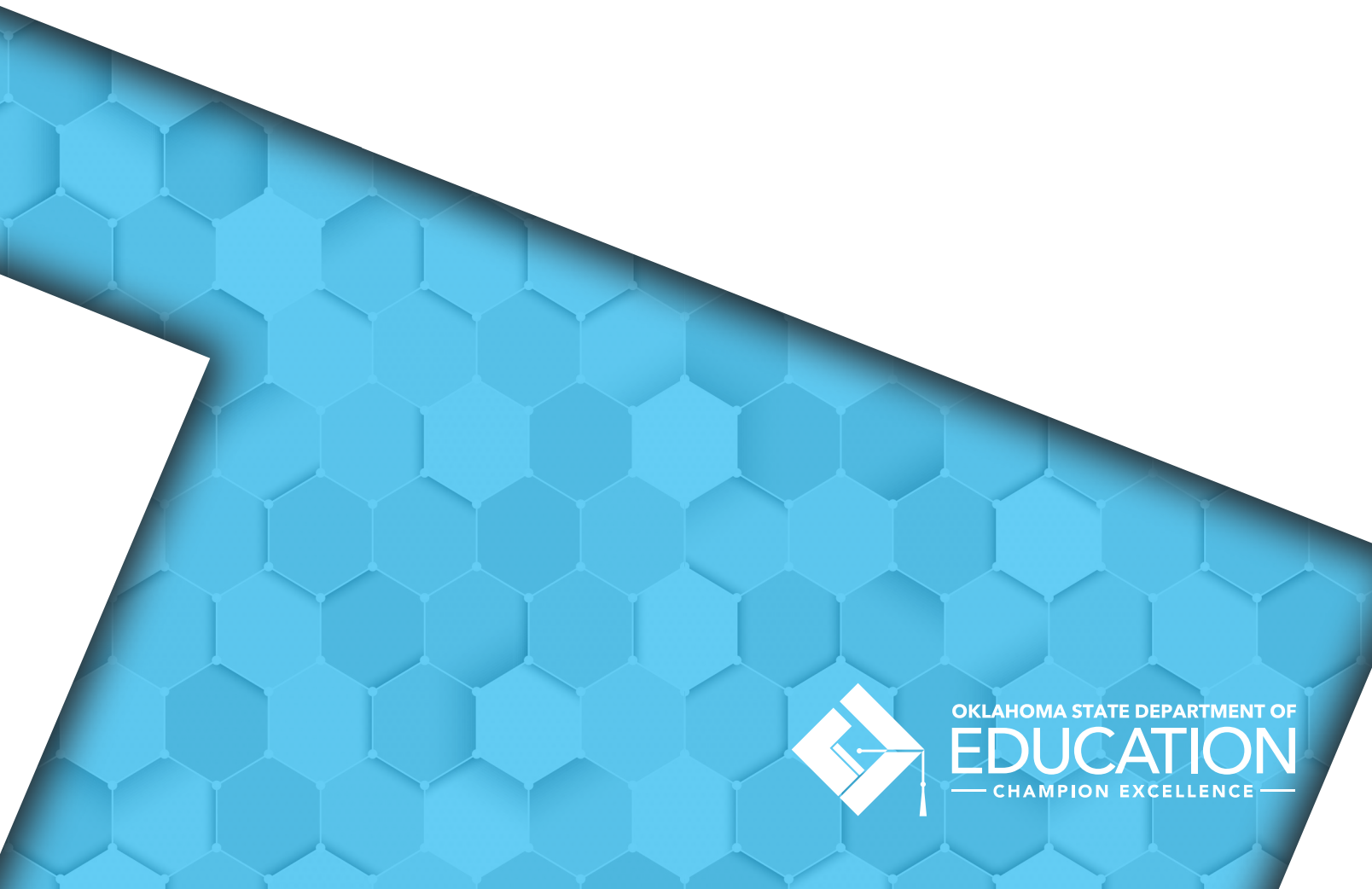
OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT AND ITEM SPECIFICATIONS MATHEMATICS 2016-2017 GRADE 6



OKLAHOMA STATE DEPARTMENT OF EDUCATION
CHAMPION EXCELLENCE

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OKLAHOMA SCHOOL TESTING PROGRAM TEST AND ITEM SPECIFICATIONS

Grade 6 Mathematics Test

Purpose

The purpose of the Grade 6 test is to measure Oklahoma students' levels of proficiency over the Oklahoma Academic Standards. Students are required to respond to a variety of items that assess identified content strands and standards outlined in the Grade 6 Test Blueprint.

Test Structure, Format, and Scoring

The Grade 6 Mathematics test will consist of 50 operational items and 10 field-test items, written at a reading level about two grade levels below a Grade 6 audience. The total 60 items will be divided into two test sections.

Each item is scored as correct or incorrect. Only operational items contribute to the total test score. Thus, for example, if a test contains 50 operational items, only those 50 items (not the 10 field-test items) contribute to a student's scaled score on the test.

The student's raw score is converted to a scaled score using the number correct scoring method.

Test Alignment with Oklahoma Academic Standards

Criteria for Aligning the Test with the Oklahoma Academic Standards Content Strands and Standards
1. Categorical Concurrence The test is constructed so that there are at least five items measuring each OAS strand. The number of items, six, is based on estimating the number of items that could produce a reasonably reliable estimate of a student's mastery of the content measured.
2. Range-of-Knowledge Correspondence The test is constructed so that every standard for each OAS strand has at least one corresponding assessment item.
3. Source of Challenge Each test item is constructed in such a way that the major cognitive demand comes directly from the targeted OAS strand or standard being assessed, not from specialized knowledge or cultural background that the test-taker may bring to the testing situation.

OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT MATHEMATICS 2016-2017 GRADE 6

This blueprint describes the content and structure of an assessment and defines the ideal number of test items by strand and standard of the Oklahoma Academic Standards (OAS).

IDEAL % OF ITEMS	IDEAL # OF ITEMS	STRANDS AND STANDARDS
40%	20	**NUMBER AND OPERATIONS**
	7	6.N.1 Number Sense of Integers and Rational Numbers (3)
	7	6.N.2 Addition and Subtraction of Integers(4)
	6	6.N.3 Ratios
		6.N.4 Multiplication and Division of Rational Numbers
22%	11	**ALGEBRAIC REASONING AND ALGEBRA**
		6.A.1 Algebraic Representations (4)
	11	6.A.2 Algebraic Expressions (4)
		6.A.3 Equations and Inequalities (3)
24%	12	**GEOMETRY AND MEASUREMENT**
	6	6.GM.1 Area of Parallelograms and Triangles (3)
		6.GM.2 Angle Relationships on Intersecting Lines (3)
	6	6.GM. 3 Units of Measurement and Unit Conversions (2)
		6.GM.4 Congruency and Symmetry of Transformations (4)
14%	7	**DATA AND PROBABILITY**
	7	6.D.1 Data Analysis (4)
		6.D.2 Probability (3)
100%	50	**TOTAL**

(Please note this blueprint does not include items that may be field-tested.)
A minimum of 6 items is required to report a standard.

Depth-of-Knowledge Assessed by Test Items

The Grade 6 test will approximately reflect the following "depth-of-knowledge (DOK)" distribution of items:

Depth-of-Knowledge	OAS Standards Percent of DOK 2016-2017
Level 1—Recall	15–25%
Level 2—Skills/Concept	65–75%
Level 3—Strategic Thinking	10–20%

DOK Ranges are based on the DOK of the new OAS standards. The standards increase grade-level expectations, increase rigor, and set the expectation for students to be college- and career-ready.

- **Level 1** (Recall and Reproduction) requires the student to recall facts, terms, definitions, or simple procedures, perform simple algorithms or apply formulas. One-step, well-defined, or straight algorithmic procedures should be included at this level.
- **Level 2** (Skills and Concepts) requires the student to make some decisions as to how to approach the problem or activity. Level 2 activities include making observations and collecting data; classifying, comparing, and organizing data; and organizing and displaying data in tables, charts, and graphs.
- **Level 3** (Strategic Thinking) requires reasoning, planning, using evidence, and a higher level of thinking. Level 3 activities include making conjectures, drawing conclusions from observations, citing evidence and developing a logical argument for concepts, explaining phenomena in terms of concepts, and using concepts to solve nonroutine problems.
- **Level 4** (Extended Thinking) requires complex reasoning, planning, developing, and thinking most likely requiring an extended amount of time. The cognitive demands of the item should be high and the work should be very complex. Students are required to make several connections (relate ideas within the content area or among content areas) and have to select one approach among many alternatives on how the situation shou ld be solved in order to be at this highest level.

