## OKLAHOMA SCHOOL TESTING PROGRAM


2016-2017 GRADE 4
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# OKLAHOMA SCHOOL TESTING PROGRAM TEST AND ITEM SPECIFICATIONS 

## Grade 4 Mathematics Test

## Purpose

The purpose of the Grade 4 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 4 Test Blueprint.

## Test Structure, Format, and Scoring

The Grade 4 Mathematics test will consist of 50 operational items and 10 field-test items, written at a reading level about one grade level below a Grade 4 audience, and includes four responses from which to choose: the correct answer and three distractors. 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 4

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

| $\begin{aligned} & \text { IDEAL\% } \\ & \text { OF ITEMS } \end{aligned}$ | $\left\|\begin{array}{l} \text { IDEALI. } \\ \text { OF TIEMS } \end{array}\right\|$ | Stranos and standards |
| :---: | :---: | :---: |
| 44\% | 22 | NUMBER AND OPERATIONS |
|  | 9 | 4.N. 1 Number Operations |
|  | 13 | 4.N. 2 Rational Numbers (10) <br> 4.N. 3 Money (3) |
| 16\% | 8 | ALGEBRAIC REASONING AND ALGEBRA |
|  | 8 | 4.A. 1 Numerical Patterns (4) <br> 4.A. 2 Equations (4) |
| 28\% | 14 | GEOMETRY AND MEASUREMENT |
|  | 6 | 4.GM.1 Polygons and Polyhedra |
|  | 8 | 4.GM. 2 Measurement (5) <br> 4.GM. 3 Time (3) |
| 12\% | 6 | DATA AND PROBABILITY |
|  | 6 | 4.D. 1 Data Analysis |
| 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 4 test will approximately reflect the following "depth-of-knowledge (DOK)" distribution of items:

| Depth-of-Knowledge | Percent of Items |
| :--- | :---: |
| Level 1-Recall and Reproduction | $25-35 \%$ |
| Level 2-Skills and Concepts | $60-70 \%$ |
| Level 3-Strategic Thinking | $5-15 \%$ |

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 4 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.

## 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 4 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.

Section 1 Grade 4 Mathematics Test Time Schedule

| Distributing Grade 4 Mathematics Test Booklets, reading directions | Approximately 15 minutes |
| :--- | :--- |
| Administering the Mathematics Test | $30-40$ minutes |
| Total: | $45-55$ minutes |
| Section 2 Grade 4 Mathematics Test Time Schedule |  |
| Distributing Grade 4 Mathematics Test Booklets, reading directions | Approximately 15 minutes |
| Administering the Mathematics Test | $30-40$ minutes |
| Total: | $45-55$ minutes |

## Item Types

The test will consist of multiple choice 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.


## 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 $\mathrm{A}, \mathrm{B}, \mathrm{C}$, 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 4 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 4 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. Calculators, formula sheets, and other resource materials may not be used on the Grade 4 Mathematics 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 4 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 4 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. All test items and answer choices have appropriate labels and units.
7. Most graphs are placed on a gray grid, with the horizontal and vertical labeled and marked.
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## 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 4.N. 1

\begin{tabular}{|c|c|c|}
\hline  \& 4.N. 1 \& Solve real-world and mathematical problems using multiplication and division. <br>
\hline \multirow{5}{*}{} \& 4.N.1.1
4.N.1.2

4.N.1.3 \& | Demonstrate fluency with multiplication and division facts with factors up to 12. Use an understanding of place value to multiply or divide a number by 10,100 , and 1,000 . |
| :--- |
| Multiply 3-digit by 1-digit or a 2 -digit by 2 -digit whole numbers, using efficient and generalizable procedures and strategies, based on knowledge of place value, including but not limited to standard algorithms. | <br>

