathbf{1 0}$ |
| Algebraic Reasoning: Patterns and Relationships | $3-5$ | 5 |
| Algebra Patterns (1.1) | $2-4$ | 3 |
| Equations (1.2) | $2-4$ | 2 |
| Number Properties (1.3) | $\mathbf{1 2 - 1 3}$ | $\mathbf{1 3}$ |
| Number Sense and Operation | $5-7$ | 7 |
| Number Sense (2.1) | $5-7$ | 6 |
| Number Operations (2.2) | $\mathbf{6 - 7}$ | $\mathbf{6}$ |
| Geometry | $3-4$ | 2 |
| Circles and Polygons (3.1) | $2-4$ | 4 |
| Angles (3.2) | $\mathbf{6 - 7}$ | $\mathbf{7}$ |
| Measurement | $3-4$ | 5 |
| Measurement (4.1) | $2-3$ | 2 |
| Money (4.2) | $\mathbf{6 - 7}$ | $\mathbf{7}$ |
| Data Analysis | $1-3$ | 2 |
| Data Analysis (5.1) | $1-3$ | 5 |
| Probability (5.2) | $1-3$ | 0 |
| Central Tendency (5.3) | $\mathbf{4 0 - 4 3}$ | $\mathbf{4 3}$ |
| Total Test |  |  |


| OKC ${ }^{3}$ Standard and Objective | Ideal Number of Items for Alignment to OKC ${ }^{3}$ | Actual Number of Items on 2013 Test |
| :---: | :---: | :---: |
| Algebraic Reasoning: Patterns and Relationships | 10-11 | 11 |
| Algebra Patterns (1.1) | 2-3 | 3 |
| Expressions and Equations (1.2) | 2-3 | 3 |
| Number Properties (1.3) | 2-3 | 3 |
| Solving Equations (1.4) | 2-3 | 2 |
| Number Sense and Operation | 12-13 | 13 |
| Number Sense (2.1) | 3-5 | 4 |
| Number Operations (2.2) | 7-9 | 9 |
| Geometry | 6-7 | 6 |
| Three Dimensional Figures (3.1) | 1-3 | 1 |
| Congruent and Similar Figures (3.2) | 1-3 | 3 |
| Coordinate Geometry (3.3) | 1-3 | 2 |
| Measurement | 6-7 | 4 |
| Circles (4.1) | 3-4 | 1 |
| Conversions (4.2) | 2-3 | 3 |
| Data Analysis | 6-7 | 7 |
| Data Analysis (5.1) | 1-3 | 3 |
| Probability (5.2) | 1-3 | 2 |
| Central Tendency (5.3) | 1-3 | 2 |
| Total Test | 40-43 | 41 |

*Two operational items aligned to objective 4.1 was suppressed.

| OMAAP Test Blueprint and Actual Item Counts: Grade 7 Mathematics |  |  |
| :--- | :---: | :---: |
|  | Ideal <br> Number of <br> Items for <br> Alignment to <br> $\mathbf{O K C}^{3}$ | Actual <br> Number of <br> Items on <br> 2013 Test |
| OKC $^{3}$ Standard and Objective | $\mathbf{1 2 - 1 3}$ | $\mathbf{1 3}$ |
| Algebraic Reasoning: Patterns and Relationships | $3-5$ | 2 |
| Linear Relationships (1.1) | $3-5$ | 6 |
| Solving Equations (1.2) | $3-5$ | 5 |
| Solving and Graphing Inequalities (1.3) | $\mathbf{8 - 9}$ | $\mathbf{9}$ |
| Number Sense and Operation | $4-5$ | 3 |
| Number Sense (2.1) | $4-5$ | 6 |
| Number Operations (2.2) | $\mathbf{6 - 7}$ | $\mathbf{8}$ |
| Geometry | $2-3$ | 1 |
| Classifying Figures (3.1) | $2-3$ | 3 |
| Lines and Angles (3.2) | $2-3$ | 4 |
| Transformations (3.3) | $\mathbf{7 - 8}$ | $\mathbf{7}$ |
| Measurement | $3-4$ | 4 |
| Perimeter and Area (4.1) | $1-3$ | 1 |
| Circles (4.2) | $1-3$ | 2 |
| Composite Figures (4.3) | $\mathbf{6 - 7}$ | $\mathbf{6}$ |
| Data Analysis | $1-3$ | 0 |
| Data Analysis (5.1) | $1-3$ | 3 |
| Probability (5.2) | $1-3$ | 3 |
| Central Tendency (5.3) | $\mathbf{4 0 - 4 3}$ | $\mathbf{4 3}$ |
| Total Test |  |  |


| OMAAP Test Blueprint and Actual Item Counts: Grade 8 Mathematics |  |  |
| :--- | :---: | :---: |
|  | Ideal <br> Number of <br> Items for <br> Alignment to <br> OKC | Actual <br> Number of <br> Items on <br> 2013 Test |
| OKC $^{3}$ Standard and Objective | $\mathbf{1 3 - 1 4}$ | $\mathbf{1 3}$ |
| Algebraic Reasoning: Patterns and Relationships | $8-9$ | 8 |
| Equations (1.1) | $4-5$ | 5 |
| Inequalities (1.2) | $\mathbf{8 - 9}$ | $\mathbf{9}$ |
| Number Sense and Operation | $2-3$ | 3 |
| Number Sense (2.1) | $5-6$ | 6 |
| Number Operations (2.2) | $\mathbf{7 - 8}$ | $\mathbf{8}$ |
| Geometry | $4-5$ | 4 |
| Three Dimensional Figures (3.1) | $2-3$ | 4 |
| Pythagorean Theorem (3.2) | $\mathbf{6 - 7}$ | $\mathbf{6}$ |
| Measurement | $1-3$ | 3 |
| Surface Area and Volume (4.1) | $1-3$ | 2 |
| Ratio and Proportions (4.2) | $1-3$ | 1 |
| Composite Figures (4.3) | $\mathbf{6 - 7}$ | $\mathbf{7}$ |
| Data Analysis | $2-4$ | 3 |
| Data Analysis (5.1) | $2-4$ | 4 |
| Central Tendency (5.3) | $\mathbf{4 0 - 4 3}$ | $\mathbf{4 3}$ |
| Total Test |  |  |

OMAAP Test Blueprint and Actual Item Counts: Grade 3 Reading

## Ideal

| OKC ${ }^{3}$ Standard and Objective | Number of <br> Items for <br> Alignment <br> to OKC $^{\mathbf{3}}$ | Actual <br> Number of <br> Items on <br> 2013 Test |
| :--- | :---: | :---: |
| Vocabulary | $\mathbf{9 - 1 1}$ | $\mathbf{1 0}$ |
| Words in Context (2.1) | $2-4$ | 3 |
| Affixes, Roots, and Stems (2.2) | $2-4$ | 2 |
| Synonyms, Antonyms, and Homonyms (2.3) | $2-4$ | 4 |
| Using Resource Materials (2.4) | $1-3$ | 1 |
| Comprehension/Critical Literacy | $\mathbf{1 8 - 2 4}$ | $\mathbf{2 0}$ |
| Literal Understanding (4.1) | $4-6$ | 5 |
| Inferences and Interpretation (4.2) | $4-6$ | 6 |
| Summary and Generalization (4.3) | $4-6$ | 5 |
| Analysis and Evaluation (4.4) | $2-4$ | 4 |
| Literature | $\mathbf{6 - 7}$ | $\mathbf{6}$ |
| Literary Elements (5.2) \& Figurative Language/Sound | $6-7$ | 6 |
| Devices (5.3) | $\mathbf{6 - 7}$ | $\mathbf{7}$ |
| Research and Information | $6-7$ | 7 |
| Accessing Information (6.1) | $\mathbf{4 0 - 4 3}$ | $\mathbf{4 3}$ |
| Total Test |  |  |


| OMAAP Test Blueprint and Actual Item Counts: Grade 4 Reading |  |  |
| :--- | :--- | :---: |
|  | Ideal <br> Number of <br> Items for <br> Alignment <br> to OKC $^{\mathbf{3}}$ | Actual <br> Number of <br> Items on <br> 2013 Test |
| OKC $^{3}$ Standard and Objective | $\mathbf{9 - 1 1}$ | $\mathbf{9}$ |
| Vocabulary | $2-4$ | 4 |
| Words in Context (1.1) | $2-4$ | 0 |
| Affixes, Roots, and Stems (1.2) | $2-4$ | 5 |
| Synonyms, Antonyms, Homonyms/Homophones (1.3) | $\mathbf{1 7 - 1 9}$ | $\mathbf{1 8}$ |
| Comprehension/Critical Literacy | $3-5$ | 4 |
| Literal Understanding (3.1) | $3-5$ | 6 |
| Inferences and Interpretation (3.2) | $3-5$ | 4 |
| Summary and Generalization (3.3) | $3-5$ | 4 |
| Analysis and Evaluation (3.4) | $\mathbf{6 - 8}$ | $\mathbf{9}$ |
| Literature | $2-4$ | 8 |
| Literary Elements (4.2) | $2-4$ | 1 |
| Figurative Language/Sound Devices (4.3) | $\mathbf{6 - 7}$ | $\mathbf{7}$ |
| Research and Information | $6-7$ | 7 |
| Accessing Information (5.1) | $\mathbf{4 0 - 4 3}$ | $\mathbf{4 3}$ |
| Total Test |  |  |


| OMAAP Test Blueprint and Actual Item Counts: Grade 5 Reading |  |  |
| :--- | :---: | :---: |
|  | Ideal <br> Number of <br> Items for <br> Alignment <br> to OKC $^{3}$ | Actual <br> Number of <br> Items on <br> 2013 Test |
| OKC $^{3}$ Standard and Objective | $\mathbf{9 - 1 1}$ | $\mathbf{1 1}$ |
| Vocabulary | $2-4$ | 4 |
| Words in Context (1.1) | $2-4$ | 5 |
| Affixes, Roots, and Stems (1.2) | $2-4$ | 2 |
| Synonyms, Antonyms, and Homonyms/Homophones | $\mathbf{1 5 - 1 7}$ | $\mathbf{1 7}$ |
| (1.3) | $3-5$ | 3 |
| Comprehension/Critical Literacy | $3-5$ | 3 |
| Literal Understanding (3.1) | $3-5$ | 7 |
| Inferences and Interpretation (3.2) | $3-5$ | 4 |
| Summary and Generalization (3.3) | $\mathbf{9 - 1 1}$ | $\mathbf{9}$ |
| Analysis and Evaluation (3.4) | $2-4$ | 3 |
| Literature | $2-4$ | 3 |
| Literary Genre (4.1) | $2-4$ | 3 |
| Literary Elements (4.2) | $\mathbf{6 - 7}$ | $\mathbf{6}$ |
| Figurative Language/Sound Devices (4.3) | $2-4$ | 3 |
| Research and Information | $2-4$ | 3 |
| Accessing Information (5.1) | $\mathbf{4 0 - 4 3}$ | $\mathbf{4 3}$ |
| Interpreting Information (5.2) |  |  |
| Total Test |  |  |