Note: These descriptions are adapted from Review Background Information and Instructions, Standards and Assessment Alignment Analysis, CCSSO TILSA Alignment Study, May 21–24, 2001, Version 2.0. For an extended description of each depth-of-knowledge level, see the web site at http://facstaff.wcer.wisc.edu/normw/TILSA/INFO and INSTR Align Anal 513.pdf

Universal Design Considerations

Universal Design, as applied to assessments, is a concept that allows the widest possible range of students to participate in assessments and may even reduce the need for accommodations and alternative assessments by expanding access to the tests themselves. In the Oklahoma Grade 6 tests, modifications have been made to some items to simplify and clarify instructions as well as to provide maximum readability, comprehensibility, and legibility. This includes such things as reducing the language load in content areas other than Language Arts, increasing the font size, displaying fewer items per page, and boxing the items to assist visual focus.

Online Administration

Test questions will be presented one at a time.

The stimulus and question will appear on the screen at the same time.

Answers may be selected by using the mouse to click on the radio button to the left of the answer choice.

Navigation buttons appear at the bottom of the page for each question. For longer items, a scroll bar will appear on the right-hand side of the window to allow scrolling through the answer choices.

Tools (including a calculator on the Grade 6 Mathematics assessment) appear at the bottom of the screen/page to aid in answering questions.

Students will be able to use scratch paper for all online assessments. This paper must be taken up and destroyed by the test administrator immediately following the test. The test administrator must not look at what the student has written on the scratch paper.

Testing Schedules

This section appears in all of the test specification documents and is provided to give the reader a general sense of the overall testing program at this particular grade level.

Each Grade 6 test is meant to be administered in two sessions within one day with a break given between sessions or on consecutive days. Estimated time for scheduling purposes is given in the table below.

Grade 6 Mathematics Online Test Time Schedule	
Distributing login information	Approximately 5 minutes
Test instructions/tutorial and reviewing sample items	Approximately 15 minutes
Total:	Approximately 20 minutes
Administering Section 1 of the G6 Mathematics Online Test	Approximately 40 minutes
Administering Section 2 of the G6 Mathematics Online Test	Approximately 40 minutes

Item Types

The test will consist of a combination of multiple choice and technology enhanced items.

Most stems are positively worded—avoiding the use of the word "not." If a negative is required, it is underlined for emphasis (e.g., if a bag has the same number of red, blue, and black marbles, what is the probability that a marble randomly selected from the bag is not red?).

Multiple-Choice Item Guidelines

- All items must clearly indicate what is expected in a response and direct students to focus on their responses.
- Each multiple-choice item has a stem (question, statement, and/or graphic component) and four answer options—the correct answer and three distractors. Distractors will be developed based on the types of errors students are most likely to make.

- Multiple-choice item stems ask a question or pose a clear problem so that students will know what to do before looking at the answer choices. Students should not need to read all answer choices before knowing what is expected. A stem will seldom include an incomplete sentence.

Technology Enhanced Item Guidelines

- Technology Enhanced Items (TEIs) should be used to more authentically address some aspects of the OAS performance expectations and/or provide more opportunity for students to construct rather than select their response.
- Interaction types are: match, hot-spot, drag-and-drop and drop-down. Each TEI contains only one interaction type per item.
- For each TEI, the interaction type used is that which is the most appropriate and enhancing to the construct to be measured.
- Each TEI is structured to contain the question (content) first followed by directions for how to complete the interaction in that item. Consistent style and language are used in these directions (e.g., "Drag the pictures," "Click the object," etc).
- See sample item 13 on page 29 for an example of a match interaction item. See Appendix A for examples of the other three TEI interactions. Please note that the sample TEIs shown in the appendix do not come from Grade 6.

In summary, Grade 6 test items assess whether students understand algebraic concepts and procedures, whether they can communicate their understandings effectively in mathematical terms, and whether they can approach problems and develop viable solutions.

Stimulus Materials

Stimulus materials are the tables, charts, graphs, passages, and illustrations students must use in order to respond to items. The following characteristics are necessary for stimulus materials:

1. A stimulus that gives information must precede a question or a set of questions.
2. When students are given information to evaluate, they should know the question and the purpose of the information.
3. Passages, graphics, tables, etc., provide sufficient information for assessment of multiple objectives.
4. Stimulus materials for a set of items may be a combination of multiple stimuli.
5. Information in stimulus materials is based on situations students would encounter in or beyond school.
6. For conceptual items, stimulus materials are necessary but not conceptually sufficient for student response.
7. There is a balance of graphic and textual stimulus materials within a test form. Approximately 50 percent of the items will have appropriate pictorial or graphical representations. Graphs, tables, or figures are clearly associated with their intended items. Graphics appear either on the same page as the stimulus or on the facing page.

General Considerations—Oklahoma School Testing Program

1. Items deal with issues and details that are of consequence in the stimulus and central to students' understanding and interpretation of the stimulus.
2. Test items are varied and address all OAS standards listed in the Test Blueprint.
3. To the greatest extent possible, no item or response choice clues the answer to any other item.
4. All items reviewed and approved by the Oklahoma Item Review Committee are assigned an OAS strand, standard and/or objective. The Test Blueprints and score reports reflect the degree to which each OAS strand and standard is represented on the test.
5. Test items are tied closely and particularly to the stimuli from which they derive, so that the impact of outside (prior) knowledge, while never wholly avoidable, is minimized.
6. Each multiple-choice item contains a question and four answer options, only one of which is correct. Correct answers will be approximately equally distributed among A, B, C, and D responses.
7. The four choices are approximately the same length, have the same format, and are syntactically and semantically parallel; students should not be able to rule out a wrong answer or identify a correct response solely because it looks different from the other answer choices.
8. Distractors adopt the language and sense of the material in the stimuli so that students must think their way to the correct answer rather than simply identify incorrect responses by virtue of a distractor's obviously inappropriate nature.
9. Distractors should always be plausible (but, of course, incorrect) in the context of the stimulus.
10. Order of presentation of item types is dictated by logic (chronologically, spatially, etc.).
11. Items are worded precisely and clearly. The better focused an item, the more reliable and fair it is certain to be, and the more likely all students will understand it in the same way.
12. The range of items measuring an OAS standard consisting of more than one skill will provide a balanced representation of those skills.
13. Items should be focused on what all students should know and be able to do as they complete their Grade 6 coursework.
14. The responses "Both of the above," "All of the above," "None of the above," and "Neither of the above" will not be used.
15. The material presented is balanced, culturally diverse, well written, and of interest to Grade 6 test level students. The stimuli and items are fairly presented in order to gain a true picture of students' skills.
16. Across all forms, a balance of gender and active/passive roles by gender is maintained.
17. Forms attempt to represent the ethnic diversity of Oklahoma students.
18. Approved calculators and the formula sheet on page 9 may be used on the Grade 6 Mathematics test. No other resource materials may be used by students during the test. More information regarding the calculator policy can be found at http://sde.ok.gov/sde/assessment-administrator-resources-administrators.
19. The stimuli avoid subject matter that might prompt emotional distress on the part of the students.
20. Permission to use stimuli from copyrighted material is obtained as necessary by testing vendor.

Considerations Specific to the Grade 6 Mathematics Test

It is necessary to create test items that are reliable, fair, and targeted to the Oklahoma Academic Standards listed on the following pages. There are some general considerations and procedures for effective item development.

These considerations include, but are not limited to, the following:

1. Each test form contains items assessing all content standards.
2. Test items that assess each standard are not limited to one particular type of response format.
3. Test questions attempt to focus on content that is authentic and that Grade 6 level students can relate to and understand.
4. Test items are worded precisely and clearly. The better focused an item, the more reliable and fair it is likely to be, and the more likely all students will understand what is required of them.
5. All items are reviewed to eliminate language that shows bias or that would otherwise likely disadvantage a particular group of students. That is, items do not display unfair representations of gender, race, ethnicity, disability, culture, or religion; nor do items contain elements that are offensive to any such groups.
6. Items are written so that calculations are kept to a minimum, and numbers are selected to minimize the time spent on computations.
7. All test items and answer choices have appropriate labels and units.
8. Most graphs are placed on a gray grid, with the x- and y-axes labeled and marked.

All items developed using these specifications are reviewed annually by Oklahoma educators and approved by the Oklahoma State Department of Education. The distribution of newly developed items is based on difficulty, cognitive ability, percentage of art/graphics, and grade-level appropriateness as determined by an annual Item Development Plan approved by the Oklahoma State Department of Education.

Oklahoma State Testing Program
6th Grade Mathematics Formula Sheet

UNIT CONVERSIONS

1 foot = 12 inches

1 yard = 3 feet

1 mile = 5280 feet

1 mile = 1760 yards

1 meter = 100 centimeters

1 meter = 1000 millimeters

1 pound = 16 ounces

1 ton = 2000 pounds

1 kilogram = 1000 grams

1 cup = 8 fluid ounces

1 pint = 2 cups

1 quart = 2 pints

1 gallon = 4 quarts

AREA

Square	$A = s^2$	Triangle	$A = \frac{1}{2}bh$
Rectangle	$A = lw$	Parallelogram	$A = bh$

School Year 2016-2017

Overview of Item Specifications

For each OAS strand, item specifications are organized under the following headings:

- OAS Strand
- OAS Standard
- OAS Objectives
- Item Specifications
    a. Emphasis
    b. Stimulus Attributes
    c. Format
    d. Content Limits
    e. Primary Process Standard(s)
    f. Distractor Domain
    g. Sample Test Items

The headings "OAS Strands" and "OAS Standards" state the OAS strand followed by the OAS standard being measured in the mathematics section of the Oklahoma Academic Standards document.

