OKLAHOMA SCHOOL TESTING PROGRAM

TEST BLUEPRINT AND ITEM SPECIFICATIONS

MATHEMATICS GRADE 4

OKLAHOMA STATE DEPARTMENT OF EDUCATION
CHAMPION EXCELLENCE

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OKLAHOMA SCHOOL TESTING PROGRAM TEST AND ITEM SPECIFICATIONS

Grade 4 Mathematics Test

Purpose

A robust assessment system is predicated upon the knowledge that no one assessment is able to provide answers to all questions affecting instructional decisions. An assessment system utilizes different types of assessment to gather multiple pieces of evidence to provide timely, relevant, actionable, and reliable information about what students know and can do relative to a set of standards.

According to the Oklahoma ESSA Plan (pp 48–49):

Oklahoma recognizes that a **robust assessment system** is tied closely to students' learning and teachers' instructional practices by valuing and promoting **local, classroom-based formative assessments** that help make **student learning visible**. At the same time, that system should provide a **strong summative assessment** program that fits as a component within a multifaceted state, district, and school accountability system.

The OSDE supports an assessment system by working with Oklahoma educators and stakeholders to:

- Ensure that state and federally required annual summative assessments delivered through the Oklahoma School Testing Program (OSTP) are effective and meaningful to families, districts, educators, and members of the community;
- Develop instructional resources to support local formative and interim assessments through the curriculum frameworks projects and assessment guidance toolkit; and
- Build and deliver professional learning through face-to-face and web-based resources to support local assessment needs and interpretation of state assessment data.

Annual assessments delivered through the OSTP are aligned to the Oklahoma Academic Standards and can therefore provide point-in-time data for programmatic and curricular decisions by supporting criterion-referenced interpretations at appropriate levels and grain size (e.g., grade, student group, teacher, building/district administrator, state). Standards-based formative and

interim assessments conducted at the local level can provide additional information and evidence of learning at a smaller grain size to inform instructional decisions made at the student and classroom level.

While state summative assessments are only one measure of what students know and can do, having Oklahoma students take OSTP assessments:

- ✓ Helps students, their families, and the public know how students have grown over time and how they are performing relative to the standards, their peers in Oklahoma, and the nation;
- ✓ Enables teachers to see how their students are performing against grade-level expectations communicated through the Performance Level Descriptors (PLDs) to support evaluation and enhancement of curriculum and programs for the next school year;
- ✓ Provides a standardized and reliable measure for school/district leaders, the state, policymakers, and the public to determine how well a system is meeting the goals of helping every child grow along a continuum to prepare them for careers, college, and life; and
- ✓ Provides comparable information and data to inform continuous improvement of a system and appropriately support federal and state accountability decisions.

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 (OAS)

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 six 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 GRADE 4

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

IDEAL % OF ITEMS	STRANDS AND STANDARDS
42–46%	**NUMBER AND OPERATIONS** 4.N.1 Number Operations 4.N.2 Rational Numbers 4.N.3 Money
14–18%	**ALGEBRAIC REASONING AND ALGEBRA** 4.A.1 Numerical Patterns 4.A.2 Equations
26–30%	**GEOMETRY AND MEASUREMENT** 4.GM.1 Polygons and Polyhedra 4.GM.2 Measurement 4.GM.3 Time
12–18%	**DATA AND PROBABILITY** 4.D.1 Data Analysis
100%	**TOTAL: 50 ITEMS**

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

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 OAS. The standards increase grade-level expectations and rigor, and set expectations 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.

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 design aspects such 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 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 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.

Grade 4 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 G4 Mathematics Online Test	Approximately 40 minutes
Administering Section 2 of the G4 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 <u>not</u> 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 vary. Reference sample items for the various types of TEIs. 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).

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 on the same page as the textual 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 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. 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.
8. Distractors should always be plausible (but, of course, incorrect) in the context of the stimulus. 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.
9. Order of presentation of item types is dictated by logic (chronological, spatial, etc.).
10. 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.
11. The range of items measuring an OAS standard consisting of more than one skill will provide a balanced representation of those skills.
12. Items should be focused on what all students should know and be able to do as they complete their Grade 4 coursework.
13. The responses "Both of the above," "All of the above," "None of the above," and "Neither of the above" will not be used.
14. 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.
15. Across all forms, a balance of gender and active/passive roles by gender is maintained.
16. Forms attempt to represent the ethnic diversity of Oklahoma students.
17. 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.
18. The stimuli avoid subject matter that might prompt emotional distress on the part of the students.
19. 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.

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.

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 objective 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

OAS STANDARD

4.N.1 Solve real-world and mathematical problems using multiplication and division.

OAS OBJECTIVES

4.N.1.1 Demonstrate fluency with multiplication and division facts with factors up to 12.

4.N.1.2 Use an understanding of place value to multiply or divide a number by 10, 100, and 1,000.