OMAAP Test Blueprint and Actual Item Counts: Grade 6 Reading

| OKC ${ }^{3}$ Standard and Objective | Ideal <br> Number of <br> Items for <br> Alignment <br> to OKC $^{\mathbf{3}}$ | Actual <br> Number of <br> Items on <br> 2013 Test |
| :--- | :---: | :---: |
| Vocabulary | $\mathbf{6 - 7}$ | $\mathbf{7}$ |
| Words in Context (1.1) | $4-5$ | 3 |
| Word Origins (1.2) | $2-3$ | 4 |
| Comprehension/Critical Literacy | $\mathbf{1 5 - 1 7}$ | $\mathbf{2 0}$ |
| Literal Understanding (3.1) | $4-5$ | 7 |
| Inferences and Interpretation (3.2) | $3-4$ | 4 |
| Summary and Generalization (3.3) | $3-4$ | 5 |
| Analysis and Evaluation (3.4) | $3-4$ | 4 |
| Literature | $\mathbf{1 0 - 1 2}$ | $\mathbf{1 1}$ |
| Literary Genres (4.1) | 3 | 2 |
| Literary Elements (4.2) | $3-4$ | 7 |
| Figurative Language/Sound Devices (4.3) | $3-4$ | 2 |
| Research and Information | $\mathbf{6 - 7}$ | $\mathbf{5}$ |
| Accessing Information (5.1) | $3-5$ | 3 |
| Interpreting Information (5.2) | $2-4$ | 2 |
| Total Test | $\mathbf{4 0 - 4 3}$ | $\mathbf{4 3}$ |


| OMAAP Test Blueprint and Actual Item Counts: Grade 7 Reading |  |  |
| :--- | :---: | :---: |
|  | Ideal <br> Number of <br> Items for <br> Alignment <br> to OKC $^{3}$ | Actual <br> Number of <br> Items on <br> 2013 Test |
| OKC $^{3}$ Standard and Objective | $\mathbf{6 - 8}$ | $\mathbf{9}$ |
| Vocabulary | $2-3$ | 5 |
| Words in Context (1.1) | $1-2$ | 2 |
| Word Origins (1.2) | $2-3$ | 2 |
| Idioms and Comparisons (1.3) | $\mathbf{1 5 - 1 7}$ | $\mathbf{1 8}$ |
| Comprehension/Critical Literacy | $3-4$ | 4 |
| Literal Understanding (3.1) | $4-6$ | 5 |
| Inferences and Interpretation (3.2) | $4-6$ | 5 |
| Summary and Generalization (3.3) | $3-4$ | 4 |
| Analysis and Evaluation (3.4) | $\mathbf{9 - 1 1}$ | $\mathbf{7}$ |
| Literature | $3-4$ | 4 |
| Literary Genres (4.1) | $3-4$ | 2 |
| Literary Elements (4.2) | $2-3$ | 1 |
| Figurative Language and Sound Devices (4.3) | $\mathbf{6 - 7}$ | $\mathbf{9}$ |
| Research and Information | $3-5$ | 5 |
| Accessing Information (5.1) | $2-4$ | 4 |
| Interpreting Information (5.2) | $\mathbf{4 0 - 4 3}$ | $\mathbf{4 3}$ |
| Total Test |  |  |


| OMAAP Test Blueprint and Actual Item Counts: Grade 8 Reading |  |  |
| :--- | :---: | :---: |
|  | Ideal <br> Number of <br> Items for <br> Alignment <br> to OKC $^{3}$ | Actual <br> Number of <br> Items on <br> 2013 Test |
| OKC $^{3}$ Standard and Objective | $\mathbf{6 - 7}$ | $\mathbf{1 2}$ |
| Vocabulary | $2-3$ | 6 |
| Words in Context (1.1) | $0-1$ | 0 |
| Word Origins (1.2) | $2-3$ | 6 |
| Idioms and Comparisons (1.3) | $\mathbf{1 6 - 1 8}$ | $\mathbf{1 7}$ |
| Comprehension/Critical Literacy | $3-4$ | 5 |
| Literal Understanding (3.1) | $4-5$ | 3 |
| Inferences and Interpretation (3.2) | $4-5$ | 2 |
| Summary and Generalization (3.3) | $4-5$ | 7 |
| Analysis and Evaluation (3.4) | $\mathbf{1 1 - 1 3}$ | $\mathbf{8}$ |
| Literature | $3-4$ | 3 |
| Literary Genre (4.1) | $5-6$ | 4 |
| Literary Elements (4.2) | $3-4$ | 1 |
| Figurative Language and Sound Devices (4.3) | $\mathbf{6 - 7}$ | $\mathbf{6}$ |
| Research and Information | $3-4$ | 4 |
| Accessing Information (5.1) | $2-4$ | 2 |
| Interpreting Information (5.2) | $\mathbf{4 0 - 4 3}$ | $\mathbf{4 3}$ |
| Total Test |  |  |

OMAAP Test Blueprint and Actual Item Counts: Grade 5 Science

| OKC ${ }^{3}$ Standard and Objective | Ideal <br> Number of Items for Alignment to $\mathrm{OKC}^{3}$ | Actual Number of Items on 2013 Test | Number of Items FieldTested in 2013 |
| :---: | :---: | :---: | :---: |
| Process Standards |  |  |  |
| Observe and Measure | 8-10 | 9 | 1 |
| SI Metric (P1.1) | 3-5 | 5 | 0 |
| Similar/different characteristics (P1.2) | 3-5 | 4 | 1 |
| Classify | 8-10 | 10 | 3 |
| Observable properties (P2.1) | 3-5 | 5 | 1 |
| Serial order (P2.2) | 3-5 | 5 | 2 |
| Experiment | 9-11 | 10 | 1 |
| Experimental design (P3.2) | 5-7 | 6 | 1 |
| Hazards/practice safety (P3.4) | 3-5 | 4 | 0 |
| Interpret and Communicate | 12-14 | 14 | 2 |
| Data tables/line/bar/trend and circle graphs (P4.2) | 4-6 | 4 | 0 |
| Prediction based on data (P4.3) | 3-5 | 4 | 1 |
| Explanations based on data (P4.4) | 3-5 | 6 | 1 |
| Total Test | 40-43 | 43 | 7 |
| Content Standards |  |  |  |
| Properties of Matter and Energy | 15-17 | 17 | 3 |
| Matter has physical properties (C1.1) | 4-6 | 5 | 0 |
| Physical properties can be measured (C1.2) | 4-6 | 6 | 0 |
| Energy can be transferred (C1.3) | 4-6 | 6 | 0 |
| Potential/Kinetic energy (C1.4) | 0 | 0 | 3 |
| Organisms and Environments | 10-12 | 11 | 1 |
| Dependence upon community (C2.1) | 4-6 | 5 | 1 |
| Individual organism and species survival (C2.2) | 4-6 | 6 | 0 |
| Structures of the Earth and the Solar System | 9-11 | 11 | 3 |
| Properties of soils (C3.1) | 0 | 0 | 3 |
| Weather patterns (C3.2) | 4-6 | 6 | 0 |
| Earth as a planet (C3.3) | 4-6 | 5 | 0 |
| Total Test | 37-40 | 39 | 7 |

* Items from the Safety Objective (P3.4) are not dual aligned to a content standard

OMAAP Test Blueprint and Actual Item Counts: Grade 8 Science

| OKC ${ }^{3}$ Standard and Objective | $\text { to } \mathrm{OKC}^{3}$ | 2013 Test | 2013 |
| :---: | :---: | :---: | :---: |
| Process Standards |  |  |  |
| Observe and Measure | 6-8 | 8 | 2 |
| Qualitative/quantitative observations/changes (P1.1) | 3-5 | 3 | 0 |
| SI (metrics) units/appropriate tools (P1.2 and P1.3) | 3-5 | 5 | 1 |
| Classify | 6-8 | 9 | 2 |
| Classification system (P2.1) | 3-5 | 4 | 2 |
| Properties ordered (P2.2) | 3-5 | 5 | 0 |
| Experiment | 13-15 | 14 | 2 |
| Experimental design (P3.2) | 4-6 | 5 | 1 |
| Identify variables (P3.3) | 4-6 | 5 | 0 |
| Hazards/practice safety (P3.6) | 3-5 | 4 | 1 |
| Interpret and Communicate | 11-13 | 12 | 2 |
| Data tables/line/bar/trend and circle graphs (P4.2) | 6-8 | 7 | 1 |
| Explanations/prediction (P4.3) | 4-6 | 5 | 1 |
| Total Test | 40-43 | 43 | 7 |
| Content Standards |  |  |  |
| Properties and Chemical Changes in Matter | 6-8 | 6 | 1 |
| Chemical reactions (C1.1) | 2-4 | 4 | 0 |
| Conservation of matter (C1.2) | 2-4 | 2 | 1 |
| Motion and Forces | 6-8 | 8 | 0 |
| Motion of an object (C2.1) | 2-4 | 5 | 0 |
| Object subjected to a force (C2.2) | 2-4 | 3 | 0 |
| Diversity and Adaptations of Organisms | 7-9 | 9 | 0 |
| Classification (C3.1) | 2-4 | 6 | 0 |
| Internal and external structures (C3.2) | 2-4 | 3 | 0 |
| Structures/Forces of the Earth/Solar System | 6-8 | 8 | 1 |
| Landforms result from constructive and destructive forces (C4.1) | 2-4 | 4 | 0 |
| Rock cycle (C4.2) | 2-4 | 4 | 0 |
| Global weather patterns (C4.3) | 0 | 0 | 1 |
| Earth's History | 6-8 | 8 | 2 |
| Catastrophic events (C5.1) | 2-4 | 3 | 2 |
| Fossil evidence (C5.2) | 2-4 | 5 | 0 |
| Total Test | 36-39 | 39 | 4 |

* Items from the Safety Objective (P3.4) are not dual aligned to a content standard


## Appendix B: Scale Score Distributions

Tables below show the Spring 2013 operational form score distribution. These analyses are based on the final student data file that is used for reporting.

