

# OKLAHOMA SCHOOL TESTING PROGRAM

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TEST BLUEPRINT AND  
ITEM SPECIFICATIONS **MATHEMATICS**  
2016-2017 **GRADE 7**



OKLAHOMA STATE DEPARTMENT OF  
**EDUCATION**  
— CHAMPION EXCELLENCE —

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# **OKLAHOMA SCHOOL TESTING PROGRAM TEST AND ITEM SPECIFICATIONS**

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## **Grade 7 Mathematics Test**

### **Purpose**

The purpose of the Grade 7 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 7 Test Blueprint.

## Test Structure, Format, and Scoring

The Grade 7 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 7 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 7

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

IDEAL % OF ITEMS	IDEAL # OF ITEMS	STRANDS AND STANDARDS
20%	10	<b>NUMBER AND OPERATIONS</b>
	10	7.N.1 Representation and Comparison of Rational Numbers (4) 7.N.2 Number Operations and Absolute Value (6)
30%	15	<b>ALGEBRAIC REASONING AND ALGEBRA</b>
	9	7.A.1 Proportional Relationships (4) 7.A.2 Proportions, Rates and Ratios (5) 7.A.3 Linear Equations and Inequalities (4) 7.A.4 Order of Operations (2)
30%	15	<b>GEOMETRY AND MEASUREMENT</b>
	9	7.GM.1 Surface Area and Volume of Rectangular Prisms (2) 7.GM.2 Trapezoids and Composite Figures (2) 7.GM.3 Circles (5) 7.GM.4 Transformations
20%	10	<b>DATA AND PROBABILITY</b>
	10	7.D.1 Data Analysis (6) 7.D.2 Probability (4)
100%	50	<b>TOTAL</b>

(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 7 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 should 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 7 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 7 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 7 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 7 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 G7 Mathematics Online Test	Approximately 40 minutes
Administering Section 2 of the G7 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 17 on page 37 for an example of a hot spot 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 7.

In summary, Grade 7 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 7 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 7 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 7 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 7 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 7 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 7<sup>th</sup> Grade Mathematics Formula Sheet

### UNIT CONVERSIONS

1 foot = 12 inches	1 pound = 16 ounces	1 cup = 8 fluid ounces
1 yard = 3 feet	1 ton = 2000 pounds	1 pint = 2 cups
1 mile = 5280 feet	1 kilogram = 1000 grams	1 quart = 2 pints
1 mile = 1760 yards		1 gallon = 4 quarts
1 meter = 100 centimeters		
1 meter = 1000 millimeters		

### AREA

Square	$A = s^2$	Parallelogram	$A = bh$
Rectangle	$A = lw$	Circle	$A = \pi r^2$
Triangle	$A = \frac{1}{2}bh$	Trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$

### CIRCUMFERENCE

Circle	$C = \pi d$ or $C = 2\pi r$
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### VOLUME

Rectangular Prism	$V = Bh$ or $V = lwh$
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### SURFACE AREA

Rectangular Prism	$S = 2B + Ph$ or $S = 2lw + 2lh + 2wh$
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### LINEAR EQUATIONS

Slope formula	$m = \frac{y_2 - y_1}{x_2 - x_1}$	Direct Variation	$y = kx$
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### OTHER

$$d = rt$$

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

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## OAS STRAND—NUMBER & OPERATIONS (N): STANDARD 7.N.1

OAS STANDARD	<p><b>7.N.1</b> Read, write, represent, and compare rational numbers, expressed as integers, fractions, and decimals.</p>
OAS OBJECTIVES	<p><b>7.N.1.1</b> Know that every rational number can be written as the ratio of two integers or as a terminating or repeating decimal.</p> <p><b>7.N.1.2</b> Compare and order rational numbers expressed in various forms using the symbols <math>&lt;</math>, <math>&gt;</math>, and <math>=</math>.</p> <p><b>7.N.1.3</b> Recognize and generate equivalent representations of rational numbers, including equivalent fractions.</p>
ITEM SPECIFICATIONS	<p><b>Emphasis:</b></p> <ul style="list-style-type: none"> <li>• Demonstrate an understanding of the structure of rational numbers.</li> <li>• Compare and order rational numbers.</li> <li>• Recognize and generate equivalent representations of rational numbers.</li> </ul> <p><b>Stimulus Attributes:</b></p> <ul style="list-style-type: none"> <li>• Test items may include illustrations of the following: number lines, 10 x 10 grids, 1000's blocks, fraction strips, two- and three-dimensional geometric figures, illustrations of coordinate graphs, balances; illustrations of rulers, thermometers, beakers, and other measuring instruments; calculator displays, tables, graphs, charts, maps, scale drawings, frequency charts; line, bar, circle and picture graphs; Venn diagrams; stem-and-leaf plots, box-and-whisker plots, scatter plots; histograms, data sets, spinners, and other diagrams.</li> </ul> <p><b>Format:</b></p> <ul style="list-style-type: none"> <li>• Convert between and among rational numbers, fractions, and decimals</li> <li>• Compare, order, and translate among representations of rational numbers</li> <li>• Generate equivalent representations of rational numbers</li> </ul> <p><b>Content Limits:</b></p> <ul style="list-style-type: none"> <li>• Limit to rational numbers, decimals, and fractions</li> <li>• Limit fractions to halves, thirds, fourths, fifths, sixths, eighths, tenths, and twelfths</li> <li>• Limit mathematical and real-life contexts to age-appropriate situations</li> <li>• Limit decimals to ten-thousandths</li> </ul>

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## STANDARD 7.N.1 continued

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### ITEM SPECIFICATIONS

#### Primary Process Standards:

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

#### Distractor Domain:

- Incorrect procedures
  - Computational errors
  - Comparison errors
  - Misunderstanding of mathematical symbols
  - Common errors
  - Incorrect use of rules or properties
-



**1** Which set of numbers is arranged in order from least to greatest?

**A**  $0.25, \frac{1}{3}, \frac{3}{5}, 0.85$

**B**  $\frac{1}{3}, 0.25, \frac{3}{5}, 0.85$

**C**  $0.25, 0.85, \frac{1}{3}, \frac{3}{5}$

**D**  $\frac{1}{3}, \frac{3}{5}, 0.25, 0.85$

**Correct Response:** A

**Depth-of-Knowledge:** 2

**2** One day last winter, the temperature was  $-5.3^{\circ}\text{C}$  in Tamika's town and  $-4.06^{\circ}\text{C}$  in Mark's town. In Gina's town, it was even colder than both of the other towns. Which could have been the temperature in Gina's town that day?