\hline \& 4.N.1.4 \& Estimate products of 3-digit by 1-digit or 2-digit by 2-digit whole numbers using rounding, benchmarks, and place value to assess the reasonableness of results. Explore larger numbers using technology to investigate patterns. <br>
\hline \& 4.N.1.5 \& Solve multi-step, real-world, and mathematical problems requiring the use of addition, subtraction, and multiplication of multi-digit whole numbers. Use various strategies, including the relationship between operations, the use of appropriate technology, and the context of the problem to assess the reasonableness of results. <br>
\hline \& 4.N.1.6 \& Use strategies and algorithms based on knowledge of place value, equality, and properties of operations to divide 3-digit dividend by 1-digit whole number divisors (e.g., mental strategies, standard algorithms, partial quotients, repeated subtraction, or the commutative, associative, and distributive properties). <br>
\hline \& 4.N.1.7 \& Determine the unknown addend or factor in equivalent and non-equivalent expressions (e.g., $5+6=4+\square, 3 \times 8<3 \times \square$ ). <br>

\hline \multirow[t]{2}{*}{} \& \multicolumn{2}{|l|}{| Emphasis: |
| :--- |
| - Demonstrate fluency with multiplication and division facts. |
| - Use the concept of place value to multiply or divide. |
| - Multiply 3 -digit by 1 -digit or a 2 -digit by 2 -digit whole numbers. |
| - Estimate products of 3-digit by 1-digit or 2-digit by 2-digit whole numbers. |
| - Solve multi-step, real-world, and mathematical problems requiring the use of addition, subtraction, and multiplication of multi-digit whole numbers. |
| - Divide 3-digit dividends by 1-digit whole number divisors. |
| - Determine the value of an unknown addend or factor in equivalent and non-equivalent expressions. |} <br>


\hline \& \multicolumn{2}{|l|}{| Stimulus Attributes: |
| :--- |
| - Test items may include tables, pictures, charts, counters, base-10 blocks, place value mats, and other manipulatives. |} <br>

\hline
\end{tabular}

## STANDARD 4.N. 1 continued

## Format:

- Calculate the product of two whole numbers
- Calculate the quotient of two whole numbers
- Identify the missing fact from a fact family
- Multiply or divide a number by 10,100 , or 1,000
- Solve an application problem by estimating the product of 3 -digit numbers
- Solve an application problem by calculating the product of 3-digit numbers
- Use technology to explore and investigate patterns with multiplication of larger numbers
- Solve a multi-step problem to find an unknown quantity
- Calculate quotients without remainders to solve real-world problems
- Solve an equivalent or non-equivalent expression for an unknown addend or factor

Content Limits:

- Limit items to division with no remainder
- Limit factors and divisors to whole numbers up to 12
- Limit numbers to whole numbers
- Limit numbers to six digits for addition and subtraction
- Limit items to up to 3-digit by 1-digit or 2-digit by 2 -digit multiplication
- Limit operation to addition, subtraction, multiplication, or division
- Limit to 1 -digit divisor and 3 -digit dividend without a remainder
- Limit to two operations in multistep problems

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
- Misidentification of related facts
- Incorrect identification of place value of a zero
- Rounding errors
- Regrouping errors
- Perform incorrect operation
- Algorithmic errors

1 Gretta planted 24 rows of carrots. Each row had 16 carrots in it. Which is closest to the total number of carrots Gretta planted?
A 200 carrots
B 300 carrots
C 400 carrots
D 600 carrots

Correct Response: C
Depth-of-Knowledge: 2

2 A student practiced playing the piano each day for 11 days. The student practiced a total of 175 minutes. Which expression shows the approximate number of minutes the student practiced each day?
A $180+10$
B 180-10
C $180 \div 10$
D $180 \times 10$