MATH Grade 03 Scale Score Distribution

| Raw Score | Scale <br> Score | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 4 | 202 | 1 | 0.04 | 1 | 0.04 |
| 5 | 207 | 1 | 0.04 | 2 | 0.07 |
| 6 | 212 | 2 | 0.07 | 4 | 0.15 |
| 7 | 216 | 8 | 0.30 | 12 | 0.45 |
| 8 | 219 | 13 | 0.49 | 25 | 0.93 |
| 9 | 223 | 25 | 0.93 | 50 | 1.87 |
| 10 | 226 | 28 | 1.05 | 78 | 2.91 |
| 11 | 228 | 47 | 1.75 | 125 | 4.67 |
| 12 | 231 | 69 | 2.58 | 194 | 7.24 |
| 13 | 234 | 72 | 2.69 | 266 | 9.93 |
| 14 | 236 | 90 | 3.36 | 356 | 13.29 |
| 15 | 238 | 92 | 3.43 | 448 | 16.72 |
| 16 | 241 | 81 | 3.02 | 529 | 19.75 |
| 17 | 243 | 106 | 3.96 | 635 | 23.70 |
| 18 | 245 | 87 | 3.25 | 722 | 26.95 |
| 19 | 247 | 88 | 3.28 | 810 | 30.24 |
| 20 | 249 | 101 | 3.77 | 911 | 34.01 |
| 21 | 252 | 98 | 3.66 | 1009 | 37.66 |
| 22 | 254 | 109 | 4.07 | 1118 | 41.73 |
| 23 | 256 | 96 | 3.58 | 1214 | 45.32 |
| 24 | 258 | 107 | 3.99 | 1321 | 49.31 |
| 25 | 260 | 114 | 4.26 | 1435 | 53.56 |
| 26 | 262 | 81 | 3.02 | 1516 | 56.59 |
| 27 | 265 | 99 | 3.70 | 1615 | 60.28 |
| 28 | 267 | 92 | 3.43 | 1707 | 63.72 |
| 29 | 269 | 96 | 3.58 | 1803 | 67.30 |
| 30 | 272 | 113 | 4.22 | 1916 | 71.52 |
| 31 | 274 | 115 | 4.29 | 2031 | 75.81 |
| 32 | 277 | 75 | 2.80 | 2106 | 78.61 |
| 33 | 280 | 73 | 2.72 | 2179 | 81.34 |
| 34 | 283 | 84 | 3.14 | 2263 | 84.47 |
| 35 | 286 | 85 | 3.17 | 2348 | 87.64 |
| 36 | 290 | 62 | 2.31 | 2410 | 89.96 |
| 37 | 294 | 73 | 2.72 | 2483 | 92.68 |
| 38 | 298 | 46 | 1.72 | 2529 | 94.40 |
| 39 | 303 | 58 | 2.16 | 2587 | 96.57 |
| 40 | 310 | 37 | 1.38 | 2624 | 97.95 |
| 41 | 319 | 27 | 1.01 | 2651 | 98.95 |
| 42 | 333 | 20 | 0.75 | 2671 | 99.70 |
| 43 | 350 | 8 | 0.30 | 2679 | 100.00 |

## MATH Grade 03 Scale Score Distribution



MATH Grade 04 Scale Score Distribution

| Raw <br> Score | Scale <br> Score | Frequency | Percent | Cumulative <br> Frequency | Cumulative <br> Percent |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{5}$ | $\mathbf{2 0 7}$ | 1 | 0.03 | 1 | 0.03 |
| $\mathbf{6}$ | $\mathbf{2 1 1}$ | 2 | 0.07 | 3 | 0.10 |
| $\mathbf{7}$ | $\mathbf{2 1 5}$ | 3 | 0.10 | 6 | 0.20 |
| $\mathbf{8}$ | $\mathbf{2 1 9}$ | 8 | 0.26 | 14 | 0.46 |
| $\mathbf{9}$ | $\mathbf{2 2 2}$ | 14 | 0.46 | 28 | 0.91 |
| $\mathbf{1 0}$ | $\mathbf{2 2 5}$ | 24 | 0.78 | 52 | 1.69 |
| $\mathbf{1 1}$ | $\mathbf{2 2 8}$ | 20 | 0.65 | 72 | 2.34 |
| $\mathbf{1 2}$ | $\mathbf{2 3 0}$ | 41 | 1.33 | 113 | 3.67 |
| $\mathbf{1 3}$ | $\mathbf{2 3 3}$ | 65 | 2.11 | 178 | 5.79 |
| $\mathbf{1 4}$ | $\mathbf{2 3 5}$ | 72 | 2.34 | 250 | 8.13 |
| $\mathbf{1 5}$ | $\mathbf{2 3 7}$ | 100 | 3.25 | 350 | 11.38 |
| $\mathbf{1 6}$ | $\mathbf{2 4 0}$ | 91 | 2.96 | 441 | 14.34 |
| $\mathbf{1 7}$ | $\mathbf{2 4 2}$ | 104 | 3.38 | 545 | 17.72 |
| $\mathbf{1 8}$ | $\mathbf{2 4 4}$ | 98 | 3.19 | 643 | 20.90 |
| $\mathbf{1 9}$ | $\mathbf{2 4 6}$ | 119 | 3.87 | 762 | 24.77 |
| $\mathbf{2 0}$ | $\mathbf{2 4 8}$ | 109 | 3.54 | 871 | 28.32 |
| $\mathbf{2 1}$ | $\mathbf{2 5 0}$ | 94 | 3.06 | 965 | 31.37 |
| $\mathbf{2 2}$ | $\mathbf{2 5 2}$ | 115 | 3.74 | 1080 | 35.11 |
| $\mathbf{2 3}$ | $\mathbf{2 5 4}$ | 89 | 2.89 | 1169 | 38.00 |
| $\mathbf{2 4}$ | $\mathbf{2 5 6}$ | 134 | 4.36 | 1303 | 42.36 |
| $\mathbf{2 5}$ | $\mathbf{2 5 8}$ | 140 | 4.55 | 1443 | 46.91 |
| $\mathbf{2 6}$ | $\mathbf{2 6 1}$ | 137 | 4.45 | 1580 | 51.37 |
| $\mathbf{2 7}$ | $\mathbf{2 6 3}$ | 132 | 4.29 | 1712 | 55.66 |
| $\mathbf{2 8}$ | $\mathbf{2 6 5}$ | 135 | 4.39 | 1847 | 60.05 |
| $\mathbf{2 9}$ | $\mathbf{2 6 7}$ | 142 | 4.62 | 1989 | 64.66 |
| $\mathbf{3 0}$ | $\mathbf{2 7 0}$ | 134 | 4.36 | 2123 | 69.02 |
| $\mathbf{3 1}$ | $\mathbf{2 7 2}$ | 116 | 3.77 | 2239 | 72.79 |
| $\mathbf{3 2}$ | $\mathbf{2 7 5}$ | 129 | 4.19 | 2368 | 76.98 |
| $\mathbf{3 3}$ | $\mathbf{2 7 8}$ | 109 | 3.54 | 2477 | 80.53 |
| $\mathbf{3 4}$ | $\mathbf{2 8 0}$ | 90 | 2.93 | 2567 | 83.45 |
| $\mathbf{3 5}$ | $\mathbf{2 8 4}$ | 96 | 3.12 | 2663 | 86.57 |
| $\mathbf{3 6}$ | $\mathbf{2 8 7}$ | 93 | 3.02 | 2756 | 89.60 |
| $\mathbf{3 7}$ | $\mathbf{2 9 1}$ | 89 | 2.89 | 2845 | 92.49 |
| $\mathbf{3 8}$ | $\mathbf{2 9 5}$ | 70 | 2.28 | 2915 | 94.77 |
| $\mathbf{3 9}$ | $\mathbf{3 0 1}$ | 53 | 1.72 | 2968 | 96.49 |
| $\mathbf{4 0}$ | $\mathbf{3 0 7}$ | 57 | 1.85 | 3025 | 98.34 |
| $\mathbf{4 1}$ | $\mathbf{3 1 6}$ | 25 | 0.81 | 3050 | 99.15 |
| $\mathbf{4 2}$ | $\mathbf{3 3 1}$ | 25 | 0.81 | 3075 | 99.97 |
| $\mathbf{4 3}$ | $\mathbf{3 5 0}$ | 1 | 0.03 | 3076 | 100.00 |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

## MATH Grade 04 Scale Score Distribution



MATH Grade 05 Scale Score Distribution

| Raw <br> Score | Scale <br> Score | Frequency | Percent | Cumulative <br> Frequency | Cumulative Percent |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 4 | 208 | 1 | 0.03 | 1 | 0.03 |
| 5 | 213 | 2 | 0.06 | 3 | 0.08 |
| 6 | 217 | 6 | 0.17 | 9 | 0.25 |
| 7 | 221 | 18 | 0.50 | 27 | 0.75 |
| 8 | 225 | 18 | 0.50 | 45 | 1.24 |
| 9 | 228 | 49 | 1.36 | 94 | 2.60 |
| 10 | 231 | 60 | 1.66 | 154 | 4.26 |
| 11 | 234 | 86 | 2.38 | 240 | 6.64 |
| 12 | 236 | 124 | 3.43 | 364 | 10.07 |
| 13 | 239 | 163 | 4.51 | 527 | 14.58 |
| 14 | 241 | 173 | 4.79 | 700 | 19.36 |
| 15 | 244 | 231 | 6.39 | 931 | 25.75 |
| 16 | 246 | 203 | 5.62 | 1134 | 31.37 |
| 17 | 248 | 194 | 5.37 | 1328 | 36.74 |
| 18 | 250 | 203 | 5.62 | 1531 | 42.35 |
| 19 | 252 | 191 | 5.28 | 1722 | 47.63 |
| 20 | 255 | 144 | 3.98 | 1866 | 51.62 |
| 21 | 257 | 156 | 4.32 | 2022 | 55.93 |
| 22 | 259 | 149 | 4.12 | 2171 | 60.06 |
| 23 | 261 | 143 | 3.96 | 2314 | 64.01 |
| 24 | 263 | 127 | 3.51 | 2441 | 67.52 |
| 25 | 265 | 140 | 3.87 | 2581 | 71.40 |
| 26 | 267 | 116 | 3.21 | 2697 | 74.61 |
| 27 | 269 | 117 | 3.24 | 2814 | 77.84 |
| 28 | 271 | 116 | 3.21 | 2930 | 81.05 |
| 29 | 274 | 100 | 2.77 | 3030 | 83.82 |
| 30 | 276 | 89 | 2.46 | 3119 | 86.28 |
| 31 | 279 | 79 | 2.19 | 3198 | 88.46 |
| 32 | 281 | 66 | 1.83 | 3264 | 90.29 |
| 33 | 284 | 62 | 1.72 | 3326 | 92.01 |
| 34 | 287 | 70 | 1.94 | 3396 | 93.94 |
| 35 | 290 | 62 | 1.72 | 3458 | 95.66 |
| 36 | 293 | 45 | 1.24 | 3503 | 96.90 |
| 37 | 297 | 28 | 0.77 | 3531 | 97.68 |
| 38 | 302 | 31 | 0.86 | 3562 | 98.53 |
| 39 | 307 | 20 | 0.55 | 3582 | 99.09 |
| 40 | 313 | 19 | 0.53 | 3601 | 99.61 |
| 41 | 322 | 9 | 0.25 | 3610 | 99.86 |
| 42 | 337 | 5 | 0.14 | 3615 | 100.00 |