**A**  $-2.6^{\circ}\text{C}$

**B**  $-4.1^{\circ}\text{C}$

**C**  $-5.03^{\circ}\text{C}$

**D**  $-5.4^{\circ}\text{C}$

**Correct Response:** D

**Depth-of-Knowledge:** 2

## OAS STRAND—NUMBER & OPERATIONS (N): STANDARD 7.N.2

<b>OAS STANDARD</b>	<p><b>7.N.2</b> Calculate with integers and rational numbers, with and without positive integer exponents, to solve real-world and mathematical problems; explain the relationship between absolute value of a rational number and the distance of that number from zero.</p>
<b>OAS OBJECTIVES</b>	<p><b>7.N.2.1</b> Estimate solutions to multiplication and division of integers in order to assess the reasonableness of results.</p> <p><b>7.N.2.2</b> Illustrate multiplication and division of integers using a variety of representations.</p> <p><b>7.N.2.3</b> Solve real-world and mathematical problems involving addition, subtraction, multiplication and division of rational numbers; use efficient and generalizable procedures including but not limited to standard algorithms.</p> <p><b>7.N.2.4</b> Raise integers to positive integer exponents.</p> <p><b>7.N.2.5</b> Solve real-world and mathematical problems involving calculations with rational numbers and positive integer exponents.</p> <p><b>7.N.2.6</b> Explain the relationship between the absolute value of a rational number and the distance of that number from zero on a number line. Use the symbol for absolute value.</p>
<b>ITEM SPECIFICATIONS</b>	<p><b>Emphasis:</b></p> <ul style="list-style-type: none"> <li>• Estimate the product and quotient of integers and assess the reasonableness of results.</li> <li>• Represent multiplication and division of integers.</li> <li>• Solve real-world and mathematical problems involving addition, subtraction, multiplication and division of rational numbers.</li> <li>• Solve real-world and mathematical problems that involve raising integers to positive integer exponents.</li> <li>• Demonstrate an understanding of absolute value.</li> </ul> <p><b>Stimulus Attributes:</b></p> <ul style="list-style-type: none"> <li>• Test items may include: illustrations of coordinate graphs, number lines, 10 x 10 grids, base-10 blocks, cubes, counting manipulatives, balances, two-dimensional geometric figures, deposits and withdrawals, rulers, thermometers, calculator displays, tables, graphs, charts, maps, scale drawings, bar graphs, picture graphs, data sets, other diagrams, equivalency statements, and algebraic expressions.</li> </ul> <p><b>Format:</b></p> <ul style="list-style-type: none"> <li>• Estimate the product and quotient of integers</li> <li>• Assess the reasonableness of the product and quotient of integers</li> <li>• Use graphs, grids, and other representations to illustrate multiplication and division of integers</li> <li>• Use rational numbers to solve problems involving products and quotients in mathematical and real-world contexts</li> <li>• Items may include fractions with different denominators</li> </ul>

## STANDARD 7.N.2 continued

### ITEM SPECIFICATIONS

#### Format (continued):

- Multiply decimals with one- or two-digit multipliers
- Divide decimals by two-digit divisors without remainder
- Divide whole numbers by two-digit divisors with and without remainders expressed as whole numbers or fractions
- Raise integers to positive integer exponents
- Use the rules of exponents in mathematical and real-life contexts
- Show the relationship between absolute value and the distance of that number from zero on a number line
- Use the symbol for absolute value

#### Content Limits:

- Limit operations to multiplication and/or division, for illustrations and estimates
- Limit fractions to halves, thirds, fourths, fifths, sixths, eighths, tenths, and twelfths
- Limit mathematical and real-world contexts to age-appropriate situations
- Limit dividends to four digits
- Limit multiplicands to three digits
- Limit exponents to natural numbers no greater than the third power
- Limit to no more than two operations on exponential numbers
- Limit to integer exponents with the same base

#### 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
- Use of incorrect equivalencies
- Error in expression of remainder as fraction
- Order of operations errors

- 3** Gabrielle had \$300 in her checking account and \$125 in her savings account. If Gabrielle transferred enough money from her checking account to her savings account to double the savings account balance, what is her new checking account balance?

- A** \$350
- B** \$250
- C** \$175
- D** \$125

**Correct Response:** C  
**Depth-of-Knowledge:** 2

**4**

$$8 - 4 \times 3^3 + 11$$

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

- A** -89
- B** -17
- C** 23
- D** 119

**Correct Response:** A  
**Depth-of-Knowledge:** 2

## OAS STRAND—ALGEBRAIC REASONING & ALGEBRA (A): STANDARD 7.A.1

OAS STANDARD	<p><b>7.A.1</b> Understand the concept of proportionality in real-world and mathematical situations, and distinguish between proportional and other relationships.</p>
OAS OBJECTIVES	<p><b>7.A.1.1</b> Describe that the relationship between two variables, <math>x</math> and <math>y</math>, is proportional if it can be expressed in the form <math>\frac{y}{x} = k</math> or <math>y = kx</math>; distinguish proportional relationships from other relationships, including inversely proportional relationships (<math>xy = k</math> or <math>y = \frac{k}{x}</math>).</p> <p><b>7.A.1.2</b> Recognize that the graph of a proportional relationship is a line through the origin and the coordinate <math>(1, r)</math>, where both <math>r</math> and the slope are the unit rate (constant of proportionality, <math>k</math>).</p>
ITEM SPECIFICATIONS	<p><b>Emphasis:</b></p> <ul style="list-style-type: none"> <li>Understand that the relationship between <math>x</math> and <math>y</math> is proportional if it can be expressed in the form <math>\frac{y}{x} = k</math> or <math>y = kx</math>.</li> <li>Distinguish proportional relationships from other relationships.</li> <li>Demonstrate an understanding of graphs of proportional relationships.</li> </ul> <p><b>Stimulus Attributes:</b></p> <ul style="list-style-type: none"> <li>Test items may include illustrations of the following: 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, data sets, spinners, and other diagrams.</li> </ul> <p><b>Format:</b></p> <ul style="list-style-type: none"> <li>Analyze the relationship between two variables in an equation to determine whether or not the relationship is proportional</li> <li>Recognize proportional relationships from other relationships</li> <li>Recognize inversely proportional relationships</li> <li>Recognize and interpret the graph of a proportional relationship</li> <li>Describe the concept of proportionality in real-world and mathematical situations</li> </ul> <p><b>Content Limits:</b></p> <ul style="list-style-type: none"> <li>Limit number of variables in a proportion to one</li> <li>Limit real-world contexts to age-appropriate situations</li> </ul>

