



pennsylvania
DEPARTMENT OF EDUCATION

The Pennsylvania System of School Assessment

Mathematics Item and Scoring Sampler



2022–2023
Grade 3

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INTRODUCTION

General Introduction

The Pennsylvania Department of Education (PDE) provides districts and schools with tools to assist in delivering focused instructional programs aligned with the Pennsylvania Core Standards (PCS). These tools include Academic Standards, Assessment Anchors and Eligible Content (AAEC) documents, assessment handbooks, and content-based item and scoring samplers. This Item and Scoring Sampler is a useful tool for Pennsylvania educators in preparing local instructional programs by providing samples of test item types and scored student responses. The item sampler is not designed to be used as a pretest, a curriculum, or any other benchmark for operational testing.

This Item and Scoring Sampler is available in Braille format. For more information regarding Braille, call (717) 901-2238.

Pennsylvania Core Standards (PCS)

This sampler contains examples of test questions designed to assess the Pennsylvania Assessment Anchors and Eligible Content aligned to the PCS. The Mathematics, Reading, and Writing PSSA transitioned to PCS-based operational Mathematics and English Language Arts assessments starting with the spring 2015 PSSA administration.

The PCS-aligned Assessment Anchors and Eligible Content documents are posted on this portal:

- www.education.pa.gov [Hover over “Data and Reporting,” select “Assessment and Accountability,” and select “PSSA-PA System of School Assessment.” Then select “Assessment Anchors/Eligible Content” on the right side of the screen.]

What Is Included

This sampler contains test questions, or test “items,” that have been written to align to the Assessment Anchors that are based on the PCS. The sample test questions model the types of items that may appear on an operational PSSA. Each sample test question has been through a rigorous review process to ensure alignment with the Assessment Anchors prior to being piloted in an embedded field test within a PSSA assessment and then used operationally on a PSSA assessment. Answer keys, scoring guidelines, and any related stimulus material are also included. Additionally, sample student responses are provided with each open-ended item to demonstrate the range of responses that students provided in response to these items.

Purpose and Uses

The items in this sampler may be used¹ as examples for creating assessment items at the classroom level. Classroom teachers may find it beneficial to have students respond to the open-ended (OE) item in this sampler. Educators may then use the sampler as a guide to score the responses either independently or together with colleagues within a school or district. This sampler also includes the *General Description of Scoring Guidelines for Mathematics Open-Ended Items* that students will have access to during a PSSA mathematics administration. The general description of scoring guidelines may be distributed to students for use during local assessments and may also be used by educators when scoring local assessments.

Item Format and Scoring Guidelines

The multiple-choice (MC) items have four answer choices. Each correct response to an MC item is worth one point.

Each OE item is designed to take approximately ten to fifteen minutes to complete. During the administration of the PSSA, students are given additional time as necessary to complete the test items. Each OE item in mathematics is scored using an item-specific scoring guideline based on a 0–4-point scale. In this sampler, every item-specific scoring guideline is combined with examples of student responses that represent each score point to form a practical, item-specific scoring guide.

Item Alignment

All PSSA items are aligned to statements and specifications included in the *Assessment Anchors and Eligible Content Aligned to the Pennsylvania Core Standards*. The mathematics content, process skills, directives, and action statements included in the PSSA mathematics questions align with the Assessment Anchor Content Standards. The Eligible Content statements represent the limits of the content of the mathematics questions.

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Testing Time and Mode of Testing Delivery for the PSSA

The PSSA is delivered in a traditional paper-and-pencil format as well as in an online format. The estimated time to respond to a test question is the same for both methods of test delivery. The following table shows the estimated response time for each item type.

Mathematics Item Type	MC	OE
Estimated Response Time (minutes)	2	10 to 15

During an official test administration, students are given as much additional time as is necessary to complete the test questions.

Mathematics Reporting Categories

The Assessment Anchors are organized into four classifications as listed below.

• A = Numbers and Operations	• C = Geometry
• B = Algebraic Concepts	• D = Data Analysis and Probability

These four classifications are used throughout the grade levels. In addition to these classifications, there are five Reporting Categories for each grade level. The first letter of each Reporting Category represents the classification; the second letter represents the Domain as stated in the Common Core State Standards for Mathematics. Listed below are the Reporting Categories for Grade 3.

- A-T = Numbers and Operations in Base Ten
- A-F = Numbers and Operations—Fractions
- B-O = Operations and Algebraic Thinking
- C-G = Geometry
- D-M = Measurement and Data

Examples of MC and OE items assessing these categories are included in this sampler.

Item and Scoring Sampler Format

This sampler includes the test directions and scoring guidelines that appear in the PSSA Mathematics assessments. Each MC item is followed by a table that includes the item alignment, the answer key, the depth of knowledge (DOK) level, the percentage² of students who chose each answer option, and a brief answer-option analysis or rationale. The OE item is followed by a table that includes the item alignment, the DOK level, and the mean student score. Additionally, each of the included item-specific scoring guidelines is combined with sample student responses representing each score point to form a practical item-specific scoring guide. The *General Description of Scoring Guidelines for Mathematics Open-Ended Items* used to develop the item-specific scoring guidelines should be used if any additional item-specific scoring guidelines are created for use within local instructional programs. The student responses in this item and scoring sampler are actual student responses; however, the handwriting has been changed to protect the students' identities and to make the item and scoring sampler accessible to as many people as possible.

Example Multiple-Choice Item Information Table

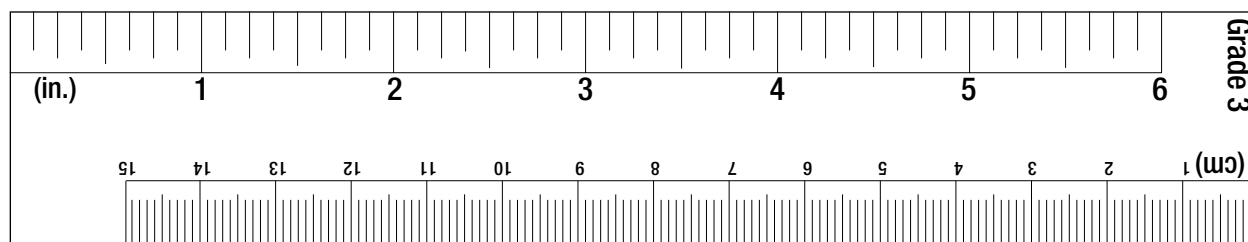
Item Information	
Alignment	Assigned AAEC
Answer Key	Correct Answer
Depth of Knowledge	Assigned DOK
p-value A	Percentage of students who selected option A
p-value B	Percentage of students who selected option B
p-value C	Percentage of students who selected option C
p-value D	Percentage of students who selected option D
Option Annotations	Brief answer-option analysis or rationale

Example Open-Ended Item Information Table

Alignment	Assigned AAEC	Depth of Knowledge	Assigned DOK	Mean Score	Average Score
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Grade 3 Ruler

The ruler shown below is not intended to be used to measure. It has been included as a representation of the rulers that will be provided for students when they take the test. Due to differences in printers, the ruler and measurement questions within this sampler may not accurately reproduce to scale.