For each standard, the information under the heading "Item Specifications" highlights important points about a test item's emphasis, format, content limits, and distractor domain. Sample test items are provided with each strand to illustrate these specifications. Although it is sometimes possible to score single items for more than one concept, all items in these tests are written to address a single standard as the primary concept.

Note: With the exception of content limits, the Item Specifications offer suggestions of what might be included and do not provide an exhaustive list of what can be included. For this reason, Item Specifications are only meant to be a supplemental resource for classroom instruction.

In addition, the sample test items are not intended to be definitive in nature or construction—the stimuli and the test items that follow them may differ from test form to test form, as may their presentations. Sample test items are not intended to predict a student's performance on the actual test, but rather to allow students to familiarize themselves with the item types and formats that they may see on the test.

STANDARDS & SAMPLE ITEMS

OAS STRAND—NUMBER & OPERATIONS (N): STANDARD 6.N.1

OAS STANDARD

6.N.1 Read, write, and represent integers and rational numbers expressed as fractions, decimals, percents, and ratios; write positive integers as products of factors; use these representations in real-world and mathematical situations.

OAS OBJECTIVES

6.N.1.1 Represent integers with counters and on a number line and rational numbers on a number line, recognizing the concepts of opposites, direction, and magnitude; use integers and rational numbers in real-world and mathematical situations, explaining the meaning of 0 in each situation.

6.N.1.2 Compare and order positive rational numbers, represented in various forms, or integers using the symbols <, >, and =.

6.N.1.3 Explain that a percent represents parts "out of 100" and ratios "to 100."

6.N.1.4 Determine equivalencies among fractions, decimals, and percents. Select among these representations to solve problems.

6.N.1.5 Factor whole numbers and express prime and composite numbers as a product of prime factors with exponents.

6.N.1.6 Determine the greatest common factors and least common multiples. Use common factors and multiples to calculate with fractions, find equivalent fractions, and express the sum of two-digit numbers with a common factor using the distributive property.

ITEM SPECIFICATIONS

Emphasis:

- Demonstrate the ability to represent integers with counters and on a number line.
- Demonstrate the ability to represent rational numbers on a number line.
- Demonstrate a working knowledge of the concepts of opposites, direction, and magnitude.
- Demonstrate the ability to use integers and rational numbers in real-world and mathematical situations.
- Demonstrate the ability to explain the meaning of zero in real-world situations.
- Demonstrate a working knowledge of positive and negative integers to solve problems in mathematical and real world contexts.
- Demonstrate the ability to convert, compare, and order rational numbers or integers.
- Demonstrate the ability to convert between a fraction, a decimal, and a percent to solve a problem.
- Demonstrate an understanding of percent and what it represents.
- Demonstrate an understanding of prime and composite numbers as a product of prime factors with exponents.
- Demonstrate the ability to find the greatest common factors and least common multiples.
- Demonstrate the ability to use common factors and multiples to calculate with fractions, find equivalent fractions, and express the sum of two-digit numbers with a common factor using the distributive property.

ITEM SPECIFICATIONS

Stimulus Attributes:

- Test items may include illustrations of the following: graphs, charts, coordinate graphs, number lines, balances, rulers, thermometers, calculator displays, tables, data sets; line, bar, and circle graphs; other diagrams, 10 x 10 grids, 1000's blocks, and fraction strips.

Format:

- Represent integers with counters and on a number line
- Represent rational numbers on a number line
- Communicate the concepts of opposites, direction, and magnitude
- Identify and compare representations of positive and negative integers in real-life contexts, explaining the meaning of 0 in each situation
- Convert between and among numerical representations of decimals, fractions, and percents
- Compare and order two or more decimals, fractions, or percents
- Explain how a percent represents parts "out of 100" and ratios "to 100"
- Write positive integers as products of factors
- Factor whole numbers
- Find the greatest common factor
- Find the least common multiple
- Use common factors and multiples to calculate with fractions
- Use common factors to find equivalent fractions
- Use common factors to express the sum of two-digit numbers with a common factor using the distributive property
- Items may include fractions with different denominators

Content Limits:

- Limit integers to 4 digits
- Limit integers and rational numbers to decimals, fractions, percents, and ratios
- Limit fractions to halves, thirds, fourths, fifths, sixths, eighths, tenths, and twelfths
- Limit decimals to 1000ths place
- Limit percents to up to and including 100 percent
- Limit real-world and mathematical contexts to age appropriate situations

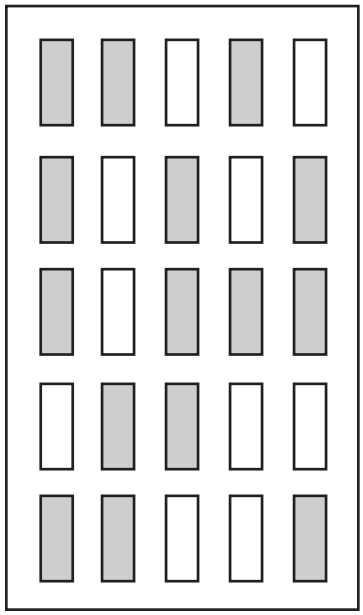
Primary Process Standards:

- Develop Strategies for Problem Solving
- Develop the Ability to Communicate Mathematically
- Develop Mathematical Reasoning
- Develop a Deep and Flexible Conceptual Understanding
- Develop the Ability to Make Conjectures, Model, and Generalize

Distractor Domain:

- Common errors
- Incorrect comparisons
- Misidentification of integers
- Incorrect procedures
- Computational errors
- Misunderstanding of mathematical symbols

1 **The office building shown has shaded windows for the rooms in which the lights are turned off.**



What portion of the rooms have their lights turned off?

A $\frac{2}{3}$

B $\frac{3}{4}$

C 15%

D 60%

Correct Response: D
Depth-of-Knowledge: 2

2 **Four friends played a game. At the end of the game, their scores were −8, −2, 1, and −3. What is the lowest score?**

A −8

B −2

C 1

D −3

Correct Response: A
Depth-of-Knowledge: 2

OAS STRAND—NUMBER & OPERATIONS (N): STANDARD 6.N.2

OAS STANDARD

6.N.2 Add and subtract integers in order to solve real-world and mathematical problems.

OAS OBJECTIVES

6.N.2.1 Estimate solutions to addition and subtraction of integers problems in order to assess the reasonableness of results.

6.N.2.2 Illustrate addition and subtraction of integers using a variety of representations.

6.N.2.3 Add and subtract integers; use efficient and generalizable procedures including but not limited to standard algorithms.

ITEM SPECIFICATIONS

Emphasis:

- Demonstrate an ability to assess the reasonableness of results of estimated solutions to addition and subtraction of integers problems.
- Demonstrate a working knowledge of positive and negative integers to solve problems in mathematical and real-world contexts.
- Demonstrate the ability to represent addition and subtraction of integers through illustration.
- Demonstrate the ability to add and subtract integers.

Stimulus Attributes:

- Test items may include illustrations of coordinate graphs, number lines, balances, deposits and withdrawals, rulers, thermometers, tables, graphs, charts, maps, data sets, and other diagrams.

Format:

- Assess the reasonableness of results by estimating solutions to addition and subtraction of integers problems
- Select, apply, and justify the use of the basic operations on positive and negative integers to solve problems in mathematical, geometric, and real-world contexts
- Use illustrations to represent addition and subtraction of integers

Content Limits:

- Limit operations to addition and subtraction

ITEM SPECIFICATIONS

Primary Process Standards:

- Develop Strategies for Problem Solving
- Develop Mathematical Reasoning
- Develop a Deep and Flexible Conceptual Understanding
- Develop the Ability to Make Conjectures, Model, and Generalize

Distractor Domain:

- Common errors
- Incorrect procedures
- Computational errors
- Incorrect use of rules or properties
- Incorrect representation of problem

3 **Eli's family had $60 for a party. They spent $28 on food. They were given an additional $10. This expression shows how much money, in dollars, Eli's family has available for the party.**

$$60 + (- 28) + 10$$

How much money does Eli's family have available for the party?

A $22

B $42

C $58

D $98

Correct Response: B
Depth-of-Knowledge: 1

4 **The temperature at a location was −12° Fahrenheit (°F). The table shows the changes in temperature over the next 4 hours.**

Changes in Temperature

Hour	Change in Temperature (°F)
1	4
2	−3
3	−5
4	3

What is the temperature at the end of the 4th hour?