Correct Response: C
Depth-of-Knowledge: 1

## OAS STRAND—NUMBER \& OPERATIONS (N): STANDARD 4.N. 2

|  | 4.N. 2 | Represent and compare fractions and decimals in real-world and mathematical situations; use place value to understand how decimals represent quantities. |
| :---: | :---: | :---: |
|  | 4.N.2.1 4.N.2.2 | Represent and rename equivalent fractions using fraction models (e.g. parts of a set, area models, fraction strips, number lines). <br> Use benchmark fractions ( $0, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, 1$ ) to locate additional fractions on a number line. Use models to order and compare whole numbers and fractions less than and greater than one using comparative language and symbols. |
|  | 4.N.2.3 | Decompose a fraction in more than one way into a sum of fractions with the same denominator using concrete and pictorial models and recording results with symbolic representations (e.g., $\frac{3}{4}=\frac{1}{4}+\frac{1}{4}+\frac{1}{4}$ ). |
|  | 4.N.2.4 | Use fraction models to add and subtract fractions with like denominators in realworld and mathematical situations. |
|  | 4.N.2.5 | Represent tenths and hundredths with concrete models, making connections between fractions and decimals. |
|  | 4.N.2.6 | Represent, read, and write decimals up to at least the hundredths place in a variety of contexts including money. |
|  | 4.N.2.7 | Compare and order decimals and whole numbers using place value, a number line, and models such as grids and base 10 blocks. |
|  | 4.N.2.8 | Compare benchmark fractions $\left(\frac{1}{4}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}\right)$ and decimals $(0.25,0.50,0.75)$ in real-world and mathematical situations. |
| ITEM SPECIFICATIONS | Emphasis: <br> - Translate between equivalent fractions and fraction models. <br> - Demonstrate an ability to use benchmark fractions to estimate or locate additional fractions on a number line. <br> - Compare and order fractions using concrete and pictorial models. <br> - Decompose a fraction in more than one way into a sum of fractions with the same denominator. <br> - Use concrete models to add or subtract fractions in mathematical situations and realworld contexts. <br> - Represent, read, and write decimals. <br> - Compare and order whole numbers and decimal numbers. <br> - Compare benchmark fractions and decimals in mathematical situations and in realworld contexts. |  |
|  |  |  |
|  | Stimulus Attributes: <br> - Test items may include parts of a set, tables, models, area models, fraction circles, fraction strips, pictures, diagrams, egg cartons, circles, rectangles, counters, number lines, graphs, base-10 blocks, $10 \times 10$ grids, cubes, sticks, and other counting manipulatives. |  |

## STANDARD 4.N. 2 continued

## Format:

- Use models to identify fractions
- Use models to compare fractions with like or unlike denominators
- Use models to calculate the sum or difference of fractions
- Determine which two benchmarks a given number lies between
- Use concrete and pictorial models to decompose a fraction
- Use fraction models for problems with addition and subtraction of fractions
- Identify connections among representations of fractions and decimals
- Organize representations of fractions and decimals
- Translate among representations of fractions and decimals
- Recognize and generate equivalent forms of fractions and decimals
- Read decimals in words
- Write decimals as words
- Write decimals as numerals
- Determine the relationship among whole numbers and decimal numbers as greater than ( $>$ ), less than ( $<$ ), or equal to (=)
- Identify the number with the greatest value
- Identify the number with the least value
- Identify numbers that are of equal value
- Compare benchmark fractions and decimals

Content Limits:

- Limit benchmarks to $0, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, 1$
- Limit fractions to halves, thirds, fourths, fifths, eighths, tenths, and twelfths
- Limit comparison items to two numbers
- Limit operations to simple addition or subtraction using models with the same denominator
- Limit fractions to values between 0 and 1
- Limit non-repeating decimals to the tenths and hundredths place
- Limit fractions to halves, fourths, and tenths in items that include both decimals and fractions
- Limit whole numbers to six digits
- Limit ordering to three 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:

- Computational errors
- Misrepresentation of numerator and denominator
- Representational errors
- Conceptual errors in number sense
- Rounding and estimation errors
- Conversion errors
- Incorrect models
- Misrepresentation of place value
- Misrepresentation of decimals
- Error in translation