² All p-value percentages listed in the item information tables have been rounded.

General Description of Scoring Guidelines for Mathematics Open-Ended Items

4— The response demonstrates a *thorough* understanding of the mathematical concepts and procedures required by the task.

The response provides correct answer(s) with clear and complete mathematical procedures shown and a correct explanation, as required by the task. The response may contain a minor “blemish” or omission in work or explanation that does not detract from demonstrating a *thorough* understanding.

3— The response demonstrates a *general* understanding of the mathematical concepts and procedures required by the task.

The response and explanation (as required by the task) are mostly complete and correct. The response may have minor errors or omissions that do not detract from demonstrating a *general* understanding.

2— The response demonstrates a *partial* understanding of the mathematical concepts and procedures required by the task.

The response is somewhat correct with *partial* understanding of the required mathematical concepts and/or procedures demonstrated and/or explained. The response may contain some work that is incomplete or unclear.

1— The response demonstrates a *minimal* understanding of the mathematical concepts and procedures required by the task.

0— The response has no correct answer and *insufficient* evidence to demonstrate any understanding of the mathematical concepts and procedures required by the task for that grade level.

The response may show only information copied from the question.

Special Categories within zero reported separately:

BLK (blank).....Is blank, is entirely erased, or gives a written refusal to respond

OT.....Is off-task

LOE.....Is in a language other than English

IL.....Is illegible

MATHEMATICS TEST DIRECTIONS

Directions: On the following pages are the Mathematics questions.

- You may not use a calculator on this test.
- You may need a ruler for question(s) on this test.

Directions for Multiple-Choice Questions

Some questions will ask you to select an answer from among four choices.

For the multiple-choice questions:

- First solve the problem on scratch paper.
- Choose the correct answer and record your choice in the booklet.
- If none of the choices matches your answer, go back and check your work for possible errors.
- Only one of the answers provided is the correct response.

Directions for Open-Ended Questions

Some questions will require you to write your response.

For the open-ended questions:

- These questions have more than one part. Be sure to read the directions carefully.
- You cannot receive the highest score for an open-ended question without completing all tasks in the question. For example, if the question asks you to show your work or explain your reasoning, be sure to show your work or explain your reasoning in the space provided.
- If the question does **not** ask you to show your work or explain your reasoning, you may use the space provided, but only those parts of your response that the question specifically asks for will be scored.
- Write your response in the appropriate location within the response box in the booklet. Some answers may require graphing, plotting, labeling, drawing, or shading. If you use scratch paper, be sure to transfer your final response and any needed work or reasoning to the booklet.

MULTIPLE-CHOICE ITEMS

1. The Liberty Bell weighs 2,080 pounds.

What is the value of the 8 in 2,080?

- Ⓐ 8 ones
- Ⓑ 8 tens
- Ⓒ 8 hundreds
- Ⓓ 8 thousands

Item Information	
Alignment	A-T.1.1
Answer Key	B
Depth of Knowledge	1
p-value A	4%
p-value B	79% (correct answer)
p-value C	7%
p-value D	10%
Option Annotations	A. confuses tens with ones B. Correct: recognizes the 8 is in the tens place C. confuses tens with hundreds D. confuses tens with thousands

2. A number sentence is shown below.

$$35 < 42$$

Which statement would require the symbol to change?

- Ⓐ Add 150 to each number.
- Ⓑ Divide each number by 7.
- Ⓒ Subtract 10 from each number.
- Ⓓ Round each number to the nearest 10.

Item Information	
Alignment	A-T.1.1.1
Answer Key	D
Depth of Knowledge	2
p-value A	7%
p-value B	14%
p-value C	8%
p-value D	71% (correct answer)
Option Annotations	<p>A. does not recognize that addition of the same number does not change the relationship</p> <p>B. does not recognize that division by the same number does not change the relationship</p> <p>C. does not recognize that subtraction by the same number does not change the relationship</p> <p>D. Correct: rounds the 35 up to 40, rounds the 42 down to 40, and recognizes the inequality symbol ($<$) would change to an equal sign ($=$)</p>

3. Four numbers are shown below.

1,991 1,199 1,919 1,999

Which list shows the numbers in order from **greatest** to **least**?

- Ⓐ 1,999 1,991 1,199 1,919
- Ⓑ 1,991 1,999 1,919 1,199
- Ⓒ 1,999 1,991 1,919 1,199
- Ⓓ 1,999 1,919 1,991 1,199

Item Information	
Alignment	A-T.1.1.4
Answer Key	C
Depth of Knowledge	1
p-value A	19%
p-value B	9%
p-value C	60% (correct answer)
p-value D	12%
Option Annotations	<p>A. compares the tens place but not the hundreds place in the last two numbers in the answer choice</p> <p>B. makes an error comparing the ones place in the first two numbers in the answer choice</p> <p>C. Correct: orders the numbers by comparing the digits in the thousands place, then the digits in the hundreds place, then the digits in the tens place, and then the digits in the ones place</p> <p>D. makes an error in the tens place for the two middle numbers in the answer choice</p>

4. Gary pours all his milk into 4 glasses.

He fills each glass with 6 ounces of milk.

Sara has the same amount of milk as Gary has.

She also has the same number of glasses as Gary has.

She pours the same amount of milk into each of her glasses as Gary pours into each of his glasses.

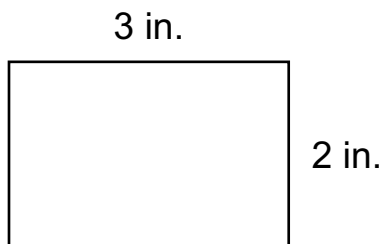
Which statement is true?