## STANDARD 7.A.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

#### Distractor Domain:

- Common errors
- Incorrect procedures
- Inappropriate operations with variables
- Computational errors
- Incorrect use of rules or properties

### 5 Which equation represents a proportional relationship?

- A**  $y = -2x$
- B**  $y = 5 - 2x$
- C**  $y = 2x - 5$
- D**  $y = 2x + 5$

**Correct Response:** A

**Depth-of-Knowledge:** 1

## OAS STRAND—ALGEBRAIC REASONING & ALGEBRA (A): STANDARD 7.A.2

OAS STANDARD	<p><b>7.A.2</b> Recognize proportional relationships in real-world and mathematical situations; represent these and other relationships with tables, verbal descriptions, symbols, and graphs; solve problems involving proportional relationships and interpret results in the original context.</p>
OAS OBJECTIVES	<p><b>7.A.2.1</b> Represent proportional relationships with tables, verbal descriptions, symbols, and graphs; translate from one representation to another. Determine and compare the unit rate (constant of proportionality, slope, or rate of change) given any of these representations.</p> <p><b>7.A.2.2</b> Solve multi-step problems involving proportional relationships involving distance-time, percent increase or decrease, discounts, tips, unit pricing, similar figures, and other real-world and mathematical situations.</p> <p><b>7.A.2.3</b> Use proportional reasoning to solve real-world and mathematical problems involving ratios.</p> <p><b>7.A.2.4</b> Use proportional reasoning to assess the reasonableness of solutions.</p>
ITEM SPECIFICATIONS	<p><b>Emphasis:</b></p> <ul style="list-style-type: none"> <li>• Create and translate between representations of proportional relationships.</li> <li>• Determine and compare the unit rate of proportional relationships.</li> <li>• Solve multi-step problems involving proportional relationships.</li> <li>• Solve real-world and mathematical problems involving ratios.</li> <li>• Assess the reasonableness of solutions to problems that involve proportional relationships.</li> </ul> <p><b>Stimulus Attributes:</b></p> <ul style="list-style-type: none"> <li>• 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, data sets, spinners, and other diagrams.</li> </ul> <p><b>Format:</b></p> <ul style="list-style-type: none"> <li>• Use tables, verbal descriptions, symbols, and graphs to represent proportional relationships</li> <li>• Translate from one representation of proportional relationships to another</li> <li>• Determine and compare the unit rate of proportional relationships</li> <li>• Graph proportional relationships</li> <li>• Select and apply ratios and proportions among other methods to solve multi-step proportional relationship problems in mathematical, geometric, and real-world contexts</li> <li>• Find the proportional relationships involving distance-time, percent increase or decrease, discounts, tips, unit pricing, similar figures, and other real-world and mathematical situations.</li> <li>• Select and apply ratios and proportions to solve problems in mathematical, geometric, and real-world contexts</li> <li>• Use proportional reasoning to assess the reasonableness of solutions</li> </ul>



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## STANDARD 7.A.2 continued

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### 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

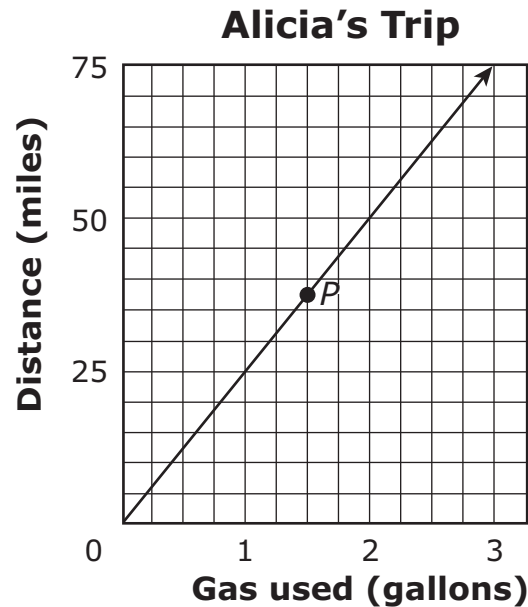
#### Primary Process Standards:

- Develop Strategies for Problem Solving
- Develop the Ability to Communicate Mathematically
- Develop Mathematical Reasoning
- Develop a Deep and Flexible Conceptual Understanding

#### Distractor Domain:

- Common errors
  - Incorrect procedures
  - Computational errors
  - Incorrect use of rules or properties
  - Inappropriate operations with variables
  - Use of incorrect equivalencies
-

- 6** Alicia drove to her grandparent's house. The graph below shows the number of gallons of gas used and the distance traveled during the trip.



**According to the graph, which statement best describes point *P*?**

- A** Alicia used 1.5 gallons to travel a distance of 37.5 miles.
- B** Alicia used 37.5 gallons to travel a distance of 1.5 miles.
- C** Alicia traveled at a rate of 37.5 miles per hour.
- D** Alicia traveled at a rate of 1.5 miles per hour.

**Correct Response:** A

**Depth-of-Knowledge:** 2

- 7** Manuel is cooking dinner for his family of 4. The recipe he is using makes dinner for 6 people. The recipe calls for 3 cups of flour. How many cups of flour should Manuel use to make the recipe for 4 people?