A −13 °F

B −11 °F

C 11 °F

D 13 °F

Correct Response: A
Depth-of-Knowledge: 2

OAS STRAND—NUMBER & OPERATIONS (N): STANDARD 6.N.3

OAS STANDARD

6.N.3 Understand the concept of ratio and its relationship to fractions and percents and to the multiplication and division of whole numbers. Use ratios to solve real-world and mathematical problems.

OAS OBJECTIVES

6.N.3.1 Identify and use ratios to compare quantities. Recognize that multiplicative comparison and additive comparison are different.

6.N.3.2 Determine the unit rate for ratios.

6.N.3.3 Apply the relationship between ratios, equivalent fractions and percents to solve problems in various contexts, including those involving mixture and concentrations.

6.N.3.4 Use multiplicative reasoning and representations to solve ratio and unit rate problems.

ITEM SPECIFICATIONS

Emphasis:

- Demonstrate the ability to identify and use ratios to compare quantities.
- Demonstrate an understanding of the difference between multiplicative comparison and additive comparison.
- Demonstrate the ability to find the unit rate for ratios.
- Demonstrate the ability to use ratio and proportional relationships to estimate and solve mathematical and real-world problems.
- Demonstrate the ability to solve percent application problems in mathematical and real-world contexts.
- Demonstrate the ability to solve ratio and unit rate problems using multiplicative reasoning.

Stimulus Attributes:

- Test items may include: illustrations of coordinate graphs, number lines, balances, two- and three-dimensional geometric figures; illustrations of rulers, thermometers, beakers, and other measuring instruments; calculator displays, tables, graphs, charts, maps, scale drawings, frequency charts; line, bar, and picture graphs; Venn diagrams; stem-and-leaf plots, box-and-whisker plots, scatter plots; histograms, circle graphs, data sets, spinners, and other diagrams.

Format:

- Select and use ratios to compare quantities
- Identify the difference between multiplicative comparison and additive comparison
- Select the unit rate for ratios
- Select and apply ratios and proportions to solve problems in mathematical, geometric, and real-world contexts
- Select and apply ratios and proportions among other methods to solve percent application problems in mathematical, geometric, and real-world contexts
- Use multiplicative reasoning and representations to solve ratio and unit rate problems

STANDARD 6.N.3 continued

ITEM SPECIFICATIONS

Content Limits:

- Limit number of variables in a proportion to one
- Limit real-world contexts to age-appropriate situations
- Limit decimal points to the thousandths

Primary Process Standards:

- Develop Strategies for Problem Solving
- Develop a Deep and Flexible Conceptual Understanding

Distractor Domain:

- Common errors
- Incorrect procedures
- Computational errors
- Incorrect use of rules or properties
- Use of incorrect equivalencies

5 **In a survey of 292 students, about 9.9% have attended more than one play. Which is closest to the number of students in the survey who have attended more than one play?**

A 3 students

B 10 students

C 20 students

D 30 students

Correct Response: D
Depth-of-Knowledge: 2

6 **During soccer practice, the goalie blocked 72% of the shots attempted by the opponents. If the goalie blocked a total of 18 shots, how many total shots were attempted?**

A 5

B 13

C 20

D 25

Correct Response: D
Depth-of-Knowledge: 2

OAS STRAND—NUMBER & OPERATIONS (N): STANDARD 6.N.4

OAS STANDARD

6.N.4 Multiply and divide decimals, fractions, and mixed numbers; solve real-world and mathematical problems with rational numbers.

OAS OBJECTIVES

6.N.4.1 Estimate solutions to problems with whole numbers, decimals, fractions, and mixed numbers and use the estimates to assess the reasonableness of results in the context of the problem.

6.N.4.2 Illustrate multiplication and division of fractions and decimals to show connections to fractions, whole number multiplication, and inverse relationships.

6.N.4.3 Multiply and divide fractions and decimals using efficient and generalizable procedures.

6.N.4.4 Solve and interpret real-world and mathematical problems including those involving money, measurement, geometry, and data requiring arithmetic with decimals, fractions and mixed numbers.

ITEM SPECIFICATIONS

Emphasis:

- Demonstrate the ability to find the solution to problems involving rational numbers
- Demonstrate the ability to estimate the solution to problems involving rational numbers
- Demonstrate the ability to use an estimate to determine the reasonableness of answer
- Demonstrate the understanding of multiplication and division of fractions and decimals by using illustrations
- Demonstrate the ability to find products and quotients using fractions and decimals
- Demonstrate the ability to solve and interpret real-world and mathematical problems involving multiplication and division of fractions and decimals

Stimulus Attributes:

- Test items may include illustrations of the following: number lines, 10 x 10 grids, base-10 blocks, cubes, other counting manipulatives, balances, two-dimensional geometric figures, tables, graphs, charts, maps, scale drawings, bar graphs, picture graphs, data sets, and other diagrams.

ITEM SPECIFICATIONS

Format:

- Use estimation strategies to solve mathematical and real-world problems involving whole numbers, decimal numbers, fractions, and percents
- Use estimation strategies to determine the soundness of solutions to mathematical and real-world problems involving whole numbers, decimal numbers, fractions, and percents
- Items may include fractions with different denominators
- Use graphs, grids, and other representations of fractions and decimals to illustrate problems involving products and quotients
- Multiply decimals with one- or two-digit multipliers
- Divide whole numbers by two-digit divisors with and without remainders expressed as whole numbers or fractions
- Divide decimals by two-digit divisors without remainder
- Use estimation strategies to solve mathematical and real-world problems involving money, measurement, geometry, and data requiring multiplication and division with decimals, fractions, and mixed numbers
- Interpret the solution to mathematical and real-world problems involving money, measurement, geometry, and data requiring multiplication and division with decimals, fractions, and mixed numbers

Content Limits:

- Limit numbers to whole numbers, decimal numbers, and fractions
- Limit decimals to the 1000ths place
- Limit fractions to halves, thirds, fourths, fifths, sixths, eighths, tenths, and twelfths
- Limit operations to multiplication and/or division
- Limit mathematical and real-world contexts to age-appropriate situations
- Limit dividends to four digits
- Limit multiplicands to three digits
- Limit multi-step problems to three operations

Primary Process Standards:

- Develop Strategies for Problem Solving
- Develop the Ability to Communicate Mathematically
- Develop Mathematical Reasoning
- Develop a Deep and Flexible Conceptual Understanding
- Develop the Ability to Make Conjectures, Model, and Generalize

Distractor Domain:

- Common errors
- Incorrect procedures
- Computational errors
- Use of incorrect equivalencies
- Rounding errors
- Error in expression of remainder as fraction

7 **Mr. Lopez bought several types of meat for a party. The amount, in pounds, of each type he bought is shown in the table.**

Meats

Type	Amount (pounds)
ham	2.53
pastrami	0.44
turkey	3.61
roast beef	1.49
salami	1.92

Which is closest to the total amount of meat Mr. Lopez bought?

A 7 pounds

B 8 pounds

C 10 pounds

D 12 pounds

Correct Response: C
Depth-of-Knowledge: 2

OAS STRAND—ALGEBRAIC REASONING & ALGEBRA (A): STANDARD 6.A.1

OAS STANDARD

6.A.1 Recognize and represent relationships between varying quantities; translate from one representation to another; use patterns, tables, graphs and rules to solve real-world and mathematical problems.

OAS OBJECTIVES

6.A.1.1 Plot integer- and rational-valued (limited to halves and fourths) ordered-pairs as coordinates in all four quadrants and recognize the reflective relationships among coordinates that differ only by their signs.

6.A.1.2 Represent relationships between two varying quantities involving no more than two operations with rules, graphs, and tables; translate between any two of these representations.

6.A.1.3 Use and evaluate variables in expressions, equations, and inequalities that arise from various contexts, including determining when or if, for a given value of the variable, an equation or inequality involving a variable is true or false.

ITEM SPECIFICATIONS

Emphasis:

- Demonstrate a working knowledge of the location of points on a coordinate grid.
- Demonstrate the ability to plot ordered-pairs as coordinates on a coordinate grid.
- Demonstrate an understanding of the reflective relationships among coordinates that differ only by their signs.
- Demonstrate the ability to identify and analyze number patterns from a variety of sources; identify and develop algebraic rules for number patterns.
- Demonstrate the ability to use variables to represent algebraic relationships.
- Demonstrate the ability to write and solve simple linear equations for mathematical and real-world contexts.
- Demonstrate the ability to use variables to represent quantities in expressions, equations, and inequalities including non-strict inequalities.
- Demonstrate the ability to use the order of operations to find the value of an algebraic expression.
- Demonstrate the ability to write and evaluate simple equations, expressions, and inequalities for mathematical and real-world contexts.

Stimulus Attributes:

- Test items may include illustrations of the following: sequences, coordinate graphs, number lines, balances, calculator displays, two-dimensional geometric figures, protractors, geoboards, other geometric manipulatives, tables, graphs, charts, diagrams, maps, data sets, other diagrams, counting manipulatives, equivalency statements, and algebraic expressions.