4.N.1.3 Multiply 3-digit by 1-digit or 2-digit by 2-digit whole numbers, using efficient and generalizable procedures and strategies, based on knowledge of place value, including but not limited to standard algorithms.

4.N.1.4 Estimate products of 3-digit by 1-digit or 2-digit by 2-digit whole numbers using rounding, benchmarks, and place value to assess the reasonableness of results. Explore larger numbers using technology to investigate patterns.

4.N.1.5 Solve multi-step, real-world, and mathematical problems requiring the use of addition, subtraction, and multiplication of multi-digit whole numbers. Use various strategies, including the relationship between operations, the use of appropriate technology, and the context of the problem to assess the reasonableness of results.

4.N.1.6 Use strategies and algorithms based on knowledge of place value, equality, and properties of operations to divide 3-digit dividend by 1-digit whole number divisors (e.g., mental strategies, standard algorithms, partial quotients, repeated subtraction, or the commutative, associative, and distributive properties).

4.N.1.7 Determine the unknown addend or factor in equivalent and non-equivalent expressions (e.g., $5 + 6 = 4 + \square$, $3 \times 8 < 3 \times \square$).

ITEM SPECIFICATIONS

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 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.

Stimulus Attributes:

- Test items may include tables, pictures, charts, counters, base-10 blocks, place value mats, and other manipulatives.

ITEM SPECIFICATIONS

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 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
- 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

Standard: 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.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to multiply and then make a decision about which answer is closest.

Distractor Rationale:

A. The student incorrectly rounded 16 to 10.

B. The student found the product and then only focused on the hundreds place being 3.

C. Correct. The student demonstrated an ability to estimate the product of a 2-digit by 2-digit multiplication problem using rounding.

D. The student incorrectly rounded 24 to 30.

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 180×10

Standard: 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).

Depth-of-Knowledge: 1

This item is a DOK 1 because it requires the student to complete a simple procedure, identifying the expression that matches a situation using estimation.

Distractor Rationale:

A. The student chose the wrong operation for the situation.

B. The student chose the wrong operation for the situation.

C. Correct. The student demonstrated an ability to translate a word problem into a division expression using estimation.

D. The student chose the wrong operation for the situation.

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

OAS STANDARD

4.N.2 Represent and compare fractions and decimals in real-world and mathematical situations; use place value to understand how decimals represent quantities.

OAS OBJECTIVES

4.N.2.1 Represent and rename equivalent fractions using fraction models (e.g., parts of a set, area models, fraction strips, number lines).

4.N.2.2 Use benchmark fractions ($0, \frac{1}{4}, \frac{3}{4}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, 1$) to locate additional fractions on a number line. Use models to order and compare whole numbers and fractions less than and greater than one using comparative language and symbols.

4.N.2.3 Decompose a fraction in more than one way into a sum of fractions with the same denominator using concrete and pictorial models and recording results with symbolic representations (e.g., $\frac{3}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$).

4.N.2.4 Use fraction models to add and subtract fractions with like denominators in real-world and mathematical situations.

4.N.2.5 Represent tenths and hundredths with concrete models, making connections between fractions and decimals.

4.N.2.6 Represent, read, and write decimals up to at least the hundredths place in a variety of contexts including money.

4.N.2.7 Compare and order decimals and whole numbers using place value, a number line, and models such as grids and base 10 blocks.

4.N.2.8 Compare benchmark fractions ($\frac{1}{4}, \frac{3}{4}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$) and decimals (0.25, 0.50, 0.75) in real-world and mathematical situations.

ITEM SPECIFICATIONS

Emphasis:

- Translate between equivalent fractions and fraction models.
- Demonstrate an ability to use benchmark fractions to estimate or locate additional fractions on a number line.
- Compare and order fractions using concrete and pictorial models.
- Decompose a fraction in more than one way into a sum of fractions with the same denominator.
- Use concrete models to add or subtract fractions in mathematical situations and real-world contexts.
- Represent, read, and write decimals.
- Compare and order whole numbers and decimal numbers.
- Compare benchmark fractions and decimals in mathematical situations and in real-world contexts.

Stimulus Attributes:

- 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 × 10 grids, cubes, sticks, and other counting manipulatives.

ITEM SPECIFICATIONS

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, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, 1
- Limit fractions to halves, thirds, fourths, fifths, sixths, 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:

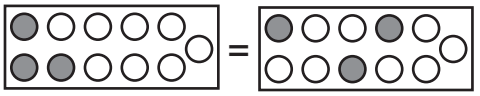
- Develop Strategies for Problem Solving
- Develop the Ability to Communicate Mathematically
- Develop Mathematical Reasoning
- Develop a Deep and Flexible Conceptual Understanding
- Develop the Ability to Make Conjectures, Model, and Generalize

Distractor Domain:

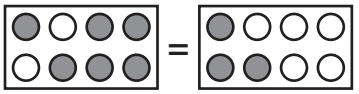
- Computational errors
- Misrepresentation of numerator and denominator
- Representational errors
- Conceptual errors in number sense
- Rounding and estimation errors
- Conversion errors
- Incorrect models
- Misrepresentation of place value
- Misrepresentation of decimals
- Error in translation

3 **Which diagram <u>best</u> represents $\frac{3}{8} = \frac{3}{8}$?**

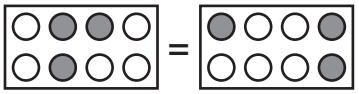
A



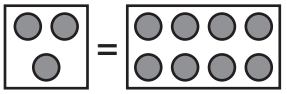
B



C



D



Standard: 4.N.2.2 Use benchmark fractions (0, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, 1) to locate additional fractions on a number line. Use models to order and compare whole numbers and fractions less than and greater than one using comparative language and symbols.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to identify a model that represents an equation with fractions. The models for the same fraction are not identical, requiring the student to think about different ways to model the same number.

Distractor Rationale:

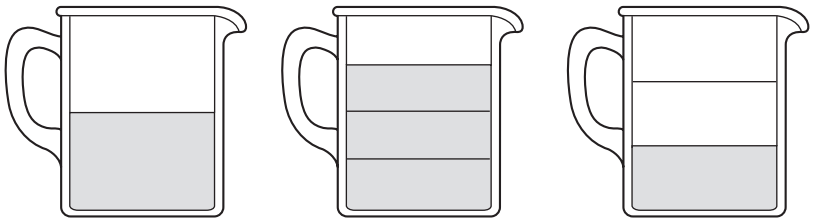
A. The student thought $\frac{3}{8}$ means 3 shaded and 8 not shaded.

B. The student saw $\frac{3}{8}$ on the right side of the equation.

C. Correct. The student demonstrated an ability to use models to compare fractions.

D. The student saw 3 on the left and 8 on the right.

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



$\frac{1}{2}$ $\frac{3}{4}$ $\frac{1}{3}$

Which list shows the amounts in order from <u>greatest</u> to <u>least</u>?

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 $\frac{1}{2}, \frac{3}{4}, \frac{1}{3}$

Standard: 4.N.2.8 Compare benchmark fractions ($\frac{1}{4}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$) and decimals (0.25, 0.50, 0.75) in real-world and mathematical situations.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to order fractions with unlike denominators from greatest to least.

Distractor Rationale:

A. The student focused only on the denominators.

B. The student reversed $\frac{1}{2}$ and $\frac{1}{3}$.

C. Correct. The student demonstrated an ability to compare benchmark fractions.

D. The student did not know how large $\frac{1}{3}$ is.

5 **Gigi ran one mile for her gym class. It took her 14.79 minutes to run the mile. Which shows 14.79 in word form?**

A fourteen and seventy-nine ones

B fourteen and seventy-nine tenths

C fourteen and seventy-nine hundredths

D fourteen and seventy-nine thousandths

Standard: 4.N.2.6 Represent, read, and write decimals up to at least the hundredths place in a variety of contexts including money.

Depth-of-Knowledge: 1

This item is a DOK 1 because it requires the student to perform a simple procedure, representing a number using words.

Distractor Rationale:

A. The student confused ones and hundredths.

B. The student confused tenths and hundredths.

C. Correct. The student demonstrated an ability to read and write a decimal up to the hundredths place.

D. The student confused thousandths and hundredths.

OAS STRAND—NUMBER & OPERATIONS (N): STANDARD 4.N.3

OAS STANDARD

4.N.3 Determine the value of coins in order to solve monetary transactions.

OAS OBJECTIVES

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.

ITEM SPECIFICATIONS

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

6 **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

Standard: 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.

Depth-of-Knowledge: 1

This item is a DOK 1 because it requires the student to complete a simple procedure, finding the change after a whole dollar payment.

Distractor Rationale:

A. The student only gave change for a $10 bill or made a regrouping error when subtracting.
B. The student computed 7−2.
C. The student ignored the one dollar bills.
D. Correct. The student demonstrated an ability to find the change required given an amount paid (whole dollars up to twenty).

7 **Jane bought a pencil for 21¢. She used a quarter to pay for the pencil. How much change should Jane get back?**

A 1¢

B 3¢

C 4¢

D 5¢

Standard: 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.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to know the value of a quarter and apply this to paying for an item and figuring out the change.

Distractor Rationale:

A. The student thought a quarter was worth 20¢ and then computed 21−20 instead of 20−21.
B. Balance distractor
C. Correct. The student demonstrated an ability to find the change required given an amount paid (coins).
D. The student used 20¢ for the cost of the pencil.

OAS STRAND—ALGEBRAIC REASONING & ALGEBRA (A): STANDARD 4.A.1

OAS STANDARD

4.A.1 Use multiple representations of patterns to solve real-world and mathematical problems.

OAS OBJECTIVES

4.A.1.1 Create an input/output chart or table to represent or extend a numerical pattern.