- A** 1 cup
- B** 2 cups
- C** 7 cups
- D** 8 cups

**Correct Response:** B

**Depth-of-Knowledge:** 2

## OAS STRAND—ALGEBRAIC REASONING & ALGEBRA (A): STANDARD 7.A.3

OAS STANDARD	7.A.3 Represent and solve linear equations and inequalities.
OAS OBJECTIVES	<p><b>7.A.3.1</b> Write and solve problems leading to linear equations with one variable in the form <math>px + q = r</math> and <math>p(x + q) = r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> are rational numbers.</p> <p><b>7.A.3.2</b> Represent, write, solve, and graph problems leading to linear inequalities with one variable in the form <math>x + p &gt; q</math> and <math>x + p &lt; q</math>, where <math>p</math>, and <math>q</math> are nonnegative rational numbers.</p> <p><b>7.A.3.3</b> Represent real-world or mathematical situations using equations and inequalities involving variables and rational numbers.</p>
ITEM SPECIFICATIONS	<p><b>Emphasis:</b></p> <ul style="list-style-type: none"> <li>• Write and solve problems leading to linear equations.</li> <li>• Write, solve, and graph problems leading to linear inequalities.</li> <li>• Represent real-world or mathematical situations using equations and inequalities.</li> </ul> <p><b>Stimulus Attributes:</b></p> <ul style="list-style-type: none"> <li>• Test items may include algebraic equations, strict and non-strict inequalities, and illustrations of the following: coordinate graphs, number lines, balances, other diagrams, and two- and three-dimensional geometric figures.</li> </ul> <p><b>Format:</b></p> <ul style="list-style-type: none"> <li>• Identify, write, and solve linear equations involved in mathematical and real-world situations</li> <li>• Solve and graph the solution to a linear inequality</li> <li>• Identify inequalities that model mathematical and real-world situations</li> <li>• Select and apply appropriate formulas for mathematical and real-world situations</li> <li>• Formulas may or may not be given</li> </ul> <p><b>Content Limits:</b></p> <ul style="list-style-type: none"> <li>• Limit inequalities to one step</li> <li>• Limit inequalities to one variable</li> <li>• Limit coefficients to integers or common fractions</li> <li>• Limit multiplication and division to positive rational numbers</li> <li>• No compound inequalities</li> <li>• Limit formulas to those used in real-world situations</li> <li>• Limit multistep processes to no more than two steps for each component stage</li> <li>• Limit real world and mathematical contexts to age appropriate situations</li> </ul>

## STANDARD 7.A.3 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
- Inappropriate operations with variables
- Use of inappropriate formulas

- 8** Carla bought 8 equally priced theater tickets. The total cost was \$190 including a \$6 service charge. This equation can be used to find  $t$ , the price of each ticket.

$$8t + 6 = 190$$

What is the price of each ticket,  $t$ ?

- A** \$14.00
- B** \$23.00
- C** \$23.75
- D** \$24.50

**Correct Response:** B

**Depth-of-Knowledge:** 2

**9 Which situation can be modeled by this inequality?**

$$x \geq 12$$

- A** Twelve bottles will fill the cardboard box.
- B** The students had to run at least 12 laps in track practice.
- C** Use the yardstick to find the length of objects longer than 12 inches.
- D** The sign says the play area is for children 12 years of age or younger.

**Correct Response:** B

**Depth-of-Knowledge:** 2

## OAS STRAND—ALGEBRAIC REASONING & ALGEBRA (A): STANDARD 7.A.4

OAS STANDARD	<p><b>7.A.4</b> Use order of operations and properties of operations to generate equivalent numerical and algebraic expressions containing rational numbers and grouping symbols; evaluate such expressions.</p>
OAS OBJECTIVES	<p><b>7.A.4.1</b> Use properties of operations (limited to associative, commutative, and distributive) to generate equivalent numerical and algebraic expressions containing rational numbers, grouping symbols and whole number exponents.</p> <p><b>7.A.4.2</b> Apply understanding of order of operations and grouping symbols when using calculators and other technologies.</p>
ITEM SPECIFICATIONS	<p><b>Emphasis:</b></p> <ul style="list-style-type: none"> <li>• Use properties of operations to generate equivalent numerical and algebraic expressions.</li> <li>• Demonstrate the ability to use the order of operations and grouping symbols.</li> </ul> <p><b>Stimulus Attributes:</b></p> <ul style="list-style-type: none"> <li>• Test items may include illustrations of the following: tables, graphs, charts, data sets, equivalency statements, and algebraic expressions.</li> </ul> <p><b>Format:</b></p> <ul style="list-style-type: none"> <li>• Use the properties of operations to generate equivalent numerical and algebraic expressions</li> <li>• Use the rules for order of operations and grouping symbols when using calculators and other technologies</li> <li>• Items may include exponents and parentheses</li> </ul> <p><b>Content Limits:</b></p> <ul style="list-style-type: none"> <li>• Limit exponents to whole numbers no greater than the third power</li> <li>• Limit properties to associative, commutative, and distributive</li> </ul> <p><b>Primary Process Standards:</b></p> <ul style="list-style-type: none"> <li>• Develop Strategies for Problem Solving</li> <li>• Develop Mathematical Reasoning</li> </ul> <p><b>Distractor Domain:</b></p> <ul style="list-style-type: none"> <li>• Common errors</li> <li>• Incorrect procedures</li> <li>• Incorrect use of rules or properties</li> <li>• Order of operations errors</li> </ul>

- 10** The expression below will be simplified according to the correct order of operations.

$$9(4 \div 2)^2 + 1 - 6$$

Which expression results after the first step of simplifying?