## MATH Grade 05 Scale Score Distribution



MATH Grade 06 Scale Score Distribution

| Raw <br> Score | Scale <br> Score | Frequency | Percent | Cumulative <br> Frequency | Cumulative <br> Percent |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{1}$ | $\mathbf{1 8 1}$ | 1 | 0.03 | 1 | 0.03 |
| $\mathbf{5}$ | $\mathbf{2 1 6}$ | 2 | 0.06 | 3 | 0.09 |
| $\mathbf{6}$ | $\mathbf{2 2 0}$ | 4 | 0.12 | 7 | 0.20 |
| $\mathbf{7}$ | $\mathbf{2 2 4}$ | 7 | 0.20 | 14 | 0.41 |
| $\mathbf{8}$ | $\mathbf{2 2 7}$ | 12 | 0.35 | 26 | 0.75 |
| $\mathbf{9}$ | $\mathbf{2 3 0}$ | 22 | 0.64 | 48 | 1.39 |
| $\mathbf{1 0}$ | $\mathbf{2 3 3}$ | 40 | 1.16 | 88 | 2.55 |
| $\mathbf{1 1}$ | $\mathbf{2 3 6}$ | 81 | 2.35 | 169 | 4.90 |
| $\mathbf{1 2}$ | $\mathbf{2 3 8}$ | 100 | 2.90 | 269 | 7.80 |
| $\mathbf{1 3}$ | $\mathbf{2 4 1}$ | 127 | 3.68 | 396 | 11.49 |
| $\mathbf{1 4}$ | $\mathbf{2 4 3}$ | 162 | 4.70 | 558 | 16.19 |
| $\mathbf{1 5}$ | $\mathbf{2 4 5}$ | 189 | 5.48 | 747 | 21.67 |
| $\mathbf{1 6}$ | $\mathbf{2 4 8}$ | 200 | 5.80 | 947 | 27.47 |
| $\mathbf{1 7}$ | $\mathbf{2 5 0}$ | 223 | 6.47 | 1170 | 33.94 |
| $\mathbf{1 8}$ | $\mathbf{2 5 2}$ | 211 | 6.12 | 1381 | 40.06 |
| $\mathbf{1 9}$ | $\mathbf{2 5 4}$ | 234 | 6.79 | 1615 | 46.85 |
| $\mathbf{2 0}$ | $\mathbf{2 5 6}$ | 196 | 5.69 | 1811 | 52.54 |
| $\mathbf{2 1}$ | $\mathbf{2 5 8}$ | 223 | 6.47 | 2034 | 59.01 |
| $\mathbf{2 2}$ | $\mathbf{2 6 0}$ | 199 | 5.77 | 2233 | 64.78 |
| $\mathbf{2 3}$ | $\mathbf{2 6 2}$ | 179 | 5.19 | 2412 | 69.97 |
| $\mathbf{2 4}$ | $\mathbf{2 6 4}$ | 158 | 4.58 | 2570 | 74.56 |
| $\mathbf{2 5}$ | $\mathbf{2 6 6}$ | 140 | 4.06 | 2710 | 78.62 |
| $\mathbf{2 6}$ | $\mathbf{2 6 8}$ | 116 | 3.37 | 2826 | 81.98 |
| $\mathbf{2 7}$ | $\mathbf{2 7 1}$ | 116 | 3.37 | 2942 | 85.35 |
| $\mathbf{2 8}$ | $\mathbf{2 7 3}$ | 104 | 3.02 | 3046 | 88.37 |
| $\mathbf{2 9}$ | $\mathbf{2 7 5}$ | 96 | 2.79 | 3142 | 91.15 |
| $\mathbf{3 0}$ | $\mathbf{2 7 8}$ | 69 | 2.00 | 3211 | 93.15 |
| $\mathbf{3 1}$ | $\mathbf{2 8 0}$ | 70 | 2.03 | 3281 | 95.18 |
| $\mathbf{3 2}$ | $\mathbf{2 8 3}$ | 45 | 1.31 | 3326 | 96.49 |
| $\mathbf{3 3}$ | $\mathbf{2 8 6}$ | 40 | 1.16 | 3366 | 97.65 |
| $\mathbf{3 4}$ | $\mathbf{2 8 9}$ | 24 | 0.70 | 3390 | 98.35 |
| $\mathbf{3 5}$ | $\mathbf{2 9 3}$ | 22 | 0.64 | 3412 | 98.98 |
| $\mathbf{3 6}$ | $\mathbf{2 9 7}$ | 15 | 0.44 | 3427 | 99.42 |
| $\mathbf{3 7}$ | $\mathbf{3 0 2}$ | 10 | 0.29 | 3437 | 99.71 |
| $\mathbf{3 8}$ | $\mathbf{3 0 9}$ | 5 | 0.15 | 3442 | 99.85 |
| $\mathbf{3 9}$ | $\mathbf{3 1 7}$ | 3 | 0.09 | 3445 | 99.94 |
| $\mathbf{4 0}$ | $\mathbf{3 3 1}$ | 2 | 0.06 | 3447 | 100.00 |
|  |  | 10 |  |  |  |

## MATH Grade 06 Scale Score Distribution



MATH Grade 07 Scale Score Distribution

| Raw <br> Score | Scale <br> Score | Frequency | Percent | Cumulative <br> Frequency | Cumulative <br> Percent |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{2}$ | $\mathbf{1 8 7}$ | 1 | 0.03 | 1 | 0.03 |
| $\mathbf{6}$ | $\mathbf{2 1 2}$ | 2 | 0.06 | 3 | 0.08 |
| $\mathbf{7}$ | $\mathbf{2 1 6}$ | 8 | 0.22 | 11 | 0.31 |
| $\mathbf{8}$ | $\mathbf{2 2 0}$ | 11 | 0.31 | 22 | 0.61 |
| $\mathbf{9}$ | $\mathbf{2 2 3}$ | 23 | 0.64 | 45 | 1.25 |
| $\mathbf{1 0}$ | $\mathbf{2 2 6}$ | 33 | 0.92 | 78 | 2.17 |
| $\mathbf{1 1}$ | $\mathbf{2 2 9}$ | 75 | 2.09 | 153 | 4.26 |
| $\mathbf{1 2}$ | $\mathbf{2 3 1}$ | 100 | 2.79 | 253 | 7.05 |
| $\mathbf{1 3}$ | $\mathbf{2 3 4}$ | 145 | 4.04 | 398 | 11.09 |
| $\mathbf{1 4}$ | $\mathbf{2 3 6}$ | 208 | 5.80 | 606 | 16.89 |
| $\mathbf{1 5}$ | $\mathbf{2 3 8}$ | 254 | 7.08 | 860 | 23.97 |
| $\mathbf{1 6}$ | $\mathbf{2 4 1}$ | 235 | 6.55 | 1095 | 30.52 |
| $\mathbf{1 7}$ | $\mathbf{2 4 3}$ | 271 | 7.55 | 1366 | 38.07 |
| $\mathbf{1 8}$ | $\mathbf{2 4 5}$ | 244 | 6.80 | 1610 | 44.87 |
| $\mathbf{1 9}$ | $\mathbf{2 4 7}$ | 236 | 6.58 | 1846 | 51.45 |
| $\mathbf{2 0}$ | $\mathbf{2 4 9}$ | 231 | 6.44 | 2077 | 57.89 |
| $\mathbf{2 1}$ | $\mathbf{2 5 1}$ | 221 | 6.16 | 2298 | 64.05 |
| $\mathbf{2 2}$ | $\mathbf{2 5 3}$ | 198 | 5.52 | 2496 | 69.57 |
| $\mathbf{2 3}$ | $\mathbf{2 5 5}$ | 153 | 4.26 | 2649 | 73.83 |
| $\mathbf{2 4}$ | $\mathbf{2 5 8}$ | 143 | 3.99 | 2792 | 77.81 |
| $\mathbf{2 5}$ | $\mathbf{2 6 0}$ | 106 | 2.95 | 2898 | 80.77 |
| $\mathbf{2 6}$ | $\mathbf{2 6 2}$ | 106 | 2.95 | 3004 | 83.72 |
| $\mathbf{2 7}$ | $\mathbf{2 6 4}$ | 109 | 3.04 | 3113 | 86.76 |
| $\mathbf{2 8}$ | $\mathbf{2 6 6}$ | 99 | 2.76 | 3212 | 89.52 |
| $\mathbf{2 9}$ | $\mathbf{2 6 8}$ | 74 | 2.06 | 3286 | 91.58 |
| $\mathbf{3 0}$ | $\mathbf{2 7 1}$ | 68 | 1.90 | 3354 | 93.48 |
| $\mathbf{3 1}$ | $\mathbf{2 7 3}$ | 51 | 1.42 | 3405 | 94.90 |
| $\mathbf{3 2}$ | $\mathbf{2 7 6}$ | 36 | 1.00 | 3441 | 95.90 |
| $\mathbf{3 3}$ | $\mathbf{2 7 9}$ | 37 | 1.03 | 3478 | 96.93 |
| $\mathbf{3 4}$ | $\mathbf{2 8 2}$ | 29 | 0.81 | 3507 | 97.74 |
| $\mathbf{3 5}$ | $\mathbf{2 8 5}$ | 27 | 0.75 | 3534 | 98.49 |
| $\mathbf{3 6}$ | $\mathbf{2 8 8}$ | 22 | 0.61 | 3556 | 99.11 |
| $\mathbf{3 7}$ | $\mathbf{2 9 2}$ | 12 | 0.33 | 3568 | 99.44 |
| $\mathbf{3 8}$ | $\mathbf{2 9 6}$ | 12 | 0.33 | 3580 | 99.78 |
| $\mathbf{3 9}$ | $\mathbf{3 0 2}$ | 2 | 0.06 | 3582 | 99.83 |
| $\mathbf{4 0}$ | $\mathbf{3 0 8}$ | 3 | 0.08 | 3585 | 99.92 |
| $\mathbf{4 2}$ | $\mathbf{3 3 2}$ | 3 | 0.08 | 3588 | 100.00 |