4.A.1.2 Describe the single operation rule for a pattern from an input/output table or function machine involving any operation of a whole number.

4.A.1.3 Create growth patterns involving geometric shapes and define the single operation rule of the pattern.

ITEM SPECIFICATIONS

Emphasis:

- Extend, create, and determine the rules for patterns using a variety of stimuli.

Stimulus Attributes:

- Test items may include input/output charts, graphs, tables, lists, charts, models, function machines, geometric shapes, and pictures.

Format:

- Extend a numerical pattern by creating an input/output chart or table
- Determine a pattern by describing the rule
- Use a pattern to solve a real-world problem
- Create growth patterns involving geometric shapes
- Determine the single operation rule of a growth pattern

Content Limits:

- Limit patterns to whole numbers
- Limit rules to one operation
- Limit operations to addition, subtraction, and multiplication
- Limit extending patterns to next two elements

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 error
- Inappropriate operation selected
- Misrepresentation of pattern or rule

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

Baseball Tickets

Number of Tickets (t)	Cost ($)
2	16
3	24
4	32
5	40

Which rule can be used to find the cost, in dollars, of t tickets?

A $t \bullet 8$

B $t \div 12$

C $t + 14$

D $t - 35$

Standard: 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.

Depth-of-Knowledge: 2
This item is a DOK 2 because it requires the student to determine and then describe the rule shown in an input/output table.

Distractor Rationale:

A. **Correct. The student demonstrated an ability to describe the single operation rule for a pattern presented in a table.**
B. Balance distractor
C. The student saw that this rule worked for 2 tickets.
D. The student thought this worked for 5 tickets, but the relationship is reversed.

9 **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

Standard: 4.A.1.1 Create an input/output chart or table to represent or extend a numerical pattern.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to analyze each input/output table to identify the one that matches a given rule.

Distractor Rationale:

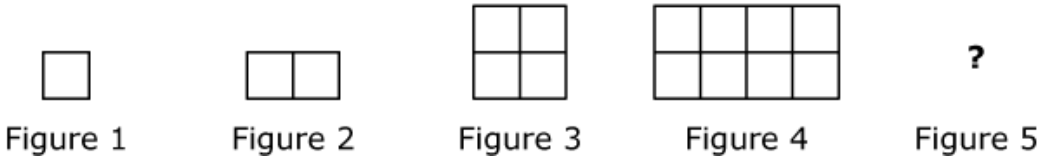
A. The student confused multiply by 6 and add 6.

B. Correct. The student demonstrated an ability to create and input/output table to represent a numerical pattern.

C. The student saw that this worked for the first 3 inputs.

D. The student saw that this worked for the first 2 inputs.

10 **The first four figures of a geometric pattern of 1-unit squares are shown.**



When the pattern continues, what rule can be used to find the number of 1-unit squares in Figure 5?

A Add 2.

B Add 4.

C Multiply by 2.

D Multiply by 4.

Standard: 4.A.1.3 Create growth patterns involving geometric shapes and define the single operation rule of the pattern.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to determine and then describe the rule shown in a geometric pattern.

Distractor Rationale:

A. The student saw that this rule worked from Figure 2 to Figure 3.

B. The student saw that this rule worked from Figure 3 to Figure 4.

C. Correct. The student demonstrated an ability to extend a growth pattern involving geometric shapes and define the single operation rule of the pattern.

D. Balance distractor

OAS STRAND—ALGEBRAIC REASONING & ALGEBRA (A): STANDARD 4.A.2

OAS STANDARD

4.A.2 Use multiplication and division with unknowns to create number sentences representing a given problem situation.

OAS OBJECTIVES

4.A.2.1 Use number sense, properties of multiplication and the relationship between multiplication and division to solve problems and find values for the unknowns represented by letters and symbols that make number sentences true.

4.A.2.2 Solve for unknowns in problems by solving open sentences (equations) and other problems involving addition, subtraction, multiplication, or division with whole numbers. Use real-world situations to represent number sentences and vice versa.

ITEM SPECIFICATIONS

Emphasis:

- Determine the value of an unknown to make a math sentence true.
- Use real-world situations to represent number sentences and vice versa.

Stimulus Attributes:

- Test items may include pictures, tables, and counters.

Format:

- Solve a math sentence involving a single operation for an unknown quantity
- Use real-world situations to represent number sentences
- Use number sentences to represent real-world situations

Content Limits:

- Limit numbers to 2-digit whole numbers
- Limit sentence to one operation
- Limit operation to addition, subtraction, multiplication, or division

Primary Process Standards:

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

Distractor Domain:

- Perform incorrect operation
- Computational error

11 **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

Standard: 4.A.2.1 Use number sense, properties of multiplication and the relationship between multiplication and division to solve problems and find values for the unknowns represented by letters and symbols that make number sentences true.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to develop a strategy for finding the missing factor in a number sentence.