- Ⓐ Sara pours a total of 24 ounces of milk into 4 glasses.
- Ⓑ Sara pours a total of 24 ounces of milk into 6 glasses.
- Ⓒ Sara pours a total of 10 ounces of milk into 4 glasses.
- Ⓓ Sara pours a total of 10 ounces of milk into 6 glasses.

Item Information	
Alignment	B-O.1.2.1
Answer Key	A
Depth of Knowledge	2
p-value A	61% (correct answer)
p-value B	15%
p-value C	17%
p-value D	7%
Option Annotations	<p>A. Correct: multiplies 4 by 6 to get 24 ounces of milk, and then identifies 4 as the divisor</p> <p>B. misunderstands the amount of milk in each glass</p> <p>C. interprets 4 as a divisor but does not find the correct product</p> <p>D. does not find the correct product and confuses the amounts</p>

5. Corey made a design using rectangles that are all the same size.

One of the rectangles is shown below.



Corey's design has a total area of 48 square inches.

How many rectangles are in Corey's design?

- (A) 6
- (B) 8
- (C) 12
- (D) 42

Item Information	
Alignment	B-O.2 D-M.3.1.2
Answer Key	B
Depth of Knowledge	2
p-value A	34%
p-value B	38% (correct answer)
p-value C	20%
p-value D	8%
Option Annotations	<p>A. selects the area of one rectangle</p> <p>B. Correct: finds the area of one rectangle by multiplying side lengths (3 inches and 2 inches), and then divides 48 square inches by the area of one rectangle (6 square inches)</p> <p>C. chooses a divisor of 48</p> <p>D. subtracts the area of one rectangle from the total area</p>

6. Emma buys 7 packages of toy rings.

Each package contains 2 bags with 5 rings in each.

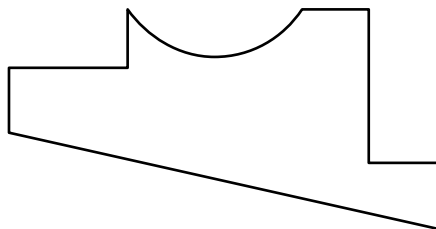
Emma uses the expression $(7 \times 2) \times 5$ to find the total number of rings.

Which expression shows another way to find the total number of rings?

- Ⓐ $(7 + 2) \times 5$
- Ⓑ $(7 \times 2) + 5$
- Ⓒ $7 \times (2 \times 5)$
- Ⓓ $7 \times (5 \times 10)$

Item Information	
Alignment	B-O.2.1.2
Answer Key	C
Depth of Knowledge	1
p-value A	11%
p-value B	13%
p-value C	68% (correct answer)
p-value D	8%
Option Annotations	<p>A. uses addition instead of multiplication</p> <p>B. uses addition instead of multiplication</p> <p>C. Correct: recognizes that, when multiplying, grouping symbols may be moved without changing the value of the expression (associative property of multiplication)</p> <p>D. multiplies 2 by 5 to get 10 but introduces a second 5</p>

7. A shape is shown below.



Which statement **best** explains whether the shape is a polygon?

- Ⓐ Because it has many sides, the shape is a polygon.
- Ⓑ Because one side is curved, the shape is not a polygon.
- Ⓒ Because it has an inside and an outside, the shape is a polygon.
- Ⓓ Because the sides have different lengths, the shape is not a polygon.

Item Information	
Alignment	C-G.1
Answer Key	B
Depth of Knowledge	1
p-value A	13%
p-value B	54% (correct answer)
p-value C	10%
p-value D	23%
Option Annotations	<p>A. knows a polygon has sides but overlooks the curved side</p> <p>B. Correct: recognizes that polygons cannot have any curved sides</p> <p>C. knows a polygon is closed but overlooks the curved side</p> <p>D. thinks of only regular polygons</p>

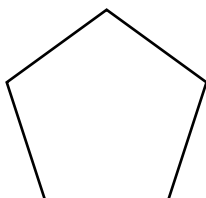
8. Keenan makes a cardboard polygon.

Then he cuts it straight from one corner to another corner.

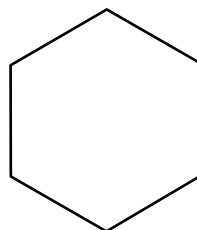
The result is two trapezoids.

Which polygon could be Keenan's original polygon?

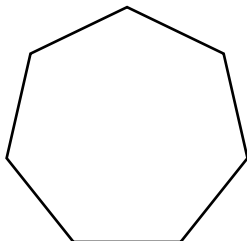
(A)



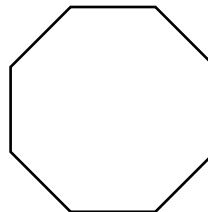
(B)



(C)



(D)

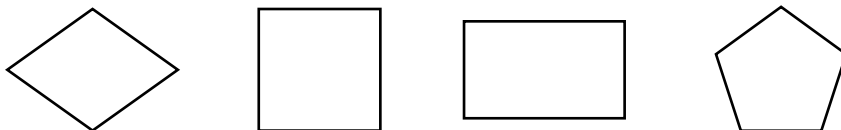


Item Information	
Alignment	C-G.1.1
Answer Key	B
Depth of Knowledge	2
p-value A	25%
p-value B	45% (correct answer)
p-value C	11%
p-value D	19%
Option Annotations	<p>A. focuses on one trapezoid but does not realize the other part would be a triangle</p> <p>B. Correct: recognizes that a cut from one corner to its opposite corner would result in two trapezoids</p> <p>C. focuses on one trapezoid but does not realize the other part would have 5 sides</p> <p>D. recognizes that a trapezoid can be taken from the top and bottom but neglects the third piece</p>

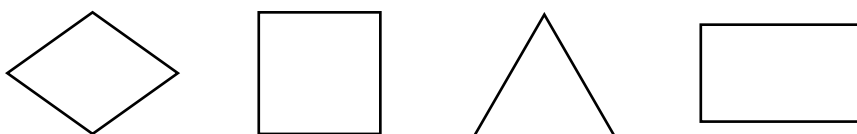
9. Paula makes a quilt using only quadrilateral shapes.

Which group of shapes could Paula use to make her quilt?