- A**  $(36 \div 18)^2 + 1 - 6$
- B**  $9(8 \div 4) + 1 - 6$
- C**  $9(4 \div 2)^2 + 5$
- D**  $9(2)^2 + 1 - 6$

**Correct Response:** D

**Depth-of-Knowledge:** 1



## OAS STRAND—GEOMETRY & MEASUREMENT (GM): STANDARD 7.GM.1

OAS STANDARD	<p><b>7.GM.1</b> Develop and understand the concept of surface area and volume of rectangular prisms.</p>
OAS OBJECTIVES	<p><b>7.GM.1.1</b> Using a variety of tools and strategies, develop the concept that surface area of a rectangular prism with rational-valued edge lengths can be found by wrapping the figure with same-sized square units without gaps or overlap. Use appropriate measurements such as <math>\text{cm}^2</math>.</p> <p><b>7.GM.1.2</b> Using a variety of tools and strategies, develop the concept that the volume of rectangular prisms with rational-valued edge lengths can be found by counting the total number of same-sized unit cubes that fill a shape without gaps or overlaps. Use appropriate measurements such as <math>\text{cm}^3</math>.</p>
ITEM SPECIFICATIONS	<p><b>Emphasis:</b></p> <ul style="list-style-type: none"> <li>Develop the concepts of surface area and volume of rectangular prisms.</li> </ul> <p><b>Stimulus Attributes:</b></p> <ul style="list-style-type: none"> <li>Test items may include illustrations of the following: rectangular prisms.</li> </ul> <p><b>Format:</b></p> <ul style="list-style-type: none"> <li>Determine the surface area of rectangular prisms</li> <li>Determine the volume of rectangular prisms</li> <li>Identify and apply strategies for determining volume and surface area of rectangular prisms</li> <li>Find the surface area of a rectangular prism by wrapping the figure with same-sized square units without gaps or overlap</li> <li>Find the volume of a rectangular prism by counting the total number of same-sized unit cubes that fill a shape without gaps or overlaps</li> <li>Identify and apply strategies for determining volume and surface area of rectangular prisms</li> <li>Choose appropriate measurements for surface area and volume</li> </ul> <p><b>Content Limits:</b></p> <ul style="list-style-type: none"> <li>Limit solids to rectangular prisms</li> <li>Limit to rational-valued edge lengths</li> </ul> <p><b>Primary Process Standards:</b></p> <ul style="list-style-type: none"> <li>Develop Strategies for Problem Solving</li> <li>Develop the Ability to Communicate Mathematically</li> <li>Develop Mathematical Reasoning</li> <li>Develop a Deep and Flexible Conceptual Understanding</li> <li>Develop the Ability to Make Conjectures, Model, and Generalize</li> </ul>

## STANDARD 7.GM.1 continued

### ITEM SPECIFICATIONS

#### Distractor Domain:

- Computational errors
- Incorrect procedures
- Interchange volume and surface area
- Incorrect measurements

**11** A box is in the shape of a cube. The box has edge lengths of 5 inches. How many unit cubes are needed to fill the box?

- A** 25
- B** 50
- C** 125
- D** 150

**Correct Response:** C

**Depth-of-Knowledge:** 2

## OAS STRAND—GEOMETRY & MEASUREMENT (GM): STANDARD 7.GM.2

OAS STANDARD	<p><b>7.GM.2</b> Determine the area of trapezoids and area and perimeter of composite figures.</p>
OAS OBJECTIVES	<p><b>7.GM.2.1</b> Develop and use the formula to determine the area of a trapezoid to solve problems.</p> <p><b>7.GM.2.2</b> Find the area and perimeter of composite figures to solve real-world and mathematical problems.</p>
ITEM SPECIFICATIONS	<p><b>Emphasis:</b></p> <ul style="list-style-type: none"> <li>Solve real-world and mathematical problems involving the area of trapezoids.</li> <li>Solve real-world and mathematical problems involving the area and perimeter of composite figures.</li> </ul> <p><b>Stimulus Attributes:</b></p> <ul style="list-style-type: none"> <li>Test items may include graphs, and diagrams of trapezoids and composite figures.</li> </ul> <p><b>Format:</b></p> <ul style="list-style-type: none"> <li>Apply the formulas used to find the area of trapezoids in a variety of contexts</li> <li>Develop a formula to determine the area of a trapezoid</li> <li>Formulas may or may not be given</li> <li>Apply the formulas used to find the area and perimeter of composite figures</li> <li>Select and apply appropriate formulas for mathematical and real-world situations</li> </ul> <p><b>Content Limits:</b></p> <ul style="list-style-type: none"> <li>Limit figures to triangles and quadrilaterals or combinations of triangles and quadrilaterals</li> <li>Limit composite shapes to those made up of squares, rectangles, and triangles</li> <li>Limit multistep processes to no more than two steps for each component stage</li> <li>Limit formulas to those used in real-world situations</li> <li>Limit real-world and mathematical contexts to age appropriate situations</li> </ul> <p><b>Primary Process Standards:</b></p> <ul style="list-style-type: none"> <li>Develop Strategies for Problem Solving</li> <li>Develop the Ability to Communicate Mathematically</li> <li>Develop Mathematical Reasoning</li> <li>Develop a Deep and Flexible Conceptual Understanding</li> <li>Develop the Ability to Make Conjectures, Model, and Generalize</li> </ul>

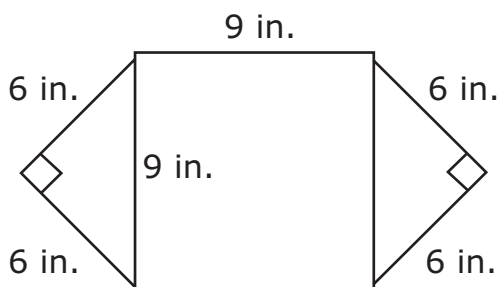
## STANDARD 7.GM.2 continued

### ITEM SPECIFICATIONS

#### Distractor Domain:

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

- 12** This figure shows the placemat Kenneth made using two square pieces of paper measured in inches (in.). He cut one piece in half.



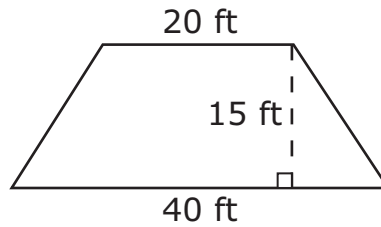
**What is the area, in square inches (sq in.), of Kenneth's placemat?**

- A** 42 sq in.
- B** 54 sq in.
- C** 99 sq in.
- D** 117 sq in.

**Correct Response:** D

**Depth-of-Knowledge:** 2

- 13** The shape and measurements, in feet (ft), of a floor are shown.