3 Which diagram best represents $\frac{\mathbf{3}}{8}=\frac{3}{8}$ ?
A


B $\begin{array}{lll}000 & 0 \\ 000 & 0 & 0\end{array}=\begin{array}{llll}0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0\end{array}$
c $\begin{array}{llll}0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0\end{array}=\begin{array}{llll}0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0\end{array}$
D $\begin{gathered}0 \\ 0\end{gathered}=\begin{array}{llll}0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0\end{array}$

## Correct Response: C

Depth-of-Knowledge: 2

4 The three cups shown are the same size. Each cup has a different amount of juice.


Which list shows the amounts in order from greatest to least?
A $\frac{3}{4}, \frac{1}{3}, \frac{1}{2}$
B $\frac{1}{2}, \frac{1}{3}, \frac{3}{4}$
C $\frac{3}{4}, \frac{1}{2}, \frac{1}{3}$
D $\frac{1}{2}, \frac{3}{4}, \frac{1}{3}$
Correct Response: C
Depth-of-Knowledge: 2

## OAS STRAND-NUMBER \& OPERATIONS (N): STANDARD 4.N. 3

4.N. 3 Determine the value of coins in order to solve monetary transactions.
4.N.3.1 Given a total cost (whole dollars up to $\$ 20$ or coins) and amount paid (whole dollars up to $\$ 20$ or coins), find the change required in a variety of ways. Limited to whole dollars up to $\$ 20$ or sets of coins.

## Emphasis:

- Given a total cost and amount paid, find the change required.


## Stimulus Attributes:

- Test items may include illustrations of money, tables, and charts.


## Format:

- Subtract small amounts of money up to $\$ 20$ to solve real-world problems.


## Content Limits:

- Limit to finding whole dollar change from up to $\$ 20$ or change from sets of coins up to one dollar
- Limit coins to pennies, nickels, dimes, quarters, and half dollars.
- Limit bills to ones, fives, tens, and twenties
- Limit transactions to only bills or only coins

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
- Select incorrect operation

5 Mr. Wilson charges a customer $\$ 7$ for a new toy. The customer pays Mr. Wilson with a $\$ 20$ bill. How much change does Mr. Wilson owe the customer?

A $\$ 3$
B $\$ 5$
C $\$ 10$
D $\$ 13$

Correct Response: D
Depth-of-Knowledge: 1

## OAS STRAND-ALGEBRAIC REASONING \& ALGEBRA (A): STANDARD 4.A. 1

|  | 4.A. 1 Use multiple representations of patterns to solve real-world and mathematical problems. |
| :---: | :---: |
|  | 4.A.1.1 Create an input/output chart or table to represent or extend a numerical pattern. <br> 4.A.1.2 Describe the single operation rule for a pattern from an input/output table or function machine involving any operation of a whole number. <br> 4.A.1.3 Create growth patterns involving geometric shapes and define the single operation rule of the pattern. |
| ITEM SPECIFICATIONS | Emphasis: <br> - Extend, create, and determine the rules for patterns using a variety of stimuli. <br> Stimulus Attributes: <br> - Test items may include input/output charts, graphs, tables, lists, charts, models, function machines, geometric shapes, and pictures. <br> Format: <br> - Extend a numerical pattern by creating an input/output chart or table <br> - Determine a pattern by describing the rule <br> - Use a pattern to solve a real-world problem <br> - Create growth patterns involving geometric shapes <br> - Determine the single operation rule of a growth pattern <br> Content Limits: <br> - Limit patterns to whole numbers <br> - Limit rules to one operation <br> - Limit operations to addition, subtraction, and multiplication <br> - Limit extending patterns to next two elements <br> Primary Process Standards: <br> - Develop Strategies for Problem Solving <br> - Develop the Ability to Communicate Mathematically <br> - Develop Mathematical Reasoning <br> - Develop a Deep and Flexible Conceptual Understanding <br> - Develop the Ability to Make Conjectures, Model, and Generalize <br> Distractor Domain: <br> - Computational error <br> - Inappropriate operation selected <br> - Misrepresentation of pattern or rule |