Distractor Rationale:

A. **Correct. The student demonstrated an ability to use the relationship between multiplication and division to solve a problem and find an unknown represented by a letter.**

B. The student computed 36 − 2.

C. The student computed 36 + 2.

D. The student computed 36 × 2.

12

Match each equation on the left to the correct value for *n* on the right. Each equation on the left matches to one value of *n* on the right. Click one box on the left and then click its match on the right. To remove a line, hold the pointer over the line until it turns red, and then click it.

5 x *n* = 40	*n* = 3
7 x *n* = 35	*n* = 5
12 x *n* = 36	*n* = 8

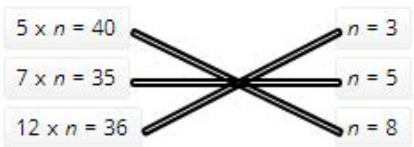
Standard: 4.A.2.1 Use number sense, properties of multiplication and the relationship between multiplication and division to solve problems and find values for the unknowns represented by letters and symbols that make number sentences true.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to develop a strategy for finding the missing factor number sentences.

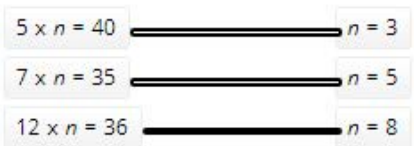
Distractor Rationale:

Correct



Incorrect

The student thought that both factors should be the same for the first equation.



The student thought that the smallest factor should be matched with the other smallest factor, the middle one with the middle, and the largestr factor with the other largest factor.

13 **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

Standard: 4.A.2.2 Solve for unknowns in problems by solving open sentences (equations) and other problems involving addition, subtraction, multiplication, or division with whole numbers. Use real-world situations to represent number sentences and vice versa.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to develop a strategy for finding the unknown in a number sentence.

Distractor Rationale:

A. **Correct. The student demonstrated an ability to solve for an unknown by solving an equation involving addition with whole numbers.**
B. The student made a computational error.
C. The student made a computational error.
D. The student computed 64 + 16.

14 **Mrs. Hart gave one pencil to each of the 30 students in her class. When she was done, Mrs. Hart had 8 pencils left. If *p* represents the number of pencils she started with, which equation models this situation?**

A $p \div 30 = 8$

B $p \bullet 30 = 8$

C $p - 30 = 8$

D $p + 30 = 8$

Standard: 4.A.2.2 Solve for unknowns in problems by solving open sentences (equations) and other problems involving addition, subtraction, multiplication, or division with whole numbers. Use real-world situations to represent number sentences and vice versa.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to translate from a verbal description into an equation with a variable.

Distractor Rationale:

A. The student chose the wrong operation for the situation.

B. The student chose the wrong operation for the situation.

C. Correct. The student demonstrated an ability to represent real-world situations with an equation.

D. The student chose the wrong operation for the situation.

OAS STRAND—GEOMETRY & MEASUREMENT (GM): STANDARD 4.GM.1

OAS STANDARD

4.GM.1 Name, describe, classify, and construct polygons and three-dimensional figures.

OAS OBJECTIVES

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.

ITEM SPECIFICATIONS

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

ITEM SPECIFICATIONS

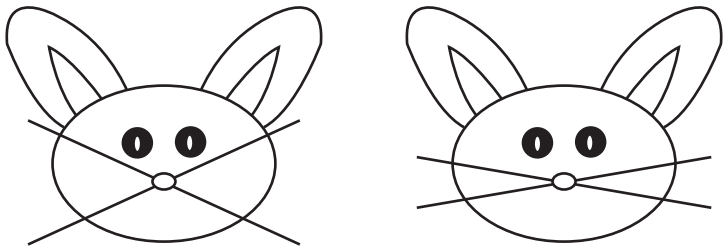
Primary Process Standards:

- 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

15 **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.

Standard: 4.GM.1.1 Identify points, lines, line segments, rays, angles, endpoints, and parallel and perpendicular lines in various contexts.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to identify the types of line segments present in two different figures.

Distractor Rationale:

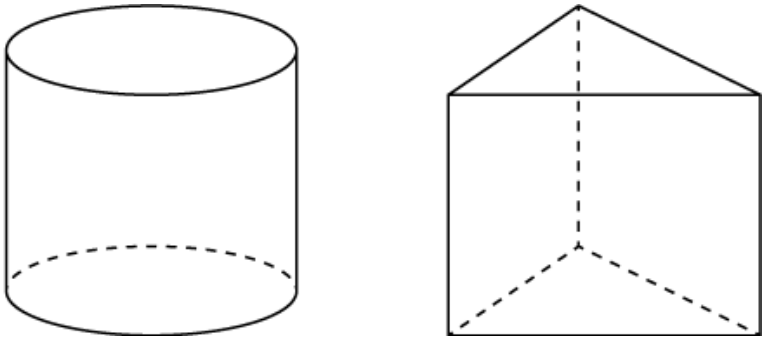
A. The student did not understand the definition of parallel.