Format:

- Plot points for identified coordinates on a coordinate plane or map
- Identify the reflective relationships among coordinates that differ only by their signs
- Identify and analyze patterns of numbers from graphs, sequences, tables, and other data sources
- Identify missing numbers in number patterns

ITEM SPECIFICATIONS

Format continued:

- Use variables to generalize a number pattern algebraically
- Use variables to develop rules which describe a pattern of numbers algebraically
- Write algebraic expressions for mathematical and real-world contexts
- Model and translate among algebraic and pictorial representations of simple linear equations
- Write and evaluate linear equations involving mathematical and real-world contexts
- Evaluate one-step linear inequalities
- Identify one-step inequalities that model mathematical and real-world situations
- Use variables as unknowns
- Substitute numerical values for variables in algebraic expressions
- Use the rules for order of operations with rational numbers to find the value of algebraic expressions
- Items may include parentheses
- Model and translate among algebraic and pictorial representations of simple linear equations

Content Limits:

- Use all four quadrants
- Limit required operations to addition, subtraction, multiplication, and division
- Limit description of rules to one variable
- Limit operations with fractions to addition and subtraction
- Limit to one variable in expressions and equations
- Limit fractional coefficients to halves, thirds, fourths, fifths, sixths, eighths, tenths, and twelfths
- Limit inequalities to one step
- Limit inequalities to one variable
- Limit coefficients to whole numbers or common fractions
- Limit multiplication and division to positive rational numbers
- Limit operations to addition, subtraction, multiplication, and division
- Limit values of the variable to two-digit whole numbers

Primary Process Standards:

- Develop Strategies for Problem Solving
- Develop the Ability to Communicate Mathematically
- Develop Mathematical Reasoning
- Develop a Deep and Flexible Conceptual Understanding
- Develop the Ability to Make Conjectures, Model, and Generalize

Distractor Domain:

- Common errors
- Incorrect procedures
- Computational errors
- Incorrect use of rules or properties
- Incorrect interpretation of data display
- Order of operations errors
- Inappropriate operations with variables

8 **The table shows the total number of pictures Cal took by the end of each week.**

Cal's Pictures

Week (w)	Total Number of Pictures
1	4
2	8
3	12
4	16

Based on this pattern, which expression can be used to find the total number of pictures Cal took by the end of w weeks?

A $2 \bullet w$

B $4 \bullet w$

C $w + 12$

D $4 \bullet w + 4$

Correct Response: B
Depth-of-Knowledge: 2

9 **Ms. Jones wrote this rule on the board.**

"a number, *n*, increased by eighteen"

Which expression represents the rule Ms. Jones wrote on the board?

A $n + 18$

B $n - 18$

C $n \bullet 18$

D $n \div 18$

Correct Response: A
Depth-of-Knowledge: 1

OAS STRAND—ALGEBRAIC REASONING & ALGEBRA (A): STANDARD 6.A.2

OAS STANDARD

6.A.2 Use properties of arithmetic to generate equivalent numerical expressions and evaluate expressions involving positive rational numbers.

OAS OBJECTIVES

6.A.2.1 Generate equivalent expressions and evaluate expressions involving positive rational numbers by applying the commutative, associative, and distributive properties and order of operations to solve real-world and mathematical problems.

ITEM SPECIFICATIONS

Emphasis:

- Demonstrate the ability to generate equivalent expressions for mathematical and real-world contexts.
- Demonstrate the ability to evaluate expressions for mathematical and real-world contexts.
- Demonstrate the ability to use the commutative, associative, and distributive properties to find the value of a numerical expression.
- Demonstrate the ability to use the order of operations to find the value of a numerical expression.

Stimulus Attributes:

- Test items may include coordinate graphs, number lines, calculator displays, tables, graphs, charts, data sets, equivalency statements, and algebraic expressions.

Format:

- Write and solve equivalent expressions involving mathematical and real-world contexts
- Use the rules for order of operations with rational numbers to find the value of expressions
- Use the commutative, associative, and distributive properties to find the value of a numerical expression
- Items may include exponents and parentheses

Content Limits:

- Limit coefficients of variables to positive integers and fractions
- Limit fractional coefficients to halves, thirds, fourths, fifths, sixths, eighths, tenths, and twelfths
- Limit exponents to natural numbers no greater than the third power
- Limit decimals to the hundredths place
- Limit real-world and mathematical contexts to age appropriate situations

STANDARD 6.A.2 continued

ITEM SPECIFICATIONS

Primary Process Standards:

- Develop Strategies for Problem Solving
- Develop the Ability to Communicate Mathematically
- Develop Mathematical Reasoning
- Develop a Deep and Flexible Conceptual Understanding
- Develop the Ability to Make Conjectures, Model, and Generalize

Distractor Domain:

- Common errors
- Incorrect procedures
- Computational errors
- Incorrect use of rules or properties
- Order of operations errors

10 **What is the value of this expression?**

$$10 \div (2 + 3) \times 5 - 3$$

A 4

B 7

C 17

D 37

Correct Response: B
Depth-of-Knowledge: 2

11 **What is the value of this numerical expression?**

$$3.27 + 4.06 \times 2 - (3.19 - 0.18)$$

A 11.65

B 11.29

C 8.38

D 8.02

Correct Response: C
Depth-of-Knowledge: 2

12

Match the expression in the left column to each equivalent expression in the right column. To connect expressions, click an expression in the left column and then an expression in the right column, and a line will automatically be drawn between them. To remove a connection, hold the pointer over the line until it turns red, and then click it. Each expression in the left column matches to only one expression in the right column.

5(6 + 8)	40 + 48
48 + 30	8 + 30
(5 + 6) x 8	6(5 + 8)
5 + 48	40 + 30
6 x 5 + 8	5 + 6 x 8

Correct Response: 1A – 2D; 1B – 2C; 1C – 2A; 1D –2E; 1E – 2B
Depth-of-Knowledge: 2

OAS STRAND—ALGEBRAIC REASONING & ALGEBRA (A): STANDARD 6.A.3

OAS STANDARD

6.A.3 Use equations and inequalities to represent real-world and mathematical problems and use the idea of maintaining equality to solve equations. Interpret solutions in the original context.

OAS OBJECTIVES

6.A.3.1 Represent real-world or mathematical situations using expressions, equations, and inequalities involving variables and rational numbers.

6.A.3.2 Use number sense and properties of operations and equality to solve real-world and mathematical problems involving equations in the form $x + p = q$ and $px = q$, where x, p, and q are nonnegative rational numbers. Graph the solution on a number line, interpret the solution in the original context, and assess the reasonableness of the solution.

ITEM SPECIFICATIONS

Emphasis:

- Use variables to express real-world or mathematical situations algebraically.
- Demonstrate the ability to write and solve expressions, equations, and inequalities for mathematical and real-world contexts.
- Demonstrate the ability to interpret the solution of an equation in the original context of the problem.
- Demonstrate the ability to assess the reasonableness of a solution of an equation.

Stimulus Attributes:

- Test items may include illustrations of the following: coordinate graphs, number lines, calculator displays, tables, graphs, charts, and data sets.

Format:

- Write algebraic expressions for mathematical and real-world contexts
- Write algebraic equations for mathematical and real-world contexts
- Write algebraic inequalities for mathematical and real-world contexts
- Model and translate among algebraic and pictorial representations of simple linear equations
- Use variables as unknowns
- Substitute numerical values for variables in algebraic expressions, equations, and inequalities
- Use the properties of operations with rational numbers to find the value of algebraic expressions, equations, and inequalities
- Items may include parentheses
- Model and translate among algebraic and pictorial representations of simple linear equations, including graphing the solution on a number line
- Use the original context to interpret the solution
- Assess the reasonableness of the solution
- Write and solve equations in the form of $x + p = q$ and $px = q$, where x, p, and q are nonnegative rational numbers, involving mathematical and real-world contexts

STANDARD 6.A.3 continued

ITEM SPECIFICATIONS

Content Limits:

- Limit to one variable in expressions, equations, and inequalities
- Limit operations to addition, subtraction, multiplication, and division
- Limit the number of variables in an expression to one
- Limit values of the variable to two-digit whole numbers
- Limit linear equations to 1-step equations
- Limit coefficients of variables to positive whole numbers and fractions
- Limit fractional coefficients to halves, thirds, fourths, fifths, sixths, eighths, tenths, and twelfths
- Limit real-world and mathematical contexts to age appropriate situations

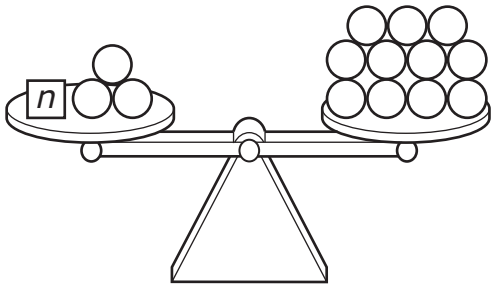
Primary Process Standards:

- Develop Strategies for Problem Solving
- Develop the Ability to Communicate Mathematically
- Develop Mathematical Reasoning
- Develop a Deep and Flexible Conceptual Understanding
- Develop the Ability to Make Conjectures, Model, and Generalize

Distractor Domain:

- Common errors
- Incorrect procedures
- Computational errors
- Incorrect use of rules or properties
- Order of operations errors

13 **Yanni balanced a scale as shown.**



How many ◯s equal $\boxed{n}$?