6 The table shows the cost of different numbers of tickets to a baseball game.

## Baseball Tickets

| Number of <br> Tickets (t) | Cost (\$) |
| :---: | :---: |
| 2 | 16 |
| 3 | 24 |
| 4 | 32 |
| 5 | 40 |

Which rule can be used to find the cost, in dollars, of $\boldsymbol{t}$ tickets?
A $t \cdot 8$
B $t \div 12$
C $t+14$
D $t-35$

Correct Response: A
Depth-of-Knowledge: 2

7 A function machine used the rule multiply by 6. Which table could represent the numbers going in and coming out of this function machine?

A

| In | Out |
| :---: | :---: |
| 2 | 8 |
| 3 | 9 |
| 6 | 12 |
| 8 | 14 |

B | In | Out |
| :---: | :---: |
| 2 | 12 |
| 5 | 30 |
| 8 | 48 |
| 9 | 54 |

C | In | Out |
| :---: | :---: |
| 1 | 6 |
| 3 | 18 |
| 5 | 30 |
| 7 | 48 |

D | In | Out |
| :---: | :---: |
| 2 | 12 |
| 3 | 18 |
| 6 | 24 |
| 8 | 30 |

Correct Response: B
Depth-of-Knowledge: 2

## OAS STRAND-ALGEBRAIC REASONING \& ALGEBRA (A): STANDARD 4.A. 2

|  | Use multiplication and division with unknowns to create number sentences <br> representing a given problem situation. |
| :---: | :---: | :---: |

8 Coach Ted bought 36 banners. He bought an equal number of blue banners and gold banners. The number of banners of each color, $n$, can be found using this equation.

$$
2 \times n=36
$$

How many banners of each color did Coach Ted buy?
A 18 banners
B 34 banners
C 38 banners
D 72 banners

Correct Response: A
Depth-of-Knowledge: 2

9 Marcia is making chocolate chip cookies. She needs to use a total of 64 ounces of chocolate chips. The equation can be used to find the number of ounces of chocolate chips, $c$, Marcia still needs to use.

$$
16+c=64
$$

How many ounces of chocolate chips does Marcia still need to use?
A 48 ounces
B 52 ounces
C 58 ounces
D 80 ounces

Correct Response: A
Depth-of-Knowledge: 2

## OAS STRAND-GEOMETRY \& MEASUREMENT (GM): STANDARD 4.GM. 1

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| :---: |
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|  |  |
|  |  |

4.GM. 1 Name, describe, classify, and construct polygons and three-dimensional figures.
4.GM.1.1 Identify points, lines, line segments, rays, angles, endpoints, and parallel and perpendicular lines in various contexts.
4.GM.1.2 Describe, classify, and sketch quadrilaterals, including squares, rectangles, trapezoids, rhombuses, parallelograms, and kites. Recognize quadrilaterals in various contexts.
4.GM.1.3 Given two three-dimensional shapes, identify similarities and differences.

## Emphasis:

- Identify points, lines, line segments, rays, angles, endpoints, and pairs of parallel and perpendicular lines.
- Describe, classify, and sketch quadrilaterals.
- Recognize quadrilaterals in various contexts.
- Identify similarities and differences between two three-dimensional shapes.


## Stimulus Attributes:

- Test items may include diagrams, tables, grids, gridded figures, pattern blocks, and pictures.
- Test items may include any of the following terms or phrases: acute, right, obtuse, less than 90 degrees, equal to 90 degrees, or greater than 90 degrees.