B. Correct. The student demonstrated an ability to identify intersecting lines.

C. The student did not understand the definition of perpendicular.

D. The student did not understand the definitions of perpendicular or parallel.

16 **A cylinder and triangular prism are shown.**



Which statement about these figures is true?

A The cylinder and prism each have the same number of faces.

B The cylinder and prism each have the same number of edges.

C The cylinder and prism each have 6 vertices.

D The cylinder and prism each have 2 bases.

Standard: 4.GM.1.3 Given two three-dimensional shapes, identify similarities and differences.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to compare two different three-dimensional shapes.

Distractor Rationale:

A. The student confused faces and bases.

B. The student confused edges and bases.

C. The student confused vertices and bases.

D. **Correct. The student demonstrated an ability to identify similarities and differences given two three-dimensional shapes.**

OAS STRAND—GEOMETRY & MEASUREMENT (GM): STANDARD 4.GM.2

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

ITEM SPECIFICATIONS

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

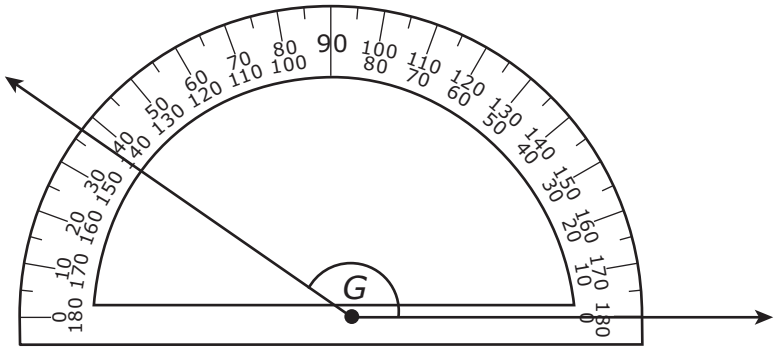
Primary Process Standards:

- 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

17 **Which is <u>closest</u> to the measure of ∠*G*?**



A 37°

B 43°

C 143°

D 157°

Standard: 4.GM.2.1 Measure angles in geometric figures and real-world objects with a protractor or angle ruler.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to measure using a protractor when the measurement is not exactly on a labeled line.

Distractor Rationale:

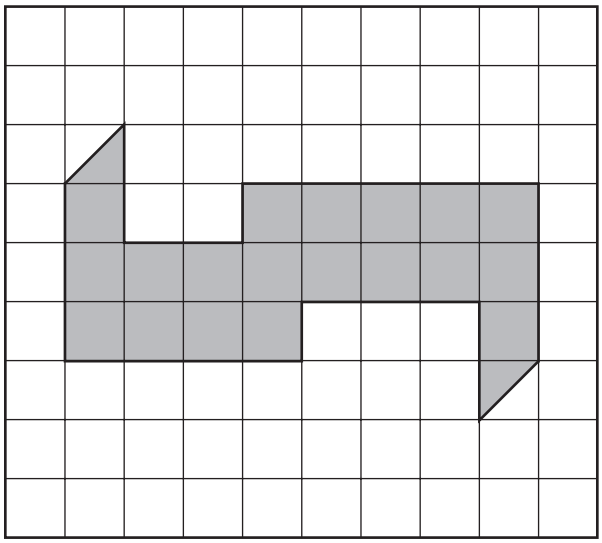
A. The student used the wrong set of numbers on the protractor.

B. The student used the wrong set of numbers on the protractor and thought the line is 3 degrees past 40 degrees.

C. Correct. The student demonstrated an ability to measure angles with a protractor.

D. The student misread the protractor and thought the line is 7 degrees past 150 degrees.

18 **The shape of a parking lot at a shopping mall is represented by the shaded part of this grid.**



= 1 square unit

What is the area, in square units, of the parking lot?

A 19 square units

B 20 square units

C 21 square units

D 28 square units

Standard: 4.GM.2.2 Find the area of polygons that can be decomposed into rectangles.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to come up with a strategy for finding the area of a figure on a grid that can be decomposed into rectangles.

Distractor Rationale:

A. The student subtracted the area of the triangles.

B. Correct. The student demonstrated an ability to find the area of polygons that can be decomposed into rectangles.

C. The student thought each triangle was worth 1 square unit.

D. The student found approximate perimeter instead of area.

OAS STRAND—GEOMETRY & MEASUREMENT (GM): STANDARD 4.GM.3

OAS STANDARD

4.GM.3 Determine elapsed time and convert between units of time.

OAS OBJECTIVES

4.GM.3.1 Determine elapsed time.

4.GM.3.2 Solve problems involving the conversion of one measure of time to another.

ITEM SPECIFICATIONS

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

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)

19 **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

Standard: 4.GM.3.1 Determine elapsed time.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to first decide how to approach the problem and then determine elapsed time.