A 3

B 8

C 11

D 14

Correct Response: B

Depth-of-Knowledge: 2

14 **Carly has $10. She used this equation to determine how many tickets, *n*, she can buy.**

$$2 \bullet n = 10$$

How many tickets can Carly buy?

A 5 tickets

B 8 tickets

C 12 tickets

D 20 tickets

Correct Response: A
Depth-of-Knowledge: 2

OAS STRAND—GEOMETRY & MEASUREMENT (GM): STANDARD 6.GM.1

OAS STANDARD

6.GM.1 Calculate area of squares, parallelograms, and triangles to solve real-world and mathematical problems.

OAS OBJECTIVES

6.GM.1.1 Develop and use formulas for the area of squares and parallelograms using a variety of methods including but not limited to the standard algorithm.

6.GM.1.2 Develop and use formulas to determine the area of triangles.

6.GM.1.3 Find the area of right triangles, other triangles, special quadrilaterals, and polygons that can be decomposed into triangles and other shapes to solve real-world and mathematical problems.

ITEM SPECIFICATIONS

Emphasis:

- Develop formulas to calculate the area of squares, parallelograms, and triangles.
- Demonstrate the ability to use formulas to calculate the area of squares, parallelograms, and triangles.
- Demonstrate the ability to decompose a polygon into triangles, squares, and rectangles.
- Demonstrate the ability to use the formulas for the areas of squares, parallelograms, and triangles to decompose a polygon and calculate the area of the polygon.

Stimulus Attributes:

- Test items may include illustrations of the following: diagrams of rectangles or squares, dot grids, geoboards, other geometric manipulatives, coordinate graphs, two-dimensional geometric figures, rulers, calculator displays, tables, graphs, charts, combined forms, maps, scale drawings, formulas, and other diagrams.

Format:

- Use the formula to find the area of a square, parallelogram, triangle, or polygon that can be decomposed into triangles and other shapes
- Apply the formulas used to find the area of squares, parallelograms, triangles, or polygons that can be decomposed into triangles and other shapes in a variety of contexts
- Decompose polygons into triangles, squares, and rectangles
- Apply combinations of formulas to determine the area of polygons
- Formulas may or may not be given

Content Limits:

- Limit figures to squares, parallelograms, triangles, and polygons that can be decomposed into triangles, squares, and rectangles
- Limit formulas to those used in real-world situations
- Limit multi-step processes to no more than two steps for each component stage
- Limit real-world and mathematical contexts to age appropriate situations

STANDARD 6.GM.1 continued

ITEM SPECIFICATIONS

Primary Process Standards:

- Develop Strategies for Problem Solving
- Develop the Ability to Communicate Mathematically
- Develop Mathematical Reasoning
- Develop a Deep and Flexible Conceptual Understanding
- Develop the Ability to Make Conjectures, Model, and Generalize

Distractor Domain:

- Computational errors
- Common errors
- Use of incorrect formula
- Confusion between area and perimeter
- Incorrect use of rules, properties, or formulas
- Incorrect procedures

15 **Mrs. Thompson has some square tiles. If each side measures 5 inches (in.), what is the area of 1 square tile?**

A 25 sq. in.

B 20 sq. in.

C 10 sq. in.

D 5 sq. in.

Correct Response: A
Depth-of-Knowledge: 2

16 **Two architects designed an object in the shape of an equilateral triangle. The height of the object is 13.5 meters, and the side length is 15.6 meters. What is the area, in square meters, of the triangular object?**

A 315.9

B 210.6

C 105.3

D 46.8

Correct Response: C
Depth-of-Knowledge: 2

OAS STRAND—GEOMETRY & MEASUREMENT (GM): STANDARD 6.GM.2

OAS STANDARD

6.GM.2 Understand and use relationships between angles in geometric figures.

OAS OBJECTIVES

6.GM.2.1 Solve problems using the relationships between the angles (vertical, complementary, and supplementary) formed by intersecting lines.

6.GM.2.2 Develop and use the fact that the sum of the interior angles of a triangle is 180° to determine missing angle measures in a triangle.

ITEM SPECIFICATIONS

Emphasis:

- Demonstrate a working knowledge of angle types and their measures formed by intersecting lines.
- Demonstrate the ability to solve problems involving angle types and their measures formed by intersecting lines.
- Demonstrate a working knowledge of the fact that the sum of the interior angles of a triangle is 180°.
- Demonstrate the ability to determine the missing angle measure in a triangle.

Stimulus Attributes:

- Test items may include illustrations of the following: coordinate graphs, two-dimensional geometric figures, protractors, geoboards, other geometric manipulatives, tables, graphs, charts, maps, data sets, and other diagrams.

Format:

- Identify and compare angles and angle relationships based on their positions in geometric figures, including the assessment of vertical, complementary and supplementary angles
- Find the measures of angles based on their positions and relationships in geometric figures
- Determine missing angle measures in a triangle
- Identify angle measures

Content Limits:

- Limit geometric figures to two dimensions
- Limit angle measurements given in diagrams to whole numbers up to 180°
- Limit the number of intersecting lines to 3

STANDARD 6.GM.2 continued

ITEM SPECIFICATIONS

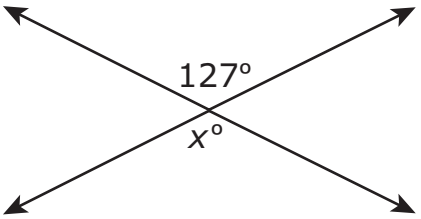
Primary Process Standards:

- Develop Strategies for Problem Solving
- Develop Mathematical Reasoning
- Develop the Ability to Make Conjectures, Model, and Generalize

Distractor Domain:

- Common errors
- Incorrect procedures
- Computational errors
- Incorrect use of rules or properties
- Angle relationship and parallel line misconceptions
- Misconceptions of vertical, complementary, and supplementary angle assumptions

17 **Two lines intersect in the diagram shown below.**



What is the value of *x*?

A 37

B 53

C 127

D 217

Correct Response: C
Depth-of-Knowledge: 1

OAS STRAND—GEOMETRY & MEASUREMENT (GM): STANDARD 6.GM.3

OAS STANDARD

6.GM.3 Choose appropriate units of measurement and use ratios to convert within measurement systems to solve real-world and mathematical problems.

OAS OBJECTIVES

6.GM.3.1 Estimate weights, capacities, and geometric measurements using benchmarks in customary and metric measurement systems with appropriate units.

6.GM.3.2 Solve problems in various real-world and mathematical contexts that require the conversion of weights, capacities, geometric measurements, and time within the same measurement systems using appropriate units.

ITEM SPECIFICATIONS

Emphasis:

- Apply knowledge of customary and metric units to estimate measurements.
- Apply concept of benchmarking to estimate weight, capacity, and other geometric measurements of common objects.
- Apply knowledge of measurement concepts to determine appropriate unit and measurement instrument for specific situations.
- Demonstrate the ability to convert and compute with measurements in the same measurement system.
- Demonstrate the ability to use conversions within the same measurement system to solve real-world problems.

Stimulus Attributes:

- Test items may include tables, graphs, charts, pictures, maps, data sets, diagrams, two- and three-dimensional figures, other geometric manipulatives, rulers, protractors, thermometers, beakers, balances, other measuring instruments, and number lines.