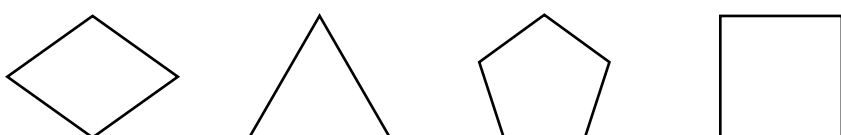
(A)



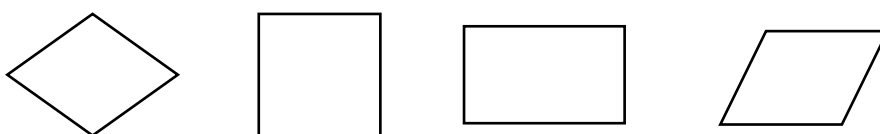
(B)



(C)



(D)

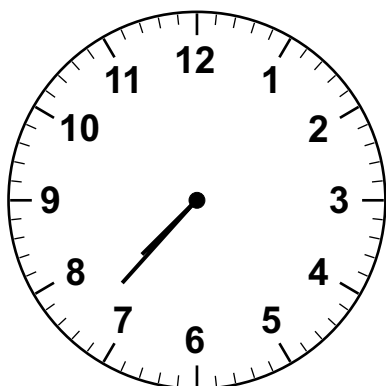


Item Information	
Alignment	C-G.1.1.2
Answer Key	D
Depth of Knowledge	1
p-value A	9%
p-value B	7%
p-value C	8%
p-value D	76% (correct answer)
Option Annotations	<p>A. thinks that a shape is a quadrilateral as long as it has 4 or more sides</p> <p>B. thinks that a shape is a quadrilateral as long as it has no more than 4 sides</p> <p>C. confuses “quadrilateral” and “polygon”</p> <p>D. Correct: recognizes that each shape has exactly 4 sides</p>

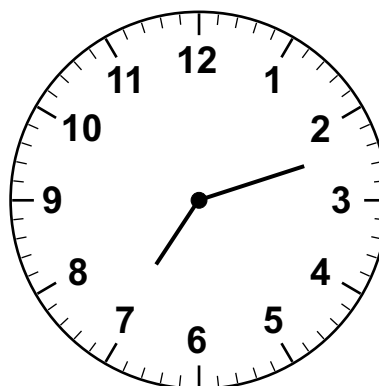
10. The television weather report begins at 7:23 each day.

Which clock shows the time when the weather report begins?

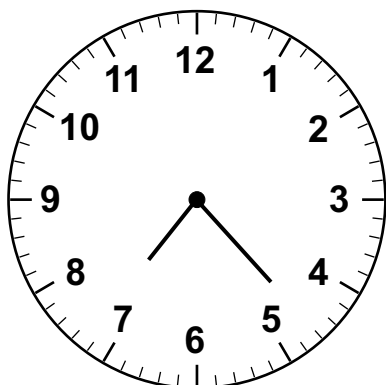
(A)



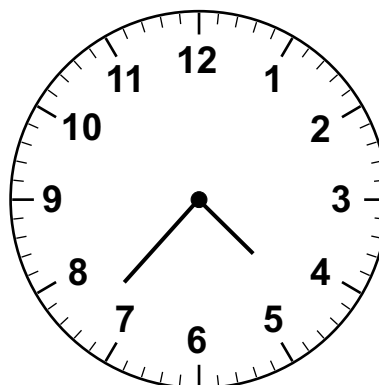
(B)



(C)



(D)



Item Information	
Alignment	D-M.1.1.1
Answer Key	C
Depth of Knowledge	1
p-value A	2%
p-value B	9%
p-value C	73% (correct answer)
p-value D	16%
Option Annotations	<p>A. counts minutes counterclockwise</p> <p>B. places the minute hand between 2 and 3 instead of at 23</p> <p>C. Correct: recognizes the hour (shorter) hand should be almost halfway between the 7 and the 8 and the minute (longer) hand should be a little over halfway between the 4 and the 5</p> <p>D. reverses the places of the hour and minute hands</p>

11. Arianna used 16 gallons of water taking a shower.

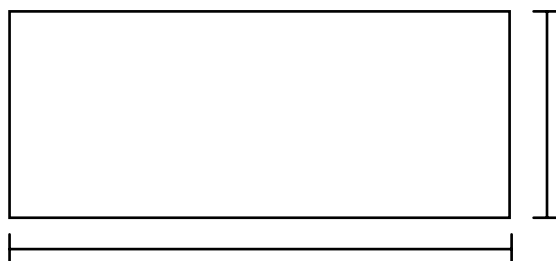
The shower lasted for 8 minutes.

How many gallons of water were used each minute?

- Ⓐ 2
- Ⓑ 4
- Ⓒ 8
- Ⓓ 24

Item Information	
Alignment	D-M.1.2.2
Answer Key	A
Depth of Knowledge	1
p-value A	57% (correct answer)
p-value B	7%
p-value C	18%
p-value D	18%
Option Annotations	A. Correct: divides the number of gallons (16) by the number of minutes (8) the shower lasted B. divides incorrectly C. subtracts D. adds

12. A rectangle is shown below.



Use your ruler to measure the lengths of the sides of the rectangle to the nearest centimeter.

Which measurement is **closest** to the area, in square centimeters, of the rectangle?

- Ⓐ 12
- Ⓑ 14
- Ⓒ 18
- Ⓓ 21

Item Information	
Alignment	D-M.1.2.3 D-M.3.1.2
Answer Key	C
Depth of Knowledge	1
p-value A	34%
p-value B	11%
p-value C	39% (correct answer)
p-value D	16%
Option Annotations	<p>A. rounds both measurements down to 2 cm and to 6 cm</p> <p>B. rounds the shorter side down to 2 cm and the longer side up to 7 cm</p> <p>C. Correct: measures the shorter side as closer to 3 cm than to 2 cm, measures the longer side as closer to 6 cm than to 7 cm, and then multiplies the side lengths (3 cm and 6 cm)</p> <p>D. rounds both measurements up to 3 cm and to 7 cm</p>

13. Cordelia and Reanna have different amounts of money.

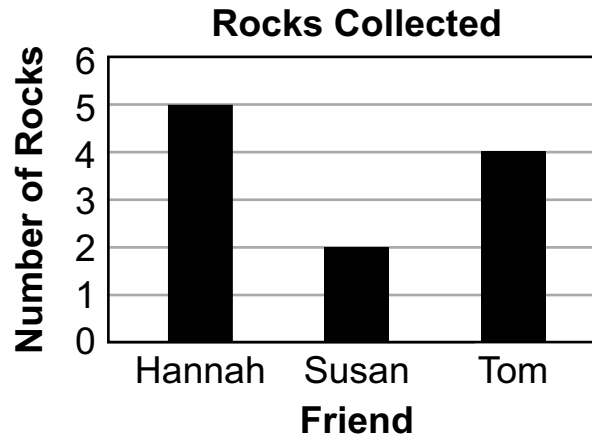
When rounded to the nearest dollar, the amount they each have rounds to \$4.