**What is the area of the floor, in square feet (sq ft)?**

- A** 190 sq ft
- B** 320 sq ft
- C** 450 sq ft
- D** 900 sq ft

**Correct Response:** C

**Depth-of-Knowledge:** 2

## OAS STRAND—GEOMETRY & MEASUREMENT (GM): STANDARD 7.GM.3

<b>OAS STANDARD</b>	<p><b>7.GM.3</b> Use reasoning with proportions and ratios to determine measurements, justify formulas, and solve real-world and mathematical problems involving circles and related geometric figures.</p>
<b>OAS OBJECTIVES</b>	<p><b>7.GM.3.1</b> Demonstrate an understanding of the proportional relationship between the diameter and circumference of a circle and that the unit rate (constant of proportionality) is <math>\pi</math> and can be approximated by rational numbers such as <math>\frac{22}{7}</math> and 3.14.</p> <p><b>7.GM.3.2</b> Calculate the circumference and area of circles to solve problems in various contexts, in terms of <math>\pi</math> and using approximations for <math>\pi</math>.</p>
<b>ITEM SPECIFICATIONS</b>	<p><b>Emphasis:</b></p> <ul style="list-style-type: none"> <li>• Demonstrate an understanding of the proportional relationship between the diameter and circumference of a circle.</li> <li>• Demonstrate a conceptual understanding of pi.</li> <li>• Demonstrate the ability to solve circumference and area of circle problems.</li> </ul> <p><b>Stimulus Attributes:</b></p> <ul style="list-style-type: none"> <li>• Test items may include illustrations of the following: rulers, calculator displays, coordinate graphs, tables, graphs, charts, circles, data sets, formulas, and other diagrams.</li> </ul> <p><b>Format:</b></p> <ul style="list-style-type: none"> <li>• Show the proportional relationship between the diameter and circumference of a circle</li> <li>• Show that unit rate for the proportional relationship between the diameter and circumference of a circle is <math>\pi</math></li> <li>• Approximate the value of <math>\pi</math></li> <li>• Apply the formula used to find the area and circumference of circles in a variety of contexts</li> <li>• Explore the concepts of area and circumference of circles in mathematical, geometric, and real-world contexts</li> </ul> <p><b>Content Limits:</b></p> <ul style="list-style-type: none"> <li>• Limit measurements of radius and diameter to whole numbers or decimals to tenths</li> <li>• Limit real-world and mathematical contexts to age appropriate situations</li> </ul>

## STANDARD 7.GM.3 continued

### 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:

- Incorrect procedures
- Computational errors
- Use of incorrect formula
- Confusion between area and circumference
- Common errors
- Incorrect use of rules and properties

**14** The circle in the center of a professional basketball court has a diameter of 12 feet. What is the circumference, in feet, of the circle?

- A  $6\pi$  feet
- B  $12\pi$  feet
- C  $24\pi$  feet
- D  $144\pi$  feet

**Correct Response:** B

**Depth-of-Knowledge:** 2

**15** Caleb went rollerskating at the local rink. The circular rink measured 70 feet from side to side through the center. What distance, in feet, did Caleb skate in one lap by skating along the edge of the rink?

- A  $35\pi$  feet
- B  $70\pi$  feet
- C  $140\pi$  feet
- D  $4,900\pi$  feet

**Correct Response:** B

**Depth-of-Knowledge:** 3

## OAS STRAND—GEOMETRY & MEASUREMENT (GM): STANDARD 7.GM.4

OAS STANDARD	<p><b>7.GM.4</b> Analyze the effect of dilations, translations, and reflections on the attributes of two-dimensional figures on and off the coordinate plane.</p>
OAS OBJECTIVES	<p><b>7.GM.4.1</b> Describe the properties of similarity, compare geometric figures for similarity, and determine scale factors resulting from dilations.</p> <p><b>7.GM.4.2</b> Apply proportions, ratios, and scale factors to solve problems involving scale drawings and determine side lengths and areas of similar triangles and rectangles.</p> <p><b>7.GM.4.3</b> Graph and describe translations and reflections of figures on a coordinate plane and determine the coordinates of the vertices of the figure after the transformation.</p>
ITEM SPECIFICATIONS	<p><b>Emphasis:</b></p> <ul style="list-style-type: none"> <li>• Demonstrate an understanding of the properties of similarity.</li> <li>• Compare geometric figures for similarity.</li> <li>• Determine scale factors resulting from dilations.</li> <li>• Apply proportions, ratios, and scale factors to solve problems.</li> <li>• Graph and describe translations and reflections of figures.</li> <li>• Determine the coordinates of the vertices of a figure after a transformation.</li> </ul> <p><b>Stimulus Attributes:</b></p> <ul style="list-style-type: none"> <li>• Test items may include illustrations of the following: tables, graphs, charts, data sets, other diagrams, coordinate graphs, two-dimensional geometric figures, protractors, geoboards, other geometric manipulatives, measuring instruments, maps, and scale drawings.</li> </ul> <p><b>Format:</b></p> <ul style="list-style-type: none"> <li>• Identify and use the concepts of similarity in mathematical, geometric, and real-world contexts</li> <li>• Determine scale factors resulting from dilations</li> <li>• Apply the concepts of similarity to geometric and real-world settings</li> <li>• Apply proportions, ratios, and scale factors to solve problems involving scale drawings and determine side lengths and areas of similar triangles and rectangles</li> <li>• Distinguish among translations and reflections of figures on a coordinate plane and in real-world contexts</li> <li>• Determine the coordinates of the vertices of the figure after a transformation</li> </ul>



## STANDARD 7.GM.4 continued

### ITEM SPECIFICATIONS

#### Content Limits:

- Limit to visual identification or definition of similarity
- Limit to ratios of length
- Limit geometric figures to two dimensions
- Limit transformations to reflections, translations, and dilations
- Limit coordinates of vertices to integers
- Limit to no more than two transformations when determining the transformation given the figure and its image
- Limit to one transformation with dilations
- Limit to no more than two transformations when determining the image given the figure and transformation