Format:

- Use a benchmark to estimate weight, capacity, or other geometric measurements in customary or metric units
- Identify appropriate unit and instrument of measure needed to solve a weight, capacity, or other geometric measurement problem
- Compute with and express solutions using customary unit conversions to solve problems in mathematical, geometric, and real-world contexts
- Compute with and express solutions using metric conversions to solve problems in mathematical, geometric, and real-world contexts
- Express solutions to problems involving customary or metric units in combined units

ITEM SPECIFICATIONS

Content Limits:

- Limit to objects common to a sixth-grade student
- Limit units of length to millimeter, centimeter, meter, kilometer, inch, foot, yard, or mile
- Limit units of weight (mass) to gram, kilogram, ounce, or pound
- Limit conversion to:
  - inches to feet and feet to inches
  - feet to yards and yards to feet
  - minutes to hours and hours to minutes
  - ounces to pounds and pounds to ounces
  - pounds to tons and tons to pounds
  - ounces to cups and cups to ounces
  - cups to pints and pints to cups
  - pints to quarts and quarts to pints
  - quarts to gallons and gallons to quarts
  - millimeters to centimeters and centimeters to millimeters
  - centimeters to meters and meters to centimeters
  - grams to kilograms and kilograms to grams
  - milliliters to liters and liters to milliliters
- Limit to linear measure, weight, mass, time, perimeter, area, and capacity
- Limit real-world and mathematical contexts to age appropriate situations

Primary Process Standards:

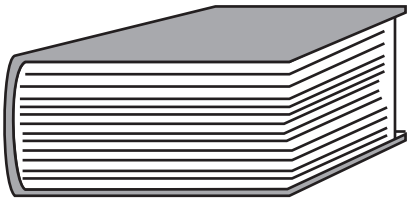
- Develop Strategies for Problem Solving
- Develop the Ability to Communicate Mathematically
- Develop Mathematical Reasoning
- Develop a Deep and Flexible Conceptual Understanding
- Develop the Ability to Make Conjectures, Model, and Generalize

Distractor Domain:

- Insufficient development of concepts of inch, foot, yard, ounces, and pounds
- Misunderstanding the concept of benchmarking
- Insufficient development of concepts of millimeter, centimeter, meter, grams, and kilograms
- Identify inappropriate unit of measure
- Select inappropriate measurement instrument
- Inappropriate procedure or incorrect value in conversion
- Computational errors
- Common errors
- Incorrect procedures
- Incorrect use of rules or properties
- Use of incorrect equivalencies
- Errors in converting units

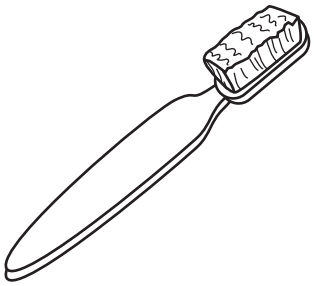
18 **Which object weighs <u>about</u> 6 ounces?**

A



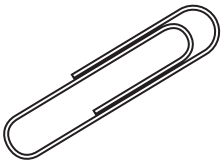
Book

B



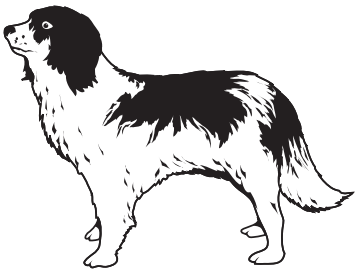
Toothbrush

C



Paper clip

D



Dog

Correct Response: B
Depth-of-Knowledge: 2

19 **A centimeter is equal to 10 millimeters. If a cell phone is 5 centimeters wide, what is the width of the cell phone in millimeters?**

A 2

B 10

C 20

D 50

Correct Response: D
Depth-of-Knowledge: 2

OAS STRAND—GEOMETRY & MEASUREMENT (GM): STANDARD 6.GM.4

OAS STANDARD

6.GM.4 Use translations, reflections, and rotations to establish congruency and understand symmetries.

OAS OBJECTIVES

6.GM.4.1 Predict, describe, and apply translations (slides), reflections (flips), and rotations (turns) to a two-dimensional figure.

6.GM.4.2 Recognize that translations, reflections, and rotations preserve congruency and use them to show that two figures are congruent.

6.GM.4.3 Use distances between two points that are either vertical or horizontal to each other (not requiring the distance formula) to solve real-world and mathematical problems about congruent two-dimensional figures.

6.GM.4.4 Identify and describe the line(s) of symmetry in two-dimensional shapes.

ITEM SPECIFICATIONS

Emphasis:

- Demonstrate the ability to identify geometric transformations.
- Demonstrate the ability to apply a given geometric transformation.
- Demonstrate a working understanding of how geometric transformations preserve congruency.
- Demonstrate a working understanding of congruency in geometric figures.
- Demonstrate the ability to solve problems about congruent two-dimensional figures.
- Demonstrate the ability to identify and describe line(s) of symmetry.

Stimulus Attributes:

- Test items may include illustrations of the following: coordinate graphs, two-dimensional geometric figures, protractors, measuring instruments, geoboards, other geometric manipulatives, tables, graphs, charts, maps, scale drawings, data sets, and other diagrams.

Format:

- Distinguish among transformations of figures on a coordinate plane and in real-world contexts
- Use geometric transformations to show that two figures are congruent
- Use distances between two points to solve mathematical, geometric, and real-world problems about congruent two-dimensional figures
- Identify line(s) of symmetry in two-dimensional shapes
- Describe the line(s) of symmetry in two-dimensional shapes

Content Limits:

- Limit geometric figures to two dimensions
- Limit transformations to translations, reflections, and rotations
- Limit to one transformation
- Limit distances to whole numbers

STANDARD 6.GM.4 continued

ITEM SPECIFICATIONS

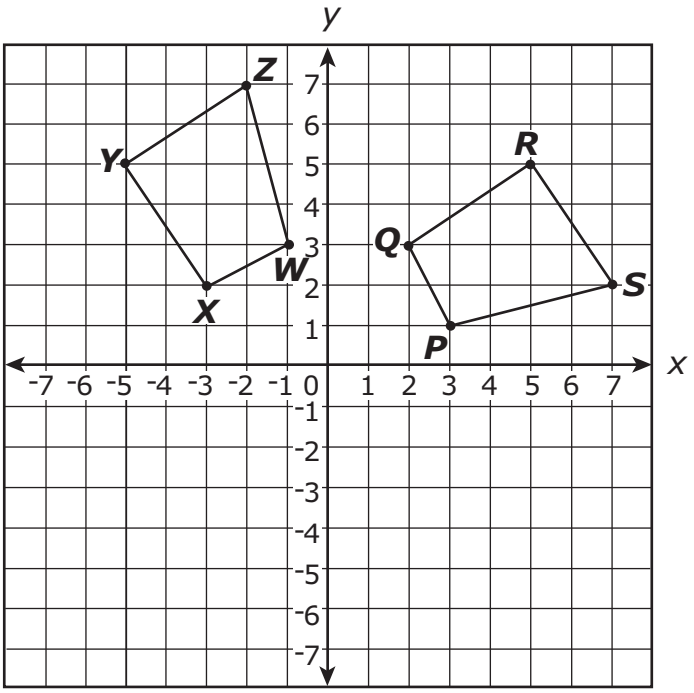
Primary Process Standards:

- Develop Strategies for Problem Solving
- Develop a Deep and Flexible Conceptual Understanding
- Develop the Ability to Make Conjectures, Model, and Generalize

Distractor Domain:

- Common errors
- Incorrect procedures
- Confusion among geometric transformations
- Computational errors
- Incorrect use of rules or properties
- Confusion between congruency and similarity

20 **A computer program was used to transform quadrilateral *PQRS* to quadrilateral *WXYZ*.**



What is the one-step transformation from quadrilateral *PQRS* to quadrilateral *WXYZ*?

A dilation

B reflection

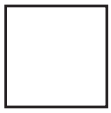
C rotation

D translation

Correct Response: C
Depth-of-Knowledge: 2

21 **Which shape has no lines of symmetry?**

A 

B 

C 

D 

Correct Response: A
Depth-of-Knowledge: 2

OAS STRAND—DATA & PROBABILITY (D): STANDARD 6.D.1

OAS STANDARD

6.D.1 Display and analyze data.

OAS OBJECTIVES

6.D.1.1 Calculate the mean, median, and mode for a set of real-world data.

6.D.1.2 Explain and justify which measure of central tendency (mean, median, or mode) would provide the most descriptive information for a given set of data.

6.D.1.3 Create and analyze box and whisker plots observing how each segment contains one quarter of the data.

ITEM SPECIFICATIONS

Emphasis:

- Demonstrate the ability to find the mean, median, and mode for a set of real-world data.
- Demonstrate an understanding how the mean, median, and mode can be used to describe a set of data.
- Demonstrate the ability to create and analyze box and whisker plots.

Stimulus Attributes:

- Test items may include lists, tables, graphs, charts, data sets, bar graphs, pictographs, frequency charts, line plots, scatter plots, stem-and-leaf plots, box and whisker plots, and any of the following terms: mean, median, and mode.

Format:

- Given a set of real-world data, the student will determine mean, median, and mode
- Compare how representations of data support inferences and predictions
- Items may include comparisons between mean, median, and mode
- Analyze the appropriate use of the mean in comparison with other measures of central tendency
- Create box and whisker plots
- Analyze box and whisker plots, observing how each segment contains one quarter of the data

Content Limits:

- Limit to descriptor of mean, mode, and median
- Limit data sets to 20 pieces of data
- Limit data sets to numerical data
- Limit real-world and mathematical contexts to age appropriate situations

STANDARD 6.D.1 continued

ITEM SPECIFICATIONS

Primary Process Standards:

- Develop Strategies for Problem Solving
- Develop the Ability to Communicate Mathematically
- Develop Mathematical Reasoning
- Develop a Deep and Flexible Conceptual Understanding
- Develop the Ability to Make Conjectures, Model, and Generalize

Distractor Domain:

- Misreported data
- Miscalculation
- Unsupportable conclusions
- Incorrect choice of measure
- Incorrect procedures
- Use of incorrect measure
- Misunderstanding of concepts
- Common errors

22 **The list shows the number of dollars Pablo saved each week.**

4, 7, 6, 2, 10, 4

What is the difference between the mean and the median of these amounts?