Format:

- Identify examples or models of points, lines, line segments, rays, angles, endpoints, and pairs of parallel and perpendicular lines
- Identify quadrilaterals in various contexts
- Sketch quadrilaterals
- Classify quadrilaterals
- Name two three-dimensional figures with given characteristics
- Identify characteristics of two three-dimensional figures (e.g., edges, faces, vertices)
- Identify congruent three-dimensional figures
- Sort three-dimensional shapes to identify similarities and differences

Content Limits:

- Limit items to pairs of lines
- Limit figures to quadrilaterals, including squares, rectangles, trapezoids, rhombuses, parallelograms, and kites
- Limit plane figures (regular or irregular) to a maximum of five sides
- Limit solid figures to spheres, cylinders, rectangular or triangular prisms, and rectangular or triangular pyramids


## STANDARD 4.GM. 1 continued

## Primary Process Standards:

- 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 intersecting, parallel, and perpendicular lines
- Misunderstanding of vocabulary
- Misidentification of quadrilaterals
- Misidentification of characteristics, figures, or congruency
- Error in correlation of characteristics with figures

10 Brady drew a picture of two animals. He used line segments to draw the whiskers.


## Which statement about the whiskers is true?

A The whiskers on both animals appear to be parallel line segments.
B The whiskers on both animals appear to be intersecting line segments.
C The whiskers on both animals appear to be perpendicular line segments.
D The whiskers on one animal appear to be perpendicular and the whiskers on the other animal appear to be parallel.

Correct Response: B
Depth-of-Knowledge: 3

## OAS STRAND-GEOMETRY \& MEASUREMENT (GM): STANDARD 4.GM. 2

| 是 | 4.GM. 2 | Understand angle, length, and area as measurable attributes of real-world and mathematical objects. Use various tools to measure angles, length, area, and volume. |
| :---: | :---: | :---: |
|  | 4.GM.2.1 | Measure angles in geometric figures and real-world objects with a protractor or angle ruler. |
|  | 4.GM.2.2 | Find the area of polygons that can be decomposed into rectangles. |
|  | 4.GM.2.3 | Using a variety of tools and strategies, develop the concept that the volume of rectangular prisms with whole-number edge lengths can be found by counting the total number of same-sized unit cubes that fill a shape without gaps or overlaps. Use appropriate measurements such as $\mathrm{cm}^{3}$. |
|  | 4.GM.2.4 | Choose an appropriate instrument and measure the length of an object to the nearest whole centimeter or quarter-inch. |
|  | 4.GM.2.5 | Solve problems that deal with measurements of length, when to use liquid volumes, when to use mass, temperatures above zero and money using addition, subtraction, multiplication, or division as appropriate (customary and metric). |
| Emphasis: |  |  |
|  | - Measure angles in geometric figures and real-world objects. <br> - Find the area of polygons that can be decomposed into rectangles. <br> - Demonstrate an understanding of the concept that the volume of rectangular prisms can be found by counting the total number of same-sized unit cubes that fill the shape. <br> - Choose an appropriate instrument and measure the length of an object. <br> - Solve problems that deal with measurements of length. <br> - Apply knowledge of measurement concepts to determine appropriate unit and measurement instrument for specific situations. |  |
|  | Stimulus Attributes: |  |
|  |  | items may include coordinate graphs, three-dimensional geometric figures, metric figures, protractors, geoboards, other geometric manipulatives, measuring ruments, tables, graphs, charts, pictures, diagrams, maps, scale drawings, circle phs, other diagrams, diagrams of rectangles or squares, grids, gridded figures, dot s , and geoboards. |

## STANDARD 4.GM. 2 continued

## Format:

- Identify and analyze angle measures in mathematical situations and in real-world contexts
- Use online protractor to find angle measures
- Use a formula to find the area of a rectangle
- Determine the number of square tiles that would be needed to build a rectangle of a certain area
- Find the area of polygons by decomposing the polygon into rectangles
- Calculate volume by counting the total number of same-sized unit cubes that fill a shape without gaps or overlaps
- Identify appropriate unit and instrument of measure needed to solve a length, liquid volume, mass, temperature, or money problem
- Measure the length of an object
- Solve problems that deal with measurements of length, when to use liquid volumes, when to use mass, temperatures above zero and money