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

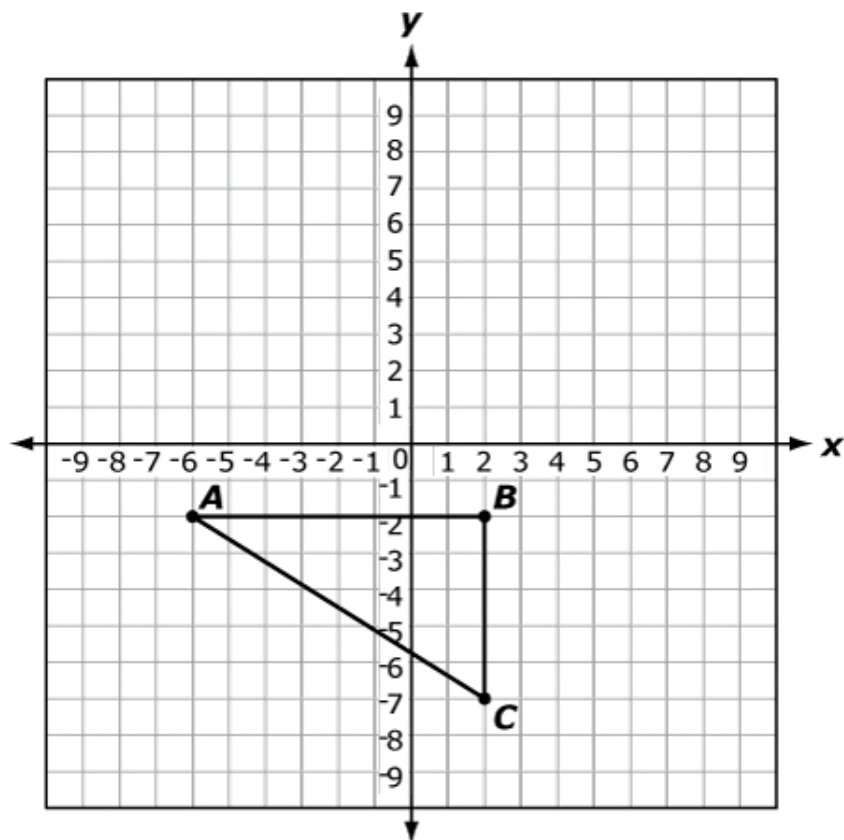
**16** Jillian made a scale model of her lawn. The actual length of her lawn is 32 feet (ft). The length of her model is 8 inches (in.). What is the ratio of the length of Jillian's lawn to the length of her model?

- A** 1 ft : 4 in.
- B** 4 ft : 1 in.
- C** 1 ft : 25 in.
- D** 25 ft : 1 in.

**Correct Response:** B

**Depth-of-Knowledge:** 2

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 STRAND—DATA & PROBABILITY (D): STANDARD 7.D.1

OAS STANDARD	<p><b>7.D.1</b> Display and analyze data in a variety of ways.</p>
OAS OBJECTIVES	<p><b>7.D.1.1</b> Design simple experiments, collect data and calculate measures of central tendency (mean, median, and mode) and spread (range). Use these quantities to draw conclusions about the data collected and make predictions.</p> <p><b>7.D.1.2</b> Use reasoning with proportions to display and interpret data in circle graphs (pie charts) and histograms. Choose the appropriate data display and know how to create the display using a spreadsheet or other graphing technology.</p>
ITEM SPECIFICATIONS	<p><b>Emphasis:</b></p> <ul style="list-style-type: none"> <li>• Demonstrate the ability to design simple experiments and collect data.</li> <li>• Calculate measures of central tendency and spread and use these quantities to draw conclusions and make predictions.</li> <li>• Display and interpret data in circle graphs and histograms.</li> <li>• Choose the appropriate display for a set of data.</li> </ul> <p><b>Stimulus Attributes:</b></p> <ul style="list-style-type: none"> <li>• Test items may include illustrations of the following: number lines, tables, frequency charts, line graphs, single/double bar graphs, pictographs, Venn diagrams, stem-and-leaf plots, scatter plots, histograms, circle graphs, data sets, and spreadsheets.</li> <li>• Test items may include any of the following terms: range, spread, mean, or average, median, and mode.</li> </ul> <p><b>Format:</b></p> <ul style="list-style-type: none"> <li>• Analyze the appropriate use of the mean in comparison with other measures of central tendency</li> <li>• Given a set of data, the student will determine mean, median, mode, and range</li> <li>• Items may include comparisons between mean, median, mode, and range</li> <li>• Compare how representations of data support inferences and predictions</li> <li>• Identify why a specific measure provides the most useful information in a given context</li> <li>• Design a probability experiment (i.e.: divide and label sectors on a spinner)</li> <li>• Organize and interpret data in circle graphs and histograms</li> <li>• Select appropriate representations of data such as circle graphs or histograms</li> </ul> <p><b>Content Limits:</b></p> <ul style="list-style-type: none"> <li>• Limit data sets to at most 20 data points</li> <li>• Limit data sets to numerical data</li> </ul>

STANDARD 7.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:

- Common errors
- Incorrect procedures
- Use of incorrect measure
- Misunderstanding of concepts
- Unsupportable conclusions
- Miscalculation
- Misreported data
- Inappropriate representations
- Incorrect or incomplete data display
- Incorrect interpretation of data display

- 18** This table shows the number of birds a bird watcher saw each day during a week.

**Bird Watcher Data**

<b>Day</b>	<b>Number of Birds</b>
Monday	42
Tuesday	35
Wednesday	31
Thursday	53
Friday	29
Saturday	31
Sunday	52

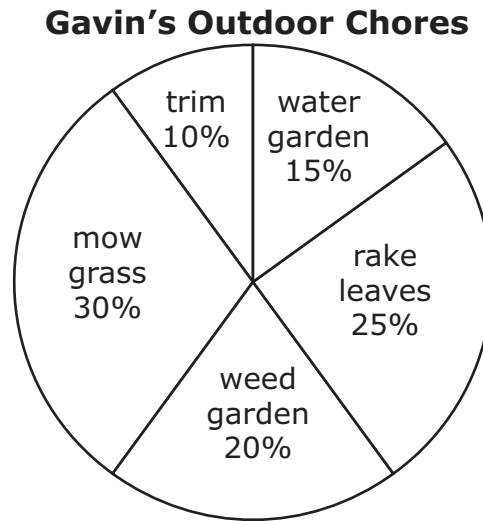
**What is the mean number of birds the bird watcher saw in one day?**

- A** 24
- B** 31
- C** 39
- D** 53

**Correct Response:** C

**Depth-of-Knowledge:** 2

- 19** Gavin spent 40 hours last month doing outdoor chores. This circle graph shows how much time he spent on each chore.