Which amounts of money could Cordelia and Reanna each have?

- Ⓐ \$3.49 and \$4.49
- Ⓑ \$3.49 and \$4.50
- Ⓒ \$3.50 and \$4.50
- Ⓓ \$3.50 and \$4.49

Item Information	
Alignment	D-M.1.3.3
Answer Key	D
Depth of Knowledge	1
p-value A	19%
p-value B	11%
p-value C	22%
p-value D	48% (correct answer)
Option Annotations	<p>A. incorrectly rounds \$3.49 up to \$4</p> <p>B. incorrectly rounds \$3.49 up to \$4 and incorrectly rounds \$4.50 down to \$4</p> <p>C. incorrectly rounds \$4.50 down to \$4</p> <p>D. Correct: identifies that \$3.50 rounds up to \$4 and that \$4.49 rounds down to \$4</p>












14. The bar graph below shows the numbers of rocks collected by three friends at a lake.




Which pictograph shows the same information as the bar graph?

Ⓐ








Rocks Collected


Friend	Number of Rocks
Hannah	    
Susan	 
Tom	   

Key:  = 2 rocks

Ⓑ







Rocks Collected

Friend	Number of Rocks
Hannah	  
Susan	 
Tom	 

Key:  = 2 rocks

Ⓒ







Rocks Collected

Friend	Number of Rocks
Hannah	  
Susan	
Tom	 

Key:  = 2 rocks

Ⓓ

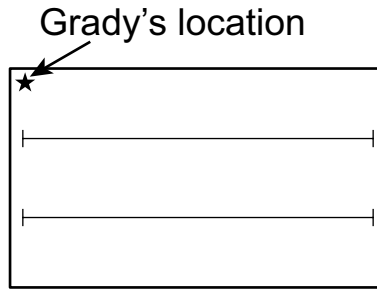
Rocks Collected

Friend	Number of Rocks
Hannah	  
Susan	
Tom	 

Key:  = 2 rocks

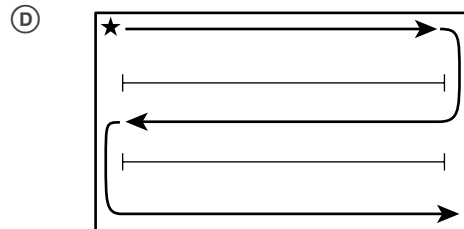
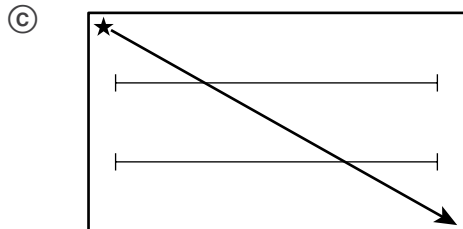
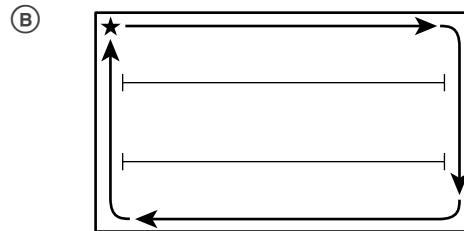
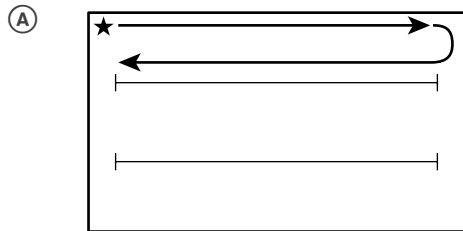
Item Information	
Alignment	D-M.2.1.4
Answer Key	D
Depth of Knowledge	2
p-value A	35%
p-value B	3%
p-value C	3%
p-value D	59% (correct answer)
Option Annotations	<p>A. does not apply the key (uses 1 “rock” = 1 rock)</p> <p>B. does not apply the key for Susan</p> <p>C. uses only whole “rocks” (does not use the half “rock” for Hannah)</p> <p>D. Correct: applies the key to each bar height, using a half “rock” for the odd height (5)</p>

15. Grady is taking swimming lessons in the swimming pool shown below.



He is going to swim the **perimeter** of the pool.

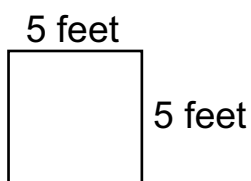
Which diagram could show the path Grady swims?



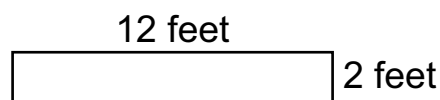
Item Information	
Alignment	D-M.4
Answer Key	B
Depth of Knowledge	2
p-value A	11%
p-value B	75% (correct answer)
p-value C	5%
p-value D	9%
Option Annotations	<p>A. confuses perimeter with length</p> <p>B. Correct: recognizes that the perimeter is the distance around the pool</p> <p>C. confuses perimeter with diagonal</p> <p>D. confuses perimeter with area</p>

16. Which rectangle has an area of 24 square feet and a perimeter less than 25 feet?

Ⓐ



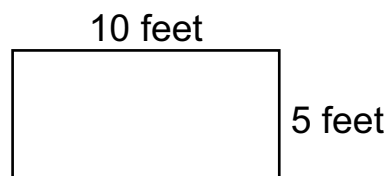
Ⓑ



Ⓒ



Ⓓ



Item Information	
Alignment	D-M.4.1.1
Answer Key	C
Depth of Knowledge	2
p-value A	15%
p-value B	26%
p-value C	46% (correct answer)
p-value D	13%
Option Annotations	<p>A. switches the target values and identifies a rectangle with an area of 25 feet and a perimeter less than 24 feet</p> <p>B. identifies a rectangle with an area of 24 feet but determines the perimeter by adding the side lengths that are labeled without doubling the sum ($12 + 2 < 25$)</p> <p>C. Correct: multiplies the side lengths to determine the area ($8 \times 3 = 24$) and either adds all four side lengths ($8 + 3 + 8 + 3 = 22$) or adds the side lengths that are labeled and then doubles the sum ($8 + 3 = 11$, $11 \times 2 = 22$) to determine the perimeter is less than 25 feet</p> <p>D. switches the target values, determines the area using the formula for the area of a triangle ($\frac{1}{2} \times 10 \times 5 = 25$), and determines the perimeter by adding the side lengths that are labeled without doubling the sum ($10 + 5 < 24$)</p>

OPEN-ENDED QUESTION

17. Kaylee is painting a picture for her art class.

Kaylee uses the colors red, yellow, green, orange, blue, and purple.