## Content Limits:

- Limit angle measures to whole numbers no greater than 180 degrees
- Limit figures to squares and rectangles or figures that can be composed of squares and rectangles
- Limit solid figures to rectangular prisms
- Limit units of length to whole centimeter and quarter-inch
- Limit units of mass to gram, kilogram, ounce, or pound
- Limit temperatures to above zero

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
- Computational errors
- Incorrect use of measurement instrument
- Inappropriate formulas
- Calculate perimeter for area
- Miscounting cubes in solid figure
- Incorrect measurements
- Identify inappropriate unit of measure
- Select inappropriate measurement instrument


## 11 Which is closest to the measure of $\angle G$ ?



A $37^{\circ}$
B $43^{\circ}$
C $143^{\circ}$
D $157^{\circ}$

Correct Response: C
Depth-of-Knowledge: 2

## OAS STRAND-GEOMETRY \& MEASUREMENT (GM): STANDARD 4.GM. 3

4.GM. 3 Determine elapsed time and convert between units of time.
4.GM.3.1 Determine elapsed time.
4.GM.3.2 Solve problems involving the conversion of one measure of time to another.

## Emphasis:

- Determine elapsed time.
- Solve problems involving the conversion of one measure of time to another.


## Stimulus Attributes:

- Test items may include pictures, tables, schedules, calendars, and charts.


## Format:

- Solve real-world problems involving time.
- Convert one measure of time to another.


## Content Limits:

- Limit time to one-minute intervals
- Limit conversion of time from hours to minutes and from minutes to seconds

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:

- Computational errors
- Select incorrect operation
- Conversion errors (minutes to hours)

12 Carmen started eating her snack at the time shown on the clock.


It took Carmen 15 minutes to eat her snack. At what time did Carmen finish eating her snack?

A 1:05
B 2:05
C 10:20
D 12:35

Correct Response: A
Depth-of-Knowledge: 2

13 A movie begins at 2:50 P.M. as shown on this clock.


The movie ends at 4:30 P.M. How long is the movie?
A 1 hour 30 minutes
B 1 hour 35 minutes
C 1 hour 40 minutes
D 1 hour 45 minutes

Correct Response: C
Depth-of-Knowledge: 2

## OAS STRAND-DATA \& PROBABILITY (D): STANDARD 4.D. 1

4.D.1 $\quad$ Collect, organize, and analyze data.

## STANDARD 4.D. 1 continued

## 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:

- Inaccurate representation of data set
- Misidentification of data set belonging to a display
- Misreading scale increments, labels, or key
- Computational errors

14 Joy and Fran each have some toy horses.

| Joy's Horses |  |
| :--- | :---: |
| Color | Number of <br> Horses |
| Red | 1 |
| Blue | 1 |
| Green | 2 |
| Yellow | 1 |

Fran's Horses

| Color | Number of <br> Horses |
| :--- | :---: |
| Red | 3 |
| Blue | 1 |
| Green | 1 |
| Yellow | 0 |

Which line plot shows how many horses of each color the girls have all together?

A $\quad \mathbf{X}$


Red Blue Green Yellow

B $\quad \mathbf{X}$


Red Blue Green Yellow

C

|  |  |  |  |
| :---: | :---: | :---: | :---: |
| $\mathbf{X}$ | $\mathbf{X}$ | $\mathbf{X}$ | $\mathbf{X}$ |
| Red | Blue | Green Yellow |  |

D $\quad \mathrm{X}$

| $\mathbf{X}$ |  | $\mathbf{X}$ |  |
| :---: | :---: | :---: | :---: |
| $\mathbf{X}$ | $\mathbf{X}$ | $\mathbf{X}$ |  |
| $\mathbf{X}$ | $\mathbf{X}$ | $\mathbf{X}$ | $\mathbf{X}$ |
| Red | Blue | Green Yellow |  |

Correct Response: D
Depth-of-Knowledge: 2

15

## Distances Traveled to School in Kilometers



Key: x represents 2 students

What is the total number of students who are represented by this line plot?
A 34
B 36
C 54
D 56

Correct Response: B
Depth-of-Knowledge: 2


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