## MATH Grade 07 Scale Score Distribution



MATH Grade 08 Scale Score Distribution

| Raw <br> Score | Scale <br> Score | Frequency | Percent | Cumulative <br> Frequency | Cumulative <br> Percent |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{4}$ | $\mathbf{2 0 5}$ | 1 | 0.03 | 1 | 0.03 |
| $\mathbf{5}$ | $\mathbf{2 1 1}$ | 2 | 0.05 | 3 | 0.08 |
| $\mathbf{6}$ | $\mathbf{2 1 5}$ | 3 | 0.08 | 6 | 0.16 |
| $\mathbf{7}$ | $\mathbf{2 1 9}$ | 10 | 0.27 | 16 | 0.44 |
| $\mathbf{8}$ | $\mathbf{2 2 2}$ | 15 | 0.41 | 31 | 0.85 |
| $\mathbf{9}$ | $\mathbf{2 2 5}$ | 32 | 0.88 | 63 | 1.73 |
| $\mathbf{1 0}$ | $\mathbf{2 2 8}$ | 45 | 1.24 | 108 | 2.97 |
| $\mathbf{1 1}$ | $\mathbf{2 3 1}$ | 90 | 2.47 | 198 | 5.44 |
| $\mathbf{1 2}$ | $\mathbf{2 3 3}$ | 125 | 3.44 | 323 | 8.88 |
| $\mathbf{1 3}$ | $\mathbf{2 3 6}$ | 121 | 3.33 | 444 | 12.20 |
| $\mathbf{1 4}$ | $\mathbf{2 3 8}$ | 155 | 4.26 | 599 | 16.46 |
| $\mathbf{1 5}$ | $\mathbf{2 4 0}$ | 160 | 4.40 | 759 | 20.86 |
| $\mathbf{1 6}$ | $\mathbf{2 4 2}$ | 171 | 4.70 | 930 | 25.56 |
| $\mathbf{1 7}$ | $\mathbf{2 4 4}$ | 187 | 5.14 | 1117 | 30.70 |
| $\mathbf{1 8}$ | $\mathbf{2 4 6}$ | 186 | 5.11 | 1303 | 35.81 |
| $\mathbf{1 9}$ | $\mathbf{2 4 9}$ | 187 | 5.14 | 1490 | 40.95 |
| $\mathbf{2 0}$ | $\mathbf{2 5 1}$ | 183 | 5.03 | 1673 | 45.97 |
| $\mathbf{2 1}$ | $\mathbf{2 5 3}$ | 187 | 5.14 | 1860 | 51.11 |
| $\mathbf{2 2}$ | $\mathbf{2 5 5}$ | 188 | 5.17 | 2048 | 56.28 |
| $\mathbf{2 3}$ | $\mathbf{2 5 7}$ | 190 | 5.22 | 2238 | 61.50 |
| $\mathbf{2 4}$ | $\mathbf{2 5 9}$ | 168 | 4.62 | 2406 | 66.12 |
| $\mathbf{2 5}$ | $\mathbf{2 6 1}$ | 153 | 4.20 | 2559 | 70.32 |
| $\mathbf{2 6}$ | $\mathbf{2 6 3}$ | 148 | 4.07 | 2707 | 74.39 |
| $\mathbf{2 7}$ | $\mathbf{2 6 5}$ | 132 | 3.63 | 2839 | 78.02 |
| $\mathbf{2 8}$ | $\mathbf{2 6 7}$ | 121 | 3.33 | 2960 | 81.34 |
| $\mathbf{2 9}$ | $\mathbf{2 6 9}$ | 123 | 3.38 | 3083 | 84.72 |
| $\mathbf{3 0}$ | $\mathbf{2 7 1}$ | 121 | 3.33 | 3204 | 88.05 |
| $\mathbf{3 1}$ | $\mathbf{2 7 4}$ | 88 | 2.42 | 3292 | 90.46 |
| $\mathbf{3 2}$ | $\mathbf{2 7 6}$ | 87 | 2.39 | 3379 | 92.86 |
| $\mathbf{3 3}$ | $\mathbf{2 7 9}$ | 70 | 1.92 | 3449 | 94.78 |
| $\mathbf{3 4}$ | $\mathbf{2 8 2}$ | 56 | 1.54 | 3505 | 96.32 |
| $\mathbf{3 5}$ | $\mathbf{2 8 5}$ | 45 | 1.24 | 3550 | 97.55 |
| $\mathbf{3 6}$ | $\mathbf{2 8 8}$ | 26 | 0.71 | 3576 | 98.27 |
| $\mathbf{3 7}$ | $\mathbf{2 9 2}$ | 22 | 0.60 | 3598 | 98.87 |
| $\mathbf{3 8}$ | $\mathbf{2 9 7}$ | 19 | 0.52 | 3617 | 99.40 |
| $\mathbf{3 9}$ | $\mathbf{3 0 2}$ | 8 | 0.22 | 3625 | 99.62 |
| $\mathbf{4 0}$ | $\mathbf{3 0 8}$ | 11 | 0.30 | 3636 | 99.92 |
| $\mathbf{4 1}$ | $\mathbf{3 1 7}$ | 2 | 0.05 | 3638 | 99.97 |
| $\mathbf{4 2}$ | $\mathbf{3 3 2}$ | 1 | 0.03 | 3639 | 100.00 |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

## MATH Grade 08 Scale Score Distribution



READING Grade 03 Scale Score Distribution

| Raw Score | Scale <br> Score | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 2 | 191 | 1 | 0.03 | 1 | 0.03 |
| 3 | 200 | 1 | 0.03 | 2 | 0.06 |
| 4 | 207 | 1 | 0.03 | 3 | 0.09 |
| 5 | 212 | 2 | 0.06 | 5 | 0.16 |
| 6 | 216 | 3 | 0.09 | 8 | 0.25 |
| 7 | 220 | 13 | 0.40 | 21 | 0.65 |
| 8 | 224 | 21 | 0.65 | 42 | 1.30 |
| 9 | 227 | 38 | 1.18 | 80 | 2.48 |
| 10 | 230 | 72 | 2.24 | 152 | 4.72 |
| 11 | 232 | 110 | 3.42 | 262 | 8.13 |
| 12 | 235 | 142 | 4.41 | 404 | 12.54 |
| 13 | 237 | 159 | 4.94 | 563 | 17.48 |
| 14 | 240 | 198 | 6.15 | 761 | 23.63 |
| 15 | 242 | 179 | 5.56 | 940 | 29.18 |
| 16 | 244 | 214 | 6.64 | 1154 | 35.83 |
| 17 | 246 | 175 | 5.43 | 1329 | 41.26 |
| 18 | 248 | 142 | 4.41 | 1471 | 45.67 |
| 19 | 250 | 140 | 4.35 | 1611 | 50.02 |
| 20 | 252 | 116 | 3.60 | 1727 | 53.62 |
| 21 | 254 | 125 | 3.88 | 1852 | 57.50 |
| 22 | 256 | 91 | 2.83 | 1943 | 60.32 |
| 23 | 258 | 91 | 2.83 | 2034 | 63.15 |
| 24 | 260 | 96 | 2.98 | 2130 | 66.13 |
| 25 | 262 | 88 | 2.73 | 2218 | 68.86 |
| 26 | 264 | 80 | 2.48 | 2298 | 71.34 |
| 27 | 267 | 81 | 2.51 | 2379 | 73.86 |
| 28 | 269 | 76 | 2.36 | 2455 | 76.22 |
| 29 | 271 | 81 | 2.51 | 2536 | 78.73 |
| 30 | 273 | 78 | 2.42 | 2614 | 81.15 |
| 31 | 276 | 95 | 2.95 | 2709 | 84.10 |
| 32 | 278 | 68 | 2.11 | 2777 | 86.22 |
| 33 | 281 | 66 | 2.05 | 2843 | 88.26 |
| 34 | 284 | 103 | 3.20 | 2946 | 91.46 |
| 35 | 287 | 67 | 2.08 | 3013 | 93.54 |
| 36 | 290 | 65 | 2.02 | 3078 | 95.56 |
| 37 | 294 | 39 | 1.21 | 3117 | 96.77 |
| 38 | 299 | 34 | 1.06 | 3151 | 97.83 |
| 39 | 304 | 29 | 0.90 | 3180 | 98.73 |
| 40 | 311 | 19 | 0.59 | 3199 | 99.32 |
| 41 | 320 | 12 | 0.37 | 3211 | 99.69 |
| 42 | 335 | 9 | 0.28 | 3220 | 99.97 |
| 43 | 350 | 1 | 0.03 | 3221 | 100.00 |