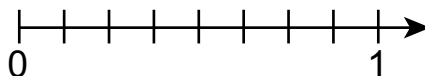
- A. Purple is what fraction of Kaylee's colors?

PUT your answer in the **BLANK BELOW**.

Answer: _____

Kaylee paints $\frac{2}{8}$ of her picture with yellow paint.

- B. **PLOT** a point on the number line shown below to represent the fraction of Kaylee's picture that is yellow.



Go to the next page to finish question 17.



17. **Continued.** Please refer to the previous page for task explanation.

Kaylee painted a green rectangle and an orange rectangle on her picture.

The green rectangle has side lengths of 3 inches and 4 inches.

The orange rectangle has side lengths of 2 inches and 6 inches.

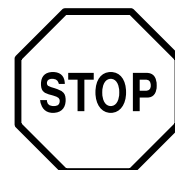
Kaylee makes the incorrect claim shown below.

The area of the green rectangle is less than the area of the orange rectangle since $14 < 16$.

- C. **EXPLAIN** the mistake Kaylee **most likely** made when finding the areas of the two rectangles.

- D. **REWRITE** Kaylee's claim with the correct comparison of the areas.

After you have finished your work, close this booklet so your teacher will know you are finished.



Item-Specific Scoring Guideline

#17 Item Information

Alignment	A-F.1.1.1 A-F.1.1.2 D-M.3.1.2	Depth of Knowledge	2	Mean Score	1.48
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Assessment Anchor this item will be reported under:

M03.A-F.1 — Develop an understanding of fractions as numbers.

Specific Anchor Descriptor addressed by this item:

M03.A-F.1.1 — Develop and apply number theory concepts to compare quantities and magnitudes of fractions and whole numbers.

M03.D-M.3.1 — Find the areas of plane figures.

M03.D-M.4.1 — Find and use the perimeters of plane figures.

Scoring Guide

Score	In this item, the student . . .
4	Demonstrates a thorough understanding of fractions as numbers by correctly solving problems and clearly explaining procedures.
3	Demonstrates a general understanding of fractions as numbers by correctly solving problems and clearly explaining procedures with only minor errors or omissions.
2	Demonstrates a partial understanding of fractions as numbers by correctly performing a significant portion of the required task.
1	Demonstrates minimal understanding of fractions as numbers.
0	The response has no correct answer and insufficient evidence to demonstrate any understanding of the mathematical concepts and procedures as required by the task. The response may show only information copied from the question.

Top-Scoring Student Response and Training Notes

Score	Description
4	Student earns 4 points.
3	Student earns 3.0–3.5 points.
2	Student earns 2.0–2.5 points.
1	Student earns 0.5–1.5 points. OR Student demonstrates minimal understanding of fractions as numbers.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Top-Scoring Response

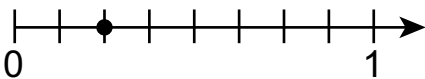
Part A (1 point):

1 point for correct answer

What?	Why?
$\frac{1}{6}$	

Part B (1 point):

1 point for correct answer

What?	Why?
 <p>OR</p> <p>Student uses any other correct identification of $\frac{2}{8}$ on the number line.</p>	

Part C (1 point):

1 point for correct and complete explanation

OR $\frac{1}{2}$ point for correct but incomplete explanation

What?	Why?
	Sample Explanation: Kaylee found the perimeters of both rectangles instead of the areas. OR equivalent

Part D (1 point):

1 point for correct and complete response

OR $\frac{1}{2}$ point for correct but incomplete response

What?	Why?
Sample Responses: The area of the green rectangle is equal to the area of the orange rectangle since $12 = 12$. OR The area of the green rectangle is equal to the area of the orange rectangle since $3 \times 4 = 2 \times 6$. OR equivalent	

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INTENTIONALLY BLANK.**

STUDENT RESPONSE

Response Score: 4 points



PART A

Question 17
Page 1 of 4

Item ID ?

Kaylee is painting a picture for her art class.
Kaylee uses the colors red, yellow, green, orange, blue, and purple.

A. Purple is what fraction of Kaylee's colors?

PUT your answer in the BLANK BELOW.

Answer:

The student provided the correct answer by counting the number of colors used and getting a sum of 6. Purple is one of the 6 colors. The student correctly answered in fraction form: 1/6. [1 point]

Next

Options

Flag

Pause

Review/End Test

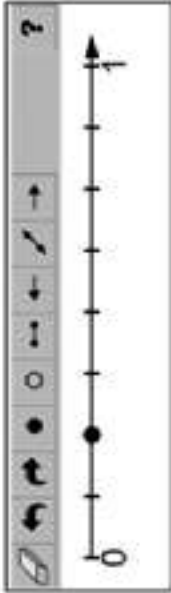
PART B

Question 17
Page 2 of 4

Item ID ?

Kaylee paints $\frac{2}{8}$ of her picture with yellow paint.

B. PLOT a point on the number line shown below to represent the fraction of Kaylee's picture that is yellow.



The student provided the correct answer by recognizing there are 8 equal intervals between 0 and 1. The student plotted a solid dot correctly at the appropriate location (the second tick mark after the 0). [1 point]

Review/End Test

Pause

Flag

Options

Back

Next

PART C

Question 17
Page 3 of 4

Item ID ?

Kaylee painted a green rectangle and an orange rectangle on her picture.

The green rectangle has side lengths of 3 inches and 4 inches.

The orange rectangle has side lengths of 2 inches and 6 inches.

Kaylee makes the incorrect claim shown below.

The area of the green rectangle is less than the area of the orange rectangle since $14 < 16$.

C. EXPLAIN the mistake Kaylee most likely made when finding the areas of the two rectangles.

The mistake Kaylee most likely made when finding the areas was instead of finding the areas she found the perimeters which is 14 for the green rectangle and 16 for the orange rectangle.