Distractor Rationale:

A. **Correct. The student demonstrated an ability to determine elapsed time.**
B. The student thought the clock showed 1:50 because the hour hand is closer to the 1 than the 12.
C. The student thought the clock showed 10:05.
D. The student subtracted 15 minutes from the time shown.

20 **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

Standard: 4.GM.3.1 Determine elapsed time.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to first decide how to approach the problem and then determine elapsed time.

Distractor Rationale:

A. The student chose because the ending time has 30 minutes in it.

B. Balance distractor

C. Correct. The student demonstrated an ability to determine elapsed time.

D. Balance distractor

21 **A coach timed all of the students in a class to see how long it took them to finish a race. Sam finished the race in 180 seconds.**

How many minutes did it take Sam to finish the race?

A 1 minute

B 2 minutes

C 3 minutes

D 4 minutes

Standard: 4.GM.3.2 Solve problems involving the conversion of one measure of time to another.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to translate from seconds to minutes.

Distractor Rationale:

A. The student thought there are 180 seconds in 1 minute.

B. The student thought there are 90 seconds in 1 minute.

C. Correct. The student demonstrated an ability to convert between seconds and minutes.

D. The student thought there are 45 seconds in 1 minute.

OAS STRAND—DATA & PROBABILITY (D): STANDARD 4.D.1

OAS STANDARD

4.D.1 Collect, organize, and analyze data.

OAS OBJECTIVES

4.D.1.1 Represent data on a frequency table or line plot marked with whole numbers and fractions using appropriate titles, labels, and units.

4.D.1.2 Use tables, bar graphs, timelines, and Venn diagrams to display data sets. The data may include benchmark fractions or decimals ($\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, 0.25, 0.50, 0.75).

4.D.1.3 Solve one- and two-step problems using data in whole number, decimal, or fraction form in a frequency table and line plot.

ITEM SPECIFICATIONS

Emphasis:

- Represent data on a frequency table or line plot.
- Construct graphical displays of sets of data.
- Solve problems using data displayed in frequency tables and line plots.

Stimulus Attributes:

- Test items may include tables, pictures, charts, tallies, graphs, bar graphs, timelines, Venn diagrams, frequency tables, line plots, pictures, and counting manipulatives.

Format:

- Identify correct data set for display
- Identify correct representation of data
- Data set displayed correctly as a graph
- Graph representing a unique data set
- Identify correct labels and title for a graph or chart
- Answer questions involving how much, and how many more or less
- Select a question that can be answered by the data

Content Limits:

- Limit data displays to frequency tables, line plots, tables, bar graphs, timelines, and Venn diagrams
- Limit data displays to four categories
- Limit scale on frequency tables to increments of 1, 2, 5, or 10, benchmark fractions or decimals ($\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, 0.25, 0.50, 0.75).
- Limit operations to addition and subtraction

STANDARD 4.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:

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

22 **Joy and Fran each have some toy horses.**

Joy's Horses

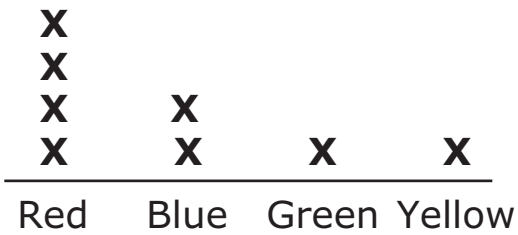
Color	Number of Horses
Red	1
Blue	1
Green	2
Yellow	1

Fran's Horses

Color	Number of Horses
Red	3
Blue	1
Green	1
Yellow	0

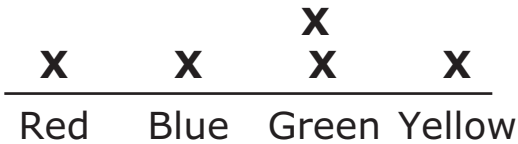
Which line plot shows how many horses of each color the girls have all together?

A

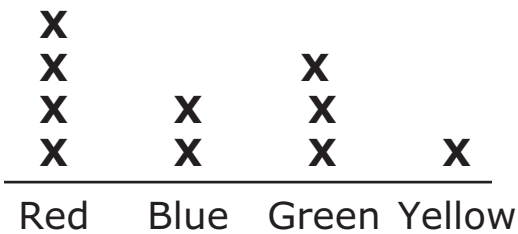


B

C



D



Standard: 4.D.1.1 Represent data on a frequency table or line plot marked with whole numbers and fractions using appropriate titles, labels, and units.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to combine data and then represent that data on a line plot.