**How many hours did Gavin spend mowing the grass?**

- A** 8 hours
- B** 10 hours
- C** 12 hours
- D** 30 hours

**Correct Response:** C

**Depth-of-Knowledge:** 2

## OAS STRAND—DATA & PROBABILITY (D): STANDARD 7.D.2

OAS STANDARD	<p><b>7.D.2</b> Calculate probabilities and reason about probabilities using proportions to solve real-world and mathematical problems.</p>
OAS OBJECTIVES	<p><b>7.D.2.1</b> Determine the theoretical probability of an event using the ratio between the size of the event and the size of the sample space; represent probabilities as percents, fractions and decimals between 0 and 1.</p> <p><b>7.D.2.2</b> Calculate probability as a fraction of sample space or as a fraction of area. Express probabilities as percents, decimals and fractions.</p> <p><b>7.D.2.3</b> Use proportional reasoning to draw conclusions about and predict relative frequencies of outcomes based on probabilities.</p>
ITEM SPECIFICATIONS	<p><b>Emphasis:</b></p> <ul style="list-style-type: none"> <li>Determine the theoretical probability of an event.</li> <li>Draw conclusions about and predict relative frequencies of outcomes based on probabilities.</li> </ul> <p><b>Stimulus Attributes:</b></p> <ul style="list-style-type: none"> <li>Test items may include: illustrations of coordinate graphs, number lines, tables, graphs, and charts, such as frequency charts, line, bar, and picture graphs; Venn diagrams; stem-and-leaf plots, box-and-whisker plots, and scatter plots; histograms, circle graphs, data sets, spinners, and other diagrams.</li> </ul> <p><b>Format:</b></p> <ul style="list-style-type: none"> <li>Predict the probability of the outcome using the ratio between the size of the event and the size of the sample space</li> <li>Express probabilities in various forms, including decimal, fraction, and percent</li> <li>Predict the probability of the outcome</li> <li>Calculate probability as a fraction of sample space or as a fraction of area</li> <li>Probability can be with or without replacement</li> <li>Draw conclusions about and predict relative frequencies of outcomes based on probabilities</li> </ul> <p><b>Content Limits:</b></p> <ul style="list-style-type: none"> <li>Limit sample to no more than 20 pieces of data</li> <li>Limit real-world contexts to age-appropriate situations</li> <li>Limit fractions and decimals between 0 and 1</li> <li>Limit to probabilities of one event</li> </ul> <p><b>Primary Process Standards:</b></p> <ul style="list-style-type: none"> <li>Develop Strategies for Problem Solving</li> <li>Develop Mathematical Reasoning</li> <li>Develop the Ability to Make Conjectures, Model, and Generalize</li> </ul>

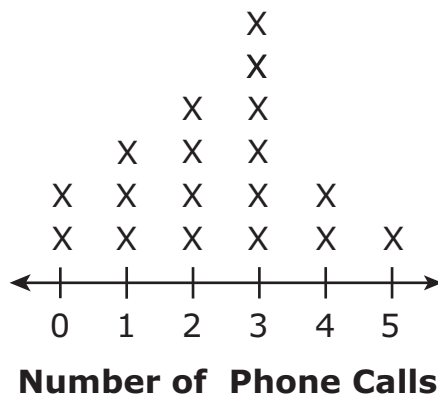
## STANDARD 7.D.2 continued

### ITEM SPECIFICATIONS

#### Distractor Domain:

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

- 20** The line plot shows the number of phone calls made in one day by students in Dorothy's class.



Based on the information in the line plot, what is the probability a student chosen at random made 2 or 3 phone calls that day?

- A  $\frac{1}{3}$
- B  $\frac{1}{10}$
- C  $\frac{2}{9}$
- D  $\frac{5}{9}$

**Correct Response:** D  
**Depth-of-Knowledge:** 2



**21** A fair coin is tossed 30 times with the results being either heads or tails. How many times should the result be tails?

- A** 15
- B** 20
- C** 25
- D** 30

**Correct Response:** A

**Depth-of-Knowledge:** 2

## **APPENDIX A: SAMPLE TECHNOLOGY ENHANCED ITEMS (TEIS) FROM GRADES 6, 8, AND 10**

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The three sample TEIs in this appendix do not come from Grade 7, but are included to provide an understanding of how each interaction type used in Grade 7 works. For an example of a hot spot interaction, see sample item 17 on page 37.

**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.

$$5(6 + 8)$$

$$48 + 30$$

$$(5 + 6) \times 8$$

$$5 + 48$$

$$6 \times 5 + 8$$

$$40 + 48$$

$$8 + 30$$

$$6(5 + 8)$$

$$40 + 30$$

$$5 + 6 \times 8$$

**Correct Response:** 1A – 2D; 1B – 2C; 1C – 2A; 1D – 2E; 1E – 2B

**Depth-of-Knowledge:** 2

**OAS Standard:** 6.A.2.1

**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  rational.

$x \cdot y$  is  irrational.

$a + x$  is  rational.

$b \cdot x$  is  irrational.

**Correct Response:** always; sometimes; never; always

**Depth-of-Knowledge:** 2

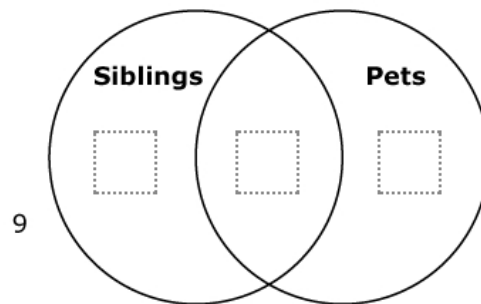
**OAS Standard:** PA.N.1.4

**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
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**Correct Response:** 21, 14, 6

**Depth-of-Knowledge:** 3

**OAS Standard:** A1.D.2.2





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