1000 / 1000

The student provided a complete explanation by identifying the mistake that would lead to the incorrect claim (instead of finding the areas she found the perimeters which is 14 for the green rectangle and 16 for the orange rectangle). The student recognized the number 14 for green and 16 for orange correspond to the perimeters of green and orange, not the areas. [1 point]

Review/End Test Pause Flag Options Back Next

PART D

Question 17
Page 4 of 4

Item ID ?

Kaylee painted a green rectangle and an orange rectangle on her picture.

The green rectangle has side lengths of 3 inches and 4 inches.

The orange rectangle has side lengths of 2 inches and 6 inches.

Kaylee makes the incorrect claim shown below.

The area of the green rectangle is less than the area of the orange rectangle since $14 < 16$.

D. REWRITE Kaylee's claim with the correct comparison of the areas.

The areas of the rectangles are equal because the areas were both 12 inches. I know this because $3 \times 4 = 12$ inches and $2 \times 6 = 12$ inches.

1237 / 1000

Review/End Test Pause Flag Options Back Next

The student correctly rewrote the claim by calculating both areas to be 12 inches (*The areas of the rectangles are equal because the areas were both 12 inches. . . . $3 \times 4 = 12$ inches and $2 \times 6 = 12$ inches*). The student is not penalized for not specifying squared inches for the area calculations. [1 point]

STUDENT RESPONSE

Response Score: 3 points

17. Kaylee is painting a picture for her art class.

Kaylee uses the colors red, yellow, green, orange, blue, and purple.

A. Purple is what fraction of Kaylee's colors?

PUT your answer in the **BLANK BELOW**.

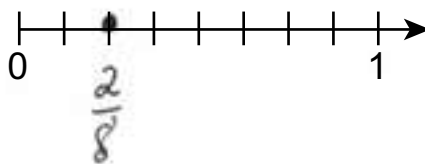
The student provided the correct answer by counting the number of colors used and getting a sum of 6. Purple is one of the 6 colors. The student correctly answered in fraction form: $\frac{1}{6}$. [1 point]

Answer:

$\frac{1}{6}$

Kaylee paints $\frac{2}{8}$ of her picture with yellow paint.

B. **PLOT** a point on the number line shown below to represent the fraction of Kaylee's picture that is yellow.



The student provided the correct answer by recognizing there are 8 equal intervals between 0 and 1. This student plotted a solid dot correctly at the appropriate location (the second tick mark after the 0). While a label is not necessary for full credit, the student also correctly labeled the plotted dot as $\frac{2}{8}$. [1 point]

Go to the next page to finish question 17.

GO ON

17. **Continued.** Please refer to the previous page for task explanation.

Kaylee painted a green rectangle and an orange rectangle on her picture.

The green rectangle has side lengths of 3 inches and 4 inches.

The orange rectangle has side lengths of 2 inches and 6 inches.

Kaylee makes the incorrect claim shown below.

The area of the green rectangle is less than the area of the orange rectangle since $14 < 16$.

C. EXPLAIN the mistake Kaylee **most likely** made when finding the areas of the two rectangles.

She got the wrong answer by
probably either not knowing her multi-
plication facts or that she thought
two rectangles couldn't have the
same areas, which they do.

The student provided an incorrect explanation that does not explain the mistake made by Kaylee. The student did not recognize that the most likely error was finding perimeter instead of area. [0 points]

D. REWRITE Kaylee's claim with the correct comparison of the areas.

The area of the green and orange
rectangles are the same because 2×6
and 3×4 both equal 12.

The student correctly rewrote the claim by calculating both areas to be 12 [square inches] (*The area of the green and orange rectangles are the same because 2×6 and 3×4 both equal 12*). The student is not penalized for not specifying squared inches for the area calculations. [1 point]

After you have finished your work, close this booklet so your teacher will know you are finished.

STOP

STUDENT RESPONSE

Response Score: 2 points



PART A

Question 17
Page 1 of 4

Item ID ?

Kaylee is painting a picture for her art class.
Kaylee uses the colors red, yellow, green, orange, blue, and purple.

A. Purple is what fraction of Kaylee's colors?

PUT your answer in the BLANK BELOW.

Answer:

The student provided the correct answer by counting the number of colors used and getting a sum of 6. Purple is one of the 6 colors. The student correctly answered in fraction form: $\frac{1}{6}$.
[1 point]

Next

Options

Flag



















Pause

Review/End Test

PART B

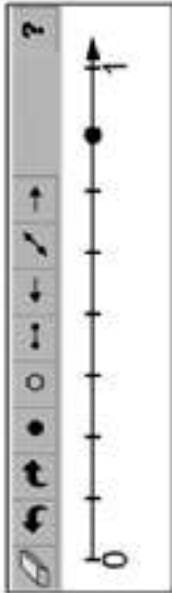
Question 17
Page 2 of 4

Item ID ?

Kaylee paints $\frac{2}{8}$ of her picture with yellow paint.

B. PLOT a point on the number line shown below to represent the fraction of Kaylee's picture that is yellow.



The student provided an incorrect answer by placing a mark near the $\frac{7}{8}$ position of the number line instead of at the $\frac{2}{8}$ position. [0 points]

Review/End Test

Pause

Flag

Options

Back

Next

PART C

Question 17
Page 3 of 4

Item ID ?

Kaylee painted a green rectangle and an orange rectangle on her picture.

The green rectangle has side lengths of 3 inches and 4 inches.

The orange rectangle has side lengths of 2 inches and 6 inches.

Kaylee makes the incorrect claim shown below.

The area of the green rectangle is less than the area of the orange rectangle since $14 < 16$.

C. EXPLAIN the mistake Kaylee most likely made when finding the areas of the two rectangles.

She said the area and it is the length around so it is the perimeter

64 / 1000

Review/End Test Pause Flag Options Back Next

The student provided a complete explanation by identifying the mistake that would lead to the incorrect claim (She said the area and it is the length around so it is the perimeter). The student recognized that the number 14 for green and 16 for orange correspond to the perimeters of green and orange, not the areas. [1 point]

PART D

Question 17
Page 4 of 4

Item ID ?

Kaylee painted a green rectangle and an orange rectangle on her picture.
 The green rectangle has side lengths of 3 inches and 4 inches.
 The orange rectangle has side lengths of 2 inches and 6 inches.
 Kaylee makes the incorrect claim shown below.

The area of the green rectangle is less than the area of the orange rectangle since $14 < 16$.