## READING Grade 03 Scale Score Distribution



READING Grade 04 Scale Score Distribution

| Raw <br> Score | Scale <br> Score | Frequency | Percent | Cumulative <br> Frequency | Cumulative <br> Percent |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{2}$ | $\mathbf{1 9 5}$ | 1 | 0.03 | 1 | 0.03 |
| $\mathbf{3}$ | $\mathbf{2 0 4}$ | 1 | 0.03 | 2 | 0.05 |
| $\mathbf{4}$ | $\mathbf{2 1 0}$ | 1 | 0.03 | 3 | 0.08 |
| $\mathbf{5}$ | $\mathbf{2 1 6}$ | 2 | 0.05 | 5 | 0.14 |
| $\mathbf{6}$ | $\mathbf{2 2 0}$ | 2 | 0.05 | 7 | 0.19 |
| $\mathbf{7}$ | $\mathbf{2 2 4}$ | 8 | 0.22 | 15 | 0.41 |
| $\mathbf{8}$ | $\mathbf{2 2 7}$ | 22 | 0.60 | 37 | 1.01 |
| $\mathbf{9}$ | $\mathbf{2 3 1}$ | 38 | 1.04 | 75 | 2.06 |
| $\mathbf{1 0}$ | $\mathbf{2 3 4}$ | 65 | 1.78 | 140 | 3.84 |
| $\mathbf{1 1}$ | $\mathbf{2 3 6}$ | 96 | 2.63 | 236 | 6.47 |
| $\mathbf{1 2}$ | $\mathbf{2 3 9}$ | 105 | 2.88 | 341 | 9.35 |
| $\mathbf{1 3}$ | $\mathbf{2 4 1}$ | 143 | 3.92 | 484 | 13.27 |
| $\mathbf{1 4}$ | $\mathbf{2 4 4}$ | 171 | 4.69 | 655 | 17.96 |
| $\mathbf{1 5}$ | $\mathbf{2 4 6}$ | 182 | 4.99 | 837 | 22.95 |
| $\mathbf{1 6}$ | $\mathbf{2 4 8}$ | 168 | 4.61 | 1005 | 27.56 |
| $\mathbf{1 7}$ | $\mathbf{2 5 0}$ | 189 | 5.18 | 1194 | 32.74 |
| $\mathbf{1 8}$ | $\mathbf{2 5 2}$ | 180 | 4.94 | 1374 | 37.67 |
| $\mathbf{1 9}$ | $\mathbf{2 5 4}$ | 155 | 4.25 | 1529 | 41.92 |
| $\mathbf{2 0}$ | $\mathbf{2 5 6}$ | 152 | 4.17 | 1681 | 46.09 |
| $\mathbf{2 1}$ | $\mathbf{2 5 8}$ | 136 | 3.73 | 1817 | 49.82 |
| $\mathbf{2 2}$ | $\mathbf{2 6 0}$ | 151 | 4.14 | 1968 | 53.96 |
| $\mathbf{2 3}$ | $\mathbf{2 6 2}$ | 154 | 4.22 | 2122 | 58.18 |
| $\mathbf{2 4}$ | $\mathbf{2 6 4}$ | 144 | 3.95 | 2266 | 62.13 |
| $\mathbf{2 5}$ | $\mathbf{2 6 6}$ | 143 | 3.92 | 2409 | 66.05 |
| $\mathbf{2 6}$ | $\mathbf{2 6 9}$ | 120 | 3.29 | 2529 | 69.34 |
| $\mathbf{2 7}$ | $\mathbf{2 7 1}$ | 107 | 2.93 | 2636 | 72.28 |
| $\mathbf{2 8}$ | $\mathbf{2 7 3}$ | 128 | 3.51 | 2764 | 75.79 |
| $\mathbf{2 9}$ | $\mathbf{2 7 5}$ | 114 | 3.13 | 2878 | 78.91 |
| $\mathbf{3 0}$ | $\mathbf{2 7 7}$ | 111 | 3.04 | 2989 | 81.96 |
| $\mathbf{3 1}$ | $\mathbf{2 8 0}$ | 98 | 2.69 | 3087 | 84.64 |
| $\mathbf{3 2}$ | $\mathbf{2 8 2}$ | 91 | 2.50 | 3178 | 87.14 |
| $\mathbf{3 3}$ | $\mathbf{2 8 5}$ | 114 | 3.13 | 3292 | 90.27 |
| $\mathbf{3 4}$ | $\mathbf{2 8 8}$ | 81 | 2.22 | 3373 | 92.49 |
| $\mathbf{3 5}$ | $\mathbf{2 9 1}$ | 69 | 1.89 | 3442 | 94.38 |
| $\mathbf{3 6}$ | $\mathbf{2 9 5}$ | 51 | 1.40 | 3493 | 95.78 |
| $\mathbf{3 7}$ | $\mathbf{2 9 9}$ | 51 | 1.40 | 3544 | 97.18 |
| $\mathbf{3 8}$ | $\mathbf{3 0 3}$ | 28 | 0.77 | 3572 | 97.94 |
| $\mathbf{3 9}$ | $\mathbf{3 0 8}$ | 27 | 0.74 | 3599 | 98.68 |
| $\mathbf{4 0}$ | $\mathbf{3 1 5}$ | 25 | 0.69 | 3624 | 99.37 |
| $\mathbf{4 1}$ | $\mathbf{3 2 4}$ | 14 | 0.38 | 3638 | 99.75 |
| $\mathbf{4 2}$ | $\mathbf{3 3 9}$ | 8 | 0.22 | 3646 | 99.97 |
| $\mathbf{4 3}$ | $\mathbf{3 5 0}$ | 1 | 0.03 | 3647 | 100.00 |
|  |  |  |  |  |  |

## READING Grade 04 Scale Score Distribution



## READING Grade 05 Scale Score Distribution

| Raw <br> Score | Scale <br> Score | Frequency | Percent | Cumulative <br> Frequency | Cumulative <br> Percent |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{1}$ | $\mathbf{1 7 3}$ | 1 | 0.02 | 1 | 0.02 |
| $\mathbf{3}$ | $\mathbf{1 9 7}$ | 1 | 0.02 | 2 | 0.05 |
| $\mathbf{4}$ | $\mathbf{2 0 3}$ | 2 | 0.05 | 4 | 0.10 |
| $\mathbf{5}$ | $\mathbf{2 0 9}$ | 2 | 0.05 | 6 | 0.15 |
| $\mathbf{6}$ | $\mathbf{2 1 3}$ | 3 | 0.07 | 9 | 0.22 |
| $\mathbf{7}$ | $\mathbf{2 1 7}$ | 6 | 0.15 | 15 | 0.37 |
| $\mathbf{8}$ | $\mathbf{2 2 0}$ | 15 | 0.37 | 30 | 0.74 |
| $\mathbf{9}$ | $\mathbf{2 2 3}$ | 31 | 0.76 | 61 | 1.51 |
| $\mathbf{1 0}$ | $\mathbf{2 2 6}$ | 28 | 0.69 | 89 | 2.20 |
| $\mathbf{1 1}$ | $\mathbf{2 2 9}$ | 83 | 2.05 | 172 | 4.24 |
| $\mathbf{1 2}$ | $\mathbf{2 3 2}$ | 89 | 2.20 | 261 | 6.44 |
| $\mathbf{1 3}$ | $\mathbf{2 3 4}$ | 132 | 3.26 | 393 | 9.70 |
| $\mathbf{1 4}$ | $\mathbf{2 3 6}$ | 130 | 3.21 | 523 | 12.90 |
| $\mathbf{1 5}$ | $\mathbf{2 3 9}$ | 146 | 3.60 | 669 | 16.51 |
| $\mathbf{1 6}$ | $\mathbf{2 4 1}$ | 184 | 4.54 | 853 | 21.05 |
| $\mathbf{1 7}$ | $\mathbf{2 4 3}$ | 182 | 4.49 | 1035 | 25.54 |
| $\mathbf{1 8}$ | $\mathbf{2 4 5}$ | 195 | 4.81 | 1230 | 30.35 |
| $\mathbf{1 9}$ | $\mathbf{2 4 7}$ | 205 | 5.06 | 1435 | 35.41 |
| $\mathbf{2 0}$ | $\mathbf{2 4 9}$ | 170 | 4.19 | 1605 | 39.60 |
| $\mathbf{2 1}$ | $\mathbf{2 5 1}$ | 191 | 4.71 | 1796 | 44.31 |
| $\mathbf{2 2}$ | $\mathbf{2 5 3}$ | 178 | 4.39 | 1974 | 48.70 |
| $\mathbf{2 3}$ | $\mathbf{2 5 5}$ | 183 | 4.52 | 2157 | 53.22 |
| $\mathbf{2 4}$ | $\mathbf{2 5 7}$ | 159 | 3.92 | 2316 | 57.14 |
| $\mathbf{2 5}$ | $\mathbf{2 5 9}$ | 148 | 3.65 | 2464 | 60.79 |
| $\mathbf{2 6}$ | $\mathbf{2 6 1}$ | 145 | 3.58 | 2609 | 64.37 |
| $\mathbf{2 7}$ | $\mathbf{2 6 4}$ | 150 | 3.70 | 2759 | 68.07 |
| $\mathbf{2 8}$ | $\mathbf{2 6 6}$ | 166 | 4.10 | 2925 | 72.17 |
| $\mathbf{2 9}$ | $\mathbf{2 6 8}$ | 133 | 3.28 | 3058 | 75.45 |
| $\mathbf{3 0}$ | $\mathbf{2 7 0}$ | 126 | 3.11 | 3184 | 78.56 |
| $\mathbf{3 1}$ | $\mathbf{2 7 3}$ | 133 | 3.28 | 3317 | 81.84 |
| $\mathbf{3 2}$ | $\mathbf{2 7 5}$ | 122 | 3.01 | 3439 | 84.85 |
| $\mathbf{3 3}$ | $\mathbf{2 7 8}$ | 108 | 2.66 | 3547 | 87.52 |
| $\mathbf{3 4}$ | $\mathbf{2 8 1}$ | 108 | 2.66 | 3655 | 90.18 |
| $\mathbf{3 5}$ | $\mathbf{2 8 4}$ | 96 | 2.37 | 3751 | 92.55 |
| $\mathbf{3 6}$ | $\mathbf{2 8 7}$ | 87 | 2.15 | 3838 | 94.70 |
| $\mathbf{3 7}$ | $\mathbf{2 9 1}$ | 71 | 1.75 | 3909 | 96.45 |
| $\mathbf{3 8}$ | $\mathbf{2 9 6}$ | 50 | 1.23 | 3959 | 97.68 |
| $\mathbf{3 9}$ | $\mathbf{3 0 1}$ | 49 | 1.21 | 4008 | 98.89 |
| $\mathbf{4 0}$ | $\mathbf{3 0 8}$ | 25 | 0.62 | 4033 | 99.51 |
| $\mathbf{4 1}$ | $\mathbf{3 1 7}$ | 17 | 0.42 | 4050 | 99.93 |
| $\mathbf{4 2}$ | $\mathbf{3 3 2}$ | 1 | 0.02 | 4051 | 99.95 |
| $\mathbf{4 3}$ | $\mathbf{3 5 0}$ | 2 | 0.05 | 4053 | 100.00 |
|  |  |  |  |  |  |