A $0.50

B $1.00

C $1.50

D $3.00

Correct Response: A
Depth-of-Knowledge: 2

23 **The manager at Max Cars recorded the number of cars sold during the first six months of last year in this table.**

Max Cars Sales

Month	Number Sold
January	49
February	49
March	64
April	46
May	45
June	47

What was the median number of cars sold during these months?

A 48

B 49

C 50

D 55

Correct Response: A
Depth-of-Knowledge: 2

OAS STRAND—DATA & PROBABILITY (D): STANDARD 6.D.2

OAS STANDARD

6.D.2 Use probability to solve real-world and mathematical problems; represent probabilities using fractions and decimals.

OAS OBJECTIVES

6.D.2.1 Represent possible outcomes using a probability continuum from impossible to certain.

6.D.2.2 Determine the sample space for a given experiment and determine which members of the sample space are related to certain events. Sample space may be determined by the use of tree diagrams, tables, or pictorial representations.

6.D.2.3 Demonstrate simple experiments in which the probabilities are known and compare the resulting relative frequencies with the known probabilities, recognizing that there may be differences between the two results.

ITEM SPECIFICATIONS

Emphasis:

- Represent possible outcomes of experiments.
- Demonstrate the ability to represent probabilities as fractions and decimals.
- Determine the sample space for a given experiment.
- Determine which members of the sample space are related to certain events.
- Demonstrate the ability to compare the results of an experiment with the known probabilities.

Stimulus Attributes:

- Test items may include the following: spinners, tables, graphs, pictures, coordinate graphs, number lines, charts, such as frequency charts, line, bar, and picture graphs; tree-diagrams, Venn diagrams; stem-and-leaf plots, box-and- whisker plots, and scatter plots; histograms, circle graphs, data sets, and other diagrams.

Format:

- Predict outcomes of an experiment as certain, equally likely, or impossible
- Predict the probability of outcomes of simple experiments
- Fractions may be in simplest form
- Determine the sample space for a given experiment
- Determine which members of the sample space are related to certain events
- Sample space may be determined by the use of tree diagrams, tables, or pictorial representations
- Demonstrate the outcome of an experiment
- Compare the results of an experiment with the known probabilities

Content Limits:

- Limit to simple experiments
- Limit predictions to certain, likely, equally likely, unlikely, or impossible
- Limit to simple probability experiments (e.g., one spinner, one coin, etc.)
- Limit sample to no more than 20 pieces of data
- Limit real-world contexts to age-appropriate situations

STANDARD 6.D.2 continued

ITEM SPECIFICATIONS

Primary Process Standards:

- Develop Strategies for Problem Solving
- Develop the Ability to Communicate Mathematically
- Develop Mathematical Reasoning
- Develop a Deep and Flexible Conceptual Understanding
- Develop the Ability to Make Conjectures, Model, and Generalize

Distractor Domain:

- Misunderstanding of likelihood of event
- Computational errors
- Common errors
- Incorrect procedures
- Incorrect use of rules or properties
- Use of incorrect equivalencies

24 **A bag contains 12 yellow tiles and 12 blue tiles. A student will choose one tile from the bag without looking. Which word(s) describe the probability of choosing a blue tile from the bag?**

A likely

B certain

C impossible

D equally likely

Correct Response: D
Depth-of-Knowledge: 2

25 **These colored candies are in a bag.**

Candy in Bag

Color	Number
blue	5
green	8
red	6
yellow	1

Sarah chooses one candy from the bag without looking. Which statement is true?

A It is certain that Sarah will pick a green candy.

B It is impossible for Sarah to pick a purple candy.

C Sarah is equally likely to pick a blue candy or a red candy.

D Sarah is less likely to pick a red candy than a yellow candy.

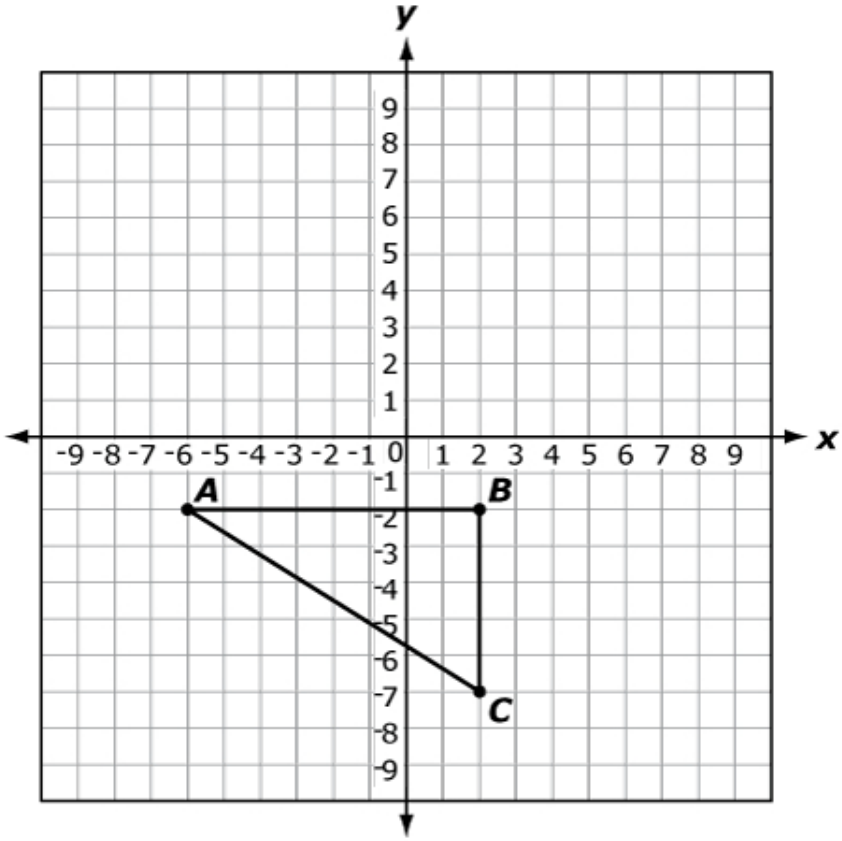
Correct Response: B
Depth-of-Knowledge: 2

APPENDIX A: SAMPLE TECHNOLOGY ENHANCED ITEMS (TEIS) FROM GRADES 7, 8, AND 10

The three sample TEIs in this appendix do not come from Grade 6, but are included to provide an understanding of how each interaction type used in Grade 6 works. For an example of a match interaction, see sample item 13 on page 29.

A1

Triangle *ABC* is translated 8 units up to create new triangle *A'B'C'*.



Which ordered pairs show the coordinates of the vertices of triangle *A'B'C'*?

To select the coordinates for a vertex, click the ordered pair. To deselect the coordinates, click on the ordered pair again.

(2, –2)	(–6, 6)	(–6, –10)	(2, 6)
(2, –10)	(10, –7)	(2, 1)	(10, –2)

Correct Response: (–6, 6); (2, 1); (2, 6)
Depth-of-Knowledge: 2
OAS Standard: 7.GM.4.3

A2

Complete the statements to describe the outcomes of operations with the following numbers.

- a and b are non-zero rational numbers.
- x and y are irrational numbers.

Select the word that best completes each statement. To select a word, click the menu and then click the desired word. To choose a different word, click the menu and click the new word.

$a + b$ is -Select an Answer- ▼ rational.

$x \cdot y$ is -Select an Answer- ▼ irrational.

$a + x$ is -Select an Answer- ▼ rational.

$b \cdot x$ is -Select an Answer- ▼ irrational.

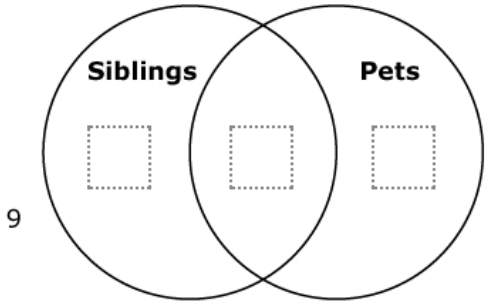
Correct Response: always; sometimes; never; always
Depth-of-Knowledge: 2
OAS Standard: PA.N.1.4

A3

Paige surveyed 50 of her classmates about whether they have any siblings and whether they have any pets.

She found that 40% of her classmates have pets. Of those students with pets, 70% also have siblings.

Paige started this Venn diagram to show her results. Complete her diagram by showing the missing numbers.
To place a number in the diagram, click and hold the number and then drag it to the desired space.



1	2	6	7	9	12	14	16	21	25

Correct Response: 21, 14, 6
Depth-of-Knowledge: 3
OAS Standard: A1.D.2.2