Distractor Rationale:

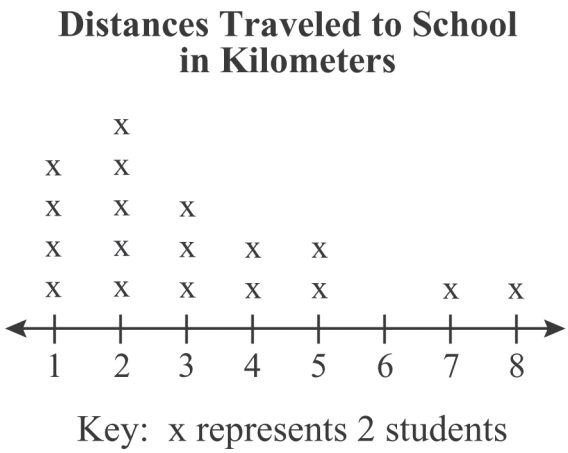
A. The student saw that the line plot was correct for red, blue, and yellow.

B. The student did not combine the girls and saw that the line plot was correct for Fran.

C. The student did not combine the girls and saw that the line plot was correct for Joy.

D. Correct. The student demonstrated an ability to represent data on a line plot marked with whole numbers.

23



What is the total number of students who are represented by this line plot?

A 34

B 36

C 54

D 56

Standard: 4.D.1.3 Solve one- and two-step problems using data in whole number, decimal, or fraction form in a frequency table and line plot.

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to determine the total number of students represented on a line plot when the key represents more than 1.

Distractor Rationale:

A. The student missed one x.

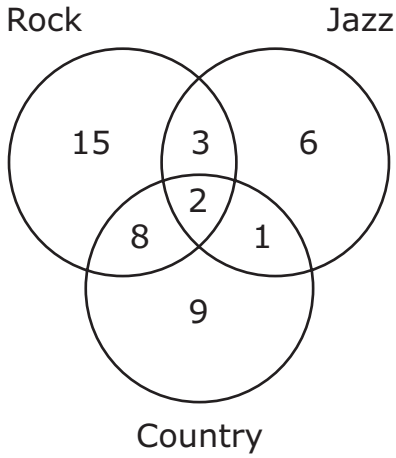
B. Correct. The student demonstrated an ability to understand data presented on a line plot.

C. The student thought x represented 3 students.

D. Balance distractor

24 **Jason asked his friends if they listen to certain types of music and recorded the information in this Venn diagram.**

Types of Music Listened To



Which frequency chart displays the same data?

A **Types of Music Listened To**

Type	Frequency
Rock	15
Jazz	6
Country	9

B **Types of Music Listened To**

Type	Frequency
Rock	17
Jazz	8
Country	11

C **Types of Music Listened To**

Type	Frequency
Rock	26
Jazz	10
Country	18

D **Types of Music Listened To**

Type	Frequency
Rock	28
Jazz	12
Country	20

24 continued...

Standard: 4.D.1.2 Use tables, bar graphs, timelines, and Venn diagrams to display data sets. The data may include benchmark fractions or decimals ($\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, 0.25, 0.50, 0.75).

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to translate information from a Venn diagram to a table.

Distractor Rationale:

A. The student only used the numbers in the outermost parts of the Venn diagram, not taking into account the numbers shared by the different types of music.

B. The student only used the numbers in the outermost parts of the Venn diagram and the number in the very middle.

C. The student failed to include the 2 which is shared by all music types.

D. Correct. The student demonstrated an ability to translate data presented in a Venn diagram to a table.

Cluster Items

The following sample items are part of a cluster. The cluster is presented first and then the two items that follow require use of the cluster. The two items are from different standards.

Use this information to answer the following two questions.

At the beginning of the week, Gabriela had $12 and Henry had $9. During the week, they both earned money collecting cans that they recycled. At the end of the week, Gabriela and Henry each had $20.

25 **Gabriela took the money she earned to the movie theater. She bought a ticket and a drink for a total of $14. How much money did she have left?**

A $2

B $6

C $14

D $34

Standard: 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.

Depth-of-Knowledge: 1

This item is a DOK 1 because it requires the student to complete a simple procedure, finding the amount of money left after buying items.

Distractor Rationale

A. The student computed 14−12 instead of 20−12.

B. Correct. The student demonstrated an ability to find the amount of money left after paying.

C. The student gave the total spent instead of the amount left.

D. The student added instead of subtracted.

26 **The equation shown can be used to find out how much Henry earned during the week collecting cans that he recycled. The value of the ☐ is the amount Henry earned.**

$$12 + 8 = 9 + \square$$

Which value can be placed in the ☐ to make this equation true?

A 3

B 11

C 20

D 29

Standard: 4.N.1.7 Determine the unknown addend or factor in equivalent and non-equivalent expressions (e.g., 5 + 6 = 4 + ☐, 3 × 8 < 3 × ☐).

Depth-of-Knowledge: 2

This item is a DOK 2 because it requires the student to decide how to determine the unknown addend in an equation.

Distractor Rationale

A. The student confused 12 and 20.

B. Correct. The student demonstrated an ability to determine the unknown addend in equivalent expressions.

C. The student knew the total must be 20, but failed to subtract the 9.

D. The student added 9 to 20 instead of subtracting.

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