## READING Grade 05 Scale Score Distribution



READING Grade 06 Scale Score Distribution

| Raw <br> Score | Scale <br> Score | Frequency | Percent | Cumulative <br> Frequency | Cumulative <br> Percent |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{6}$ | $\mathbf{2 1 3}$ | 2 | 0.06 | 2 | 0.06 |
| $\mathbf{7}$ | $\mathbf{2 1 7}$ | 3 | 0.08 | 5 | 0.14 |
| $\mathbf{8}$ | $\mathbf{2 2 1}$ | 6 | 0.17 | 11 | 0.30 |
| $\mathbf{9}$ | $\mathbf{2 2 4}$ | 15 | 0.41 | 26 | 0.72 |
| $\mathbf{1 0}$ | $\mathbf{2 2 7}$ | 22 | 0.61 | 48 | 1.32 |
| $\mathbf{1 1}$ | $\mathbf{2 3 0}$ | 57 | 1.57 | 105 | 2.90 |
| $\mathbf{1 2}$ | $\mathbf{2 3 3}$ | 70 | 1.93 | 175 | 4.83 |
| $\mathbf{1 3}$ | $\mathbf{2 3 6}$ | 111 | 3.06 | 286 | 7.89 |
| $\mathbf{1 4}$ | $\mathbf{2 3 8}$ | 131 | 3.61 | 417 | 11.50 |
| $\mathbf{1 5}$ | $\mathbf{2 4 1}$ | 156 | 4.30 | 573 | 15.80 |
| $\mathbf{1 6}$ | $\mathbf{2 4 3}$ | 199 | 5.49 | 772 | 21.29 |
| $\mathbf{1 7}$ | $\mathbf{2 4 5}$ | 216 | 5.96 | 988 | 27.25 |
| $\mathbf{1 8}$ | $\mathbf{2 4 7}$ | 217 | 5.98 | 1205 | 33.23 |
| $\mathbf{1 9}$ | $\mathbf{2 5 0}$ | 223 | 6.15 | 1428 | 39.38 |
| $\mathbf{2 0}$ | $\mathbf{2 5 2}$ | 217 | 5.98 | 1645 | 45.37 |
| $\mathbf{2 1}$ | $\mathbf{2 5 4}$ | 187 | 5.16 | 1832 | 50.52 |
| $\mathbf{2 2}$ | $\mathbf{2 5 6}$ | 176 | 4.85 | 2008 | 55.38 |
| $\mathbf{2 3}$ | $\mathbf{2 5 8}$ | 177 | 4.88 | 2185 | 60.26 |
| $\mathbf{2 4}$ | $\mathbf{2 6 0}$ | 158 | 4.36 | 2343 | 64.62 |
| $\mathbf{2 5}$ | $\mathbf{2 6 2}$ | 154 | 4.25 | 2497 | 68.86 |
| $\mathbf{2 6}$ | $\mathbf{2 6 5}$ | 141 | 3.89 | 2638 | 72.75 |
| $\mathbf{2 7}$ | $\mathbf{2 6 7}$ | 131 | 3.61 | 2769 | 76.37 |
| $\mathbf{2 8}$ | $\mathbf{2 6 9}$ | 123 | 3.39 | 2892 | 79.76 |
| $\mathbf{2 9}$ | $\mathbf{2 7 2}$ | 101 | 2.79 | 2993 | 82.54 |
| $\mathbf{3 0}$ | $\mathbf{2 7 4}$ | 114 | 3.14 | 3107 | 85.69 |
| $\mathbf{3 1}$ | $\mathbf{2 7 7}$ | 100 | 2.76 | 3207 | 88.44 |
| $\mathbf{3 2}$ | $\mathbf{2 7 9}$ | 88 | 2.43 | 3295 | 90.87 |
| $\mathbf{3 3}$ | $\mathbf{2 8 2}$ | 83 | 2.29 | 3378 | 93.16 |
| $\mathbf{3 4}$ | $\mathbf{2 8 5}$ | 64 | 1.77 | 3442 | 94.93 |
| $\mathbf{3 5}$ | $\mathbf{2 8 9}$ | 51 | 1.41 | 3493 | 96.33 |
| $\mathbf{3 6}$ | $\mathbf{2 9 2}$ | 40 | 1.10 | 3533 | 97.44 |
| $\mathbf{3 7}$ | $\mathbf{2 9 6}$ | 43 | 1.19 | 3576 | 98.62 |
| $\mathbf{3 8}$ | $\mathbf{3 0 1}$ | 22 | 0.61 | 3598 | 99.23 |
| $\mathbf{3 9}$ | $\mathbf{3 0 6}$ | 12 | 0.33 | 3610 | 99.56 |
| $\mathbf{4 0}$ | $\mathbf{3 1 3}$ | 11 | 0.30 | 3621 | 99.86 |
| $\mathbf{4 1}$ | $\mathbf{3 2 3}$ | 2 | 0.06 | 3623 | 99.92 |
| $\mathbf{4 2}$ | $\mathbf{3 3 9}$ | 3 | 0.08 | 3626 | 100.00 |

## READING Grade 06 Scale Score Distribution



READING Grade 07 Scale Score Distribution

| Raw <br> Score | Scale <br> Score | Frequency | Percent | Cumulative <br> Frequency | Cumulative <br> Percent |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{5}$ | $\mathbf{2 0 6}$ | 3 | 0.08 | 3 | 0.08 |
| $\mathbf{6}$ | $\mathbf{2 1 0}$ | 2 | 0.06 | 5 | 0.14 |
| $\mathbf{7}$ | $\mathbf{2 1 4}$ | 7 | 0.20 | 12 | 0.34 |
| $\mathbf{8}$ | $\mathbf{2 1 8}$ | 18 | 0.50 | 30 | 0.84 |
| $\mathbf{9}$ | $\mathbf{2 2 1}$ | 25 | 0.70 | 55 | 1.54 |
| $\mathbf{1 0}$ | $\mathbf{2 2 4}$ | 30 | 0.84 | 85 | 2.38 |
| $\mathbf{1 1}$ | $\mathbf{2 2 7}$ | 65 | 1.82 | 150 | 4.19 |
| $\mathbf{1 2}$ | $\mathbf{2 3 0}$ | 85 | 2.38 | 235 | 6.57 |
| $\mathbf{1 3}$ | $\mathbf{2 3 3}$ | 99 | 2.77 | 334 | 9.34 |
| $\mathbf{1 4}$ | $\mathbf{2 3 5}$ | 148 | 4.14 | 482 | 13.48 |
| $\mathbf{1 5}$ | $\mathbf{2 3 7}$ | 178 | 4.98 | 660 | 18.46 |
| $\mathbf{1 6}$ | $\mathbf{2 4 0}$ | 191 | 5.34 | 851 | 23.80 |
| $\mathbf{1 7}$ | $\mathbf{2 4 2}$ | 184 | 5.15 | 1035 | 28.94 |
| $\mathbf{1 8}$ | $\mathbf{2 4 4}$ | 183 | 5.12 | 1218 | 34.06 |
| $\mathbf{1 9}$ | $\mathbf{2 4 6}$ | 187 | 5.23 | 1405 | 39.29 |
| $\mathbf{2 0}$ | $\mathbf{2 4 9}$ | 165 | 4.61 | 1570 | 43.90 |
| $\mathbf{2 1}$ | $\mathbf{2 5 1}$ | 177 | 4.95 | 1747 | 48.85 |
| $\mathbf{2 2}$ | $\mathbf{2 5 3}$ | 170 | 4.75 | 1917 | 53.61 |
| $\mathbf{2 3}$ | $\mathbf{2 5 5}$ | 192 | 5.37 | 2109 | 58.98 |
| $\mathbf{2 4}$ | $\mathbf{2 5 7}$ | 150 | 4.19 | 2259 | 63.17 |
| $\mathbf{2 5}$ | $\mathbf{2 5 9}$ | 166 | 4.64 | 2425 | 67.81 |
| $\mathbf{2 6}$ | $\mathbf{2 6 2}$ | 138 | 3.86 | 2563 | 71.67 |
| $\mathbf{2 7}$ | $\mathbf{2 6 4}$ | 145 | 4.05 | 2708 | 75.73 |
| $\mathbf{2 8}$ | $\mathbf{2 6 6}$ | 105 | 2.94 | 2813 | 78.66 |
| $\mathbf{2 9}$ | $\mathbf{2 6 9}$ | 113 | 3.16 | 2926 | 81.82 |
| $\mathbf{3 0}$ | $\mathbf{2 7 1}$ | 117 | 3.27 | 3043 | 85.10 |
| $\mathbf{3 1}$ | $\mathbf{2 7 4}$ | 98 | 2.74 | 3141 | 87.84 |
| $\mathbf{3 2}$ | $\mathbf{2 7 6}$ | 104 | 2.91 | 3245 | 90.74 |
| $\mathbf{3 3}$ | $\mathbf{2 7 9}$ | 86 | 2.40 | 3331 | 93.15 |
| $\mathbf{3 4}$ | $\mathbf{2 8 2}$ | 72 | 2.01 | 3403 | 95.16 |
| $\mathbf{3 5}$ | $\mathbf{2 8 6}$ | 43 | 1.20 | 3446 | 96.36 |
| $\mathbf{3 6}$ | $\mathbf{2 8 9}$ | 35 | 0.98 | 3481 | 97.34 |
| $\mathbf{3 7}$ | $\mathbf{2 9 3}$ | 38 | 1.06 | 3519 | 98.41 |
| $\mathbf{3 8}$ | $\mathbf{2 9 8}$ | 25 | 0.70 | 3544 | 99.11 |
| $\mathbf{3 9}$ | $\mathbf{3 0 4}$ | 17 | 0.48 | 3561 | 99.58 |
| $\mathbf{4 0}$ | $\mathbf{3 1 0}$ | 8 | 0.22 | 3569 | 99.80 |
| $\mathbf{4 1}$ | $\mathbf{3 2 0}$ | 6 | 0.17 | 3575 | 99.97 |
| $\mathbf{4 3}$ | $\mathbf{3 5 0}$ | 1 | 0.03 | 3576 | 100.00 |
|  |  |  |  |  |  |