D. REWRITE Kaylee's claim with the correct comparison of the areas.

she said the area when side lengths are perimeters

48 / 1000

Review/End Test
 Pause
 Flag
 Options
 Back
 Next

The student did not attempt to rewrite the claim with a correct comparison of the areas. Instead, the student restated the answer for Part C. [0 points]

STUDENT RESPONSE

Response Score: 1 point

17. Kaylee is painting a picture for her art class.

Kaylee uses the colors red, yellow, green, orange, blue, and purple.

A. Purple is what fraction of Kaylee's colors?

PUT your answer in the **BLANK BELOW**.

The student provided an incorrect answer. The student most likely counted the total number of colors as 6 but then saw purple was the sixth color in the list and put $\frac{6}{6}$ as the answer.

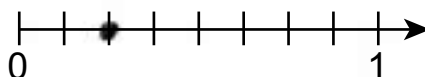
[0 points]

Answer:

$\frac{6}{6}$

Kaylee paints $\frac{2}{8}$ of her picture with yellow paint.

B. **PLOT** a point on the number line shown below to represent the fraction of Kaylee's picture that is yellow.



The student provided a correct answer by recognizing there are 8 equal intervals between 0 and 1. This student plotted a solid dot correctly at the appropriate location (the second tick mark after the 0). [1 point]

Go to the next page to finish question 17.



17. **Continued.** Please refer to the previous page for task explanation.

Kaylee painted a green rectangle and an orange rectangle on her picture.

The green rectangle has side lengths of 3 inches and 4 inches.

The orange rectangle has side lengths of 2 inches and 6 inches.

Kaylee makes the incorrect claim shown below.

The area of the green rectangle is less than the area of the orange rectangle since $14 < 16$.

C. EXPLAIN the mistake Kaylee **most likely** made when finding the areas of the two rectangles.

She didn't multipli the
side corectly.

The student provided an incomplete explanation by giving an insufficient explanation (*She didn't multipli the side corectly*). The student did recognize that the multiplication shown was incorrect but did not fully explain that the numbers 14 and 16 were referring to perimeter, not to area. [0.5 points]

D. REWRITE Kaylee's claim with the correct comparison of the areas.

$16 < 18$

The student did not rewrite the claim with a correct comparison of the areas. The inequality provided ($16 < 18$) indicates this student did not know how to calculate either rectangle's correct area. [0 points]

After you have finished your work, close this booklet so your teacher will know you are finished.



STUDENT RESPONSE

Response Score: 0 points



PART A

Question 17
Page 1 of 4

Item ID ?

Kaylee is painting a picture for her art class.
Kaylee uses the colors red, yellow, green, orange, blue, and purple.

A. Purple is what fraction of Kaylee's colors?

PUT your answer in the BLANK BELOW.

Answer:

The student provided an incorrect answer (5) and did not write the answer in the form of a fraction. The student may have confused the term "fraction" with the term "subtraction," as it appears the student may have subtracted one color, purple, from the total number of colors ($6 - 1 = 5$) to arrive at an incorrect answer. [0 points]

Next

Options

Flag

Pause

Review/End Test


PART B

Question 17
Page 2 of 4

Item ID ?

Kaylee paints $\frac{2}{8}$ of her picture with yellow paint.

B. PLOT a point on the number line shown below to represent the fraction of Kaylee's picture that is yellow.



The student provided an incorrect answer by placing multiple marks from the $\frac{1}{8}$ position through the $\frac{6}{8}$ position. [0 points]

Back Next

Options

Flag

Pause

Review/End Test

PART C

Question 17
Page 3 of 4

Item ID ?

Kaylee painted a green rectangle and an orange rectangle on her picture.

The green rectangle has side lengths of 3 inches and 4 inches.

The orange rectangle has side lengths of 2 inches and 6 inches.

Kaylee makes the incorrect claim shown below.

The area of the green rectangle is less than the area of the orange rectangle since $14 < 16$.

C. EXPLAIN the mistake Kaylee most likely made when finding the areas of the two rectangles.

16 is bigger than 14 because $14 + 2 = 16$. So 16 is larger than 14.

0.0 / 1000

Review/End Test Pause Flag Options Back Next

The student provided an incorrect explanation that does not explain the mistake made by Kaylee. The student did not recognize that the most likely error was finding perimeter instead of area. [0 points]

PART D

Question 17
Page 4 of 4

Item ID ?

Kaylee painted a green rectangle and an orange rectangle on her picture.

The green rectangle has side lengths of 3 inches and 4 inches.

The orange rectangle has side lengths of 2 inches and 6 inches.

Kaylee makes the incorrect claim shown below.

The area of the green rectangle is less than the area of the orange rectangle since $14 < 16$.

D. REWRITE Kaylee's claim with the correct comparison of the areas.

So 16 is the bigger number.

26 / 1000

Review/End Test Pause Flag Options Back Next

The student did not rewrite the claim to be a correct comparison of the areas. The answer provided (So 16 is the bigger number) indicates that this student did not know how to calculate either rectangle's correct area. [0 points]

MATHEMATICS—SUMMARY DATA

Multiple-Choice

Sample Number	Alignment	Answer Key	Depth of Knowledge	p-value A	p-value B	p-value C	p-value D
1	A-T.1.1	B	1	4%	79%	7%	10%
2	A-T.1.1.1	D	2	7%	14%	8%	71%
3	A-T.1.1.4	C	1	19%	9%	60%	12%
4	B-O.1.2.1	A	2	61%	15%	17%	7%
5	B-O.2 D-M.3.1.2	B	2	34%	38%	20%	8%
6	B-O.2.1.2	C	1	11%	13%	68%	8%
7	C-G.1	B	1	13%	54%	10%	23%
8	C-G.1.1	B	2	25%	45%	11%	19%
9	C-G.1.1.2	D	1	9%	7%	8%	76%
10	D-M.1.1.1	C	1	2%	9%	73%	16%
11	D-M.1.2.2	A	1	57%	7%	18%	18%
12	D-M.1.2.3 D-M.3.1.2	C	1	34%	11%	39%	16%
13	D-M.1.3.3	D	1	19%	11%	22%	48%
14	D-M.2.1.4	D	2	35%	3%	3%	59%
15	D-M.4	B	2	11%	75%	5%	9%
16	D-M.4.1.1	C	2	15%	26%	46%	13%

Open-Ended

Sample Number	Alignment	Points	Depth of Knowledge	Mean Score
17	A-F.1.1.1 A-F.1.1.2 D-M.3.1.2	4	2	1.48

PSSA Grade 3 Mathematics Item and Scoring Sampler

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