## READING Grade 07 Scale Score Distribution



READING Grade 08 Scale Score Distribution

| Raw Score | Scale Score | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 171 | 1 | 0.03 | 1 | 0.03 |
| 2 | 186 | 1 | 0.03 | 2 | 0.06 |
| 5 | 208 | 2 | 0.06 | 4 | 0.11 |
| 6 | 212 | 3 | 0.09 | 7 | 0.20 |
| 7 | 216 | 4 | 0.11 | 11 | 0.31 |
| 8 | 220 | 9 | 0.26 | 20 | 0.57 |
| 9 | 223 | 17 | 0.48 | 37 | 1.05 |
| 10 | 226 | 44 | 1.25 | 81 | 2.30 |
| 11 | 229 | 40 | 1.13 | 121 | 3.43 |
| 12 | 231 | 67 | 1.90 | 188 | 5.33 |
| 13 | 234 | 101 | 2.86 | 289 | 8.19 |
| 14 | 236 | 117 | 3.32 | 406 | 11.51 |
| 15 | 239 | 133 | 3.77 | 539 | 15.28 |
| 16 | 241 | 121 | 3.43 | 660 | 18.71 |
| 17 | 243 | 138 | 3.91 | 798 | 22.62 |
| 18 | 245 | 143 | 4.05 | 941 | 26.67 |
| 19 | 247 | 157 | 4.45 | 1098 | 31.12 |
| 20 | 250 | 166 | 4.71 | 1264 | 35.83 |
| 21 | 252 | 148 | 4.20 | 1412 | 40.02 |
| 22 | 254 | 170 | 4.82 | 1582 | 44.84 |
| 23 | 256 | 162 | 4.59 | 1744 | 49.43 |
| 24 | 258 | 152 | 4.31 | 1896 | 53.74 |
| 25 | 260 | 162 | 4.59 | 2058 | 58.33 |
| 26 | 262 | 147 | 4.17 | 2205 | 62.50 |
| 27 | 264 | 173 | 4.90 | 2378 | 67.40 |
| 28 | 267 | 143 | 4.05 | 2521 | 71.46 |
| 29 | 269 | 135 | 3.83 | 2656 | 75.28 |
| 30 | 271 | 120 | 3.40 | 2776 | 78.68 |
| 31 | 274 | 121 | 3.43 | 2897 | 82.11 |
| 32 | 277 | 124 | 3.51 | 3021 | 85.63 |
| 33 | 279 | 117 | 3.32 | 3138 | 88.95 |
| 34 | 282 | 121 | 3.43 | 3259 | 92.38 |
| 35 | 286 | 82 | 2.32 | 3341 | 94.70 |
| 36 | 289 | 60 | 1.70 | 3401 | 96.40 |
| 37 | 293 | 44 | 1.25 | 3445 | 97.65 |
| 38 | 298 | 36 | 1.02 | 3481 | 98.67 |
| 39 | 303 | 26 | 0.74 | 3507 | 99.40 |
| 40 | 310 | 14 | 0.40 | 3521 | 99.80 |
| 41 | 319 | 4 | 0.11 | 3525 | 99.91 |
| 42 | 334 | 3 | 0.09 | 3528 | 100.00 |

## READING Grade 08 Scale Score Distribution



SCIENCE Grade 05 Scale Score Distribution

| Raw <br> Score | Scale <br> Score | Frequency | Percent | Cumulative <br> Frequency | Cumulative <br> Percent |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{3}$ | $\mathbf{1 9 4}$ | 1 | 0.03 | 1 | 0.03 |
| $\mathbf{5}$ | $\mathbf{2 0 6}$ | 1 | 0.03 | 2 | 0.07 |
| $\mathbf{6}$ | $\mathbf{2 1 1}$ | 1 | 0.03 | 3 | 0.10 |
| $\mathbf{7}$ | $\mathbf{2 1 5}$ | 1 | 0.03 | 4 | 0.13 |
| $\mathbf{8}$ | $\mathbf{2 1 9}$ | 2 | 0.07 | 6 | 0.20 |
| $\mathbf{9}$ | $\mathbf{2 2 2}$ | 10 | 0.33 | 16 | 0.52 |
| $\mathbf{1 0}$ | $\mathbf{2 2 5}$ | 17 | 0.56 | 33 | 1.08 |
| $\mathbf{1 1}$ | $\mathbf{2 2 8}$ | 28 | 0.92 | 61 | 2.00 |
| $\mathbf{1 2}$ | $\mathbf{2 3 0}$ | 40 | 1.31 | 101 | 3.30 |
| $\mathbf{1 3}$ | $\mathbf{2 3 3}$ | 43 | 1.41 | 144 | 4.71 |
| $\mathbf{1 4}$ | $\mathbf{2 3 5}$ | 59 | 1.93 | 203 | 6.64 |
| $\mathbf{1 5}$ | $\mathbf{2 3 8}$ | 79 | 2.58 | 282 | 9.22 |
| $\mathbf{1 6}$ | $\mathbf{2 4 0}$ | 97 | 3.17 | 379 | 12.40 |
| $\mathbf{1 7}$ | $\mathbf{2 4 2}$ | 105 | 3.43 | 484 | 15.83 |
| $\mathbf{1 8}$ | $\mathbf{2 4 5}$ | 113 | 3.70 | 597 | 19.53 |
| $\mathbf{1 9}$ | $\mathbf{2 4 7}$ | 136 | 4.45 | 733 | 23.98 |
| $\mathbf{2 0}$ | $\mathbf{2 4 9}$ | 134 | 4.38 | 867 | 28.36 |
| $\mathbf{2 1}$ | $\mathbf{2 5 1}$ | 142 | 4.65 | 1009 | 33.01 |
| $\mathbf{2 2}$ | $\mathbf{2 5 3}$ | 136 | 4.45 | 1145 | 37.46 |
| $\mathbf{2 3}$ | $\mathbf{2 5 5}$ | 160 | 5.23 | 1305 | 42.69 |
| $\mathbf{2 4}$ | $\mathbf{2 5 7}$ | 145 | 4.74 | 1450 | 47.43 |
| $\mathbf{2 5}$ | $\mathbf{2 6 0}$ | 137 | 4.48 | 1587 | 51.91 |
| $\mathbf{2 6}$ | $\mathbf{2 6 2}$ | 146 | 4.78 | 1733 | 56.69 |
| $\mathbf{2 7}$ | $\mathbf{2 6 4}$ | 162 | 5.30 | 1895 | 61.99 |
| $\mathbf{2 8}$ | $\mathbf{2 6 6}$ | 148 | 4.84 | 2043 | 66.83 |
| $\mathbf{2 9}$ | $\mathbf{2 6 9}$ | 131 | 4.29 | 2174 | 71.12 |
| $\mathbf{3 0}$ | $\mathbf{2 7 1}$ | 129 | 4.22 | 2303 | 75.34 |
| $\mathbf{3 1}$ | $\mathbf{2 7 4}$ | 136 | 4.45 | 2439 | 79.78 |
| $\mathbf{3 2}$ | $\mathbf{2 7 6}$ | 103 | 3.37 | 2542 | 83.15 |
| $\mathbf{3 3}$ | $\mathbf{2 7 9}$ | 105 | 3.43 | 2647 | 86.59 |
| $\mathbf{3 4}$ | $\mathbf{2 8 2}$ | 91 | 2.98 | 2738 | 89.56 |
| $\mathbf{3 5}$ | $\mathbf{2 8 5}$ | 88 | 2.88 | 2826 | 92.44 |
| $\mathbf{3 6}$ | $\mathbf{2 8 9}$ | 59 | 1.93 | 2885 | 94.37 |
| $\mathbf{3 7}$ | $\mathbf{2 9 3}$ | 50 | 1.64 | 2935 | 96.01 |
| $\mathbf{3 8}$ | $\mathbf{2 9 7}$ | 42 | 1.37 | 2977 | 97.38 |
| $\mathbf{3 9}$ | $\mathbf{3 0 3}$ | 34 | 1.11 | 3011 | 98.50 |
| $\mathbf{4 0}$ | $\mathbf{3 0 9}$ | 27 | 0.88 | 3038 | 99.38 |
| $\mathbf{4 1}$ | $\mathbf{3 1 9}$ | 12 | 0.39 | 3050 | 99.77 |
| $\mathbf{4 2}$ | $\mathbf{3 3 4}$ | 6 | 0.20 | 3056 | 99.97 |
| $\mathbf{4 3}$ | $\mathbf{3 5 0}$ | 1 | 0.03 | 3057 | 100.00 |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

## SCIENCE Grade 05 Scale Score Distribution



SCIENCE Grade 08 Scale Score Distribution

| Raw <br> Score | Scale <br> Score | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 8 | 227 | 2 | 0.08 | 2 | 0.08 |
| 9 | 230 | 9 | 0.36 | 11 | 0.43 |
| 10 | 233 | 6 | 0.24 | 17 | 0.67 |
| 11 | 236 | 14 | 0.55 | 31 | 1.22 |
| 12 | 239 | 31 | 1.22 | 62 | 2.45 |
| 13 | 241 | 50 | 1.97 | 112 | 4.42 |
| 14 | 243 | 39 | 1.54 | 151 | 5.96 |
| 15 | 246 | 67 | 2.64 | 218 | 8.60 |
| 16 | 248 | 83 | 3.27 | 301 | 11.87 |
| 17 | 250 | 75 | 2.96 | 376 | 14.83 |
| 18 | 252 | 104 | 4.10 | 480 | 18.93 |
| 19 | 254 | 77 | 3.04 | 557 | 21.97 |
| 20 | 256 | 111 | 4.38 | 668 | 26.35 |
| 21 | 258 | 107 | 4.22 | 775 | 30.57 |
| 22 | 261 | 105 | 4.14 | 880 | 34.71 |
| 23 | 263 | 86 | 3.39 | 966 | 38.11 |
| 24 | 265 | 110 | 4.34 | 1076 | 42.45 |
| 25 | 267 | 114 | 4.50 | 1190 | 46.94 |
| 26 | 269 | 122 | 4.81 | 1312 | 51.76 |
| 27 | 271 | 104 | 4.10 | 1416 | 55.86 |
| 28 | 273 | 115 | 4.54 | 1531 | 60.39 |
| 29 | 275 | 127 | 5.01 | 1658 | 65.40 |
| 30 | 278 | 109 | 4.30 | 1767 | 69.70 |
| 31 | 280 | 118 | 4.65 | 1885 | 74.36 |
| 32 | 283 | 113 | 4.46 | 1998 | 78.82 |
| 33 | 285 | 100 | 3.94 | 2098 | 82.76 |
| 34 | 288 | 72 | 2.84 | 2170 | 85.60 |
| 35 | 291 | 92 | 3.63 | 2262 | 89.23 |
| 36 | 295 | 76 | 3.00 | 2338 | 92.23 |
| 37 | 299 | 54 | 2.13 | 2392 | 94.36 |
| 38 | 303 | 51 | 2.01 | 2443 | 96.37 |
| 39 | 308 | 46 | 1.81 | 2489 | 98.19 |
| 40 | 315 | 25 | 0.99 | 2514 | 99.17 |
| 41 | 323 | 18 | 0.71 | 2532 | 99.88 |
| 42 | 338 | 2 | 0.08 | 2534 | 99.96 |
| 43 | 350 | 1 | 0.04 | 2535 | 100.00 |

## SCIENCE Grade 08 Scale Score Distribution




[^0]:    * rpb= Point biserial; Item Points = Max. Possible Raw Score

[^1]:    *SD = standard deviation; Med. = median

