



**pennsylvania**  
DEPARTMENT OF EDUCATION

# The Pennsylvania System of School Assessment

## Mathematics Item and Scoring Sampler



**2016–2017**  
**Grade 4**

Pennsylvania Department of Education Bureau of Curriculum, Assessment and Instruction—September 2016

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## INTRODUCTION

### General Introduction

The Pennsylvania Department of Education 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 Anchor 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. It can also be useful in preparing students for the statewide assessment.

### Pennsylvania Core Standards (PCS)

This sampler contains examples of test questions that are aligned to the new Pennsylvania Core Standards-based 2013 PSSA Assessment Anchors and Eligible Content. 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 2013 PCS-aligned Assessment Anchor and Eligible Content documents are posted on this portal:

- [www.education.pa.gov](http://www.education.pa.gov) [Hover over “K–12,” select “Assessment and Accountability,” and select “Pennsylvania System of School Assessment (PSSA).” Then select “Assessment Anchors” from the “Other Materials” list on the right side of the screen.]

### What Is Included

This sampler contains test questions (items) that have been written to align to the Assessment Anchors that are based on the Pennsylvania Core Standards (PCS). The test questions provide an idea of the types of items that will appear on an operational, PCS-based PSSA. Each sample test question has been through a rigorous review process to ensure alignment with the Assessment Anchors.

### Purpose and Uses

The items in this sampler may be used as examples for creating assessment items at the classroom level, and they may also be copied and used as part of a local instructional program.<sup>1</sup> Classroom teachers may find it beneficial to have students respond to the open-ended item in this sampler. Educators can then use the sampler as a guide to score the responses either independently or together with colleagues within a school or district.

### 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 open-ended (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.

This sampler also includes the *General Description of Scoring Guidelines for Mathematics Open-Ended Questions* that students will have access to during a PSSA mathematics administration. The general description of scoring guidelines can be distributed to students for use during local assessments and can also be used by educators when scoring local assessments.<sup>1</sup>

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<sup>1</sup> The permission to copy and/or use these materials does not extend to commercial purposes.

## 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.

## Testing Time and Mode of Testing Delivery for the PSSA

The PSSA is delivered in 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. During an official testing administration, students are given additional time as necessary to complete the test questions. 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

## Mathematics Reporting Categories

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

<ul style="list-style-type: none"> <li>• A = Numbers and Operations</li> </ul>	<ul style="list-style-type: none"> <li>• C = Geometry</li> </ul>
<ul style="list-style-type: none"> <li>• B = Algebraic Concepts</li> </ul>	<ul style="list-style-type: none"> <li>• D = Data Analysis and Probability</li> </ul>

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 4.

- 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 multiple-choice and open-ended items assessing these categories are included in this booklet.

**General Description of Scoring Guidelines for Mathematics Open-Ended Questions**

**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. 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.**

Response may show only information copied from the question.

Special Categories within zero reported separately:

- BLK (blank).....Blank, entirely erased, or written refusal to respond
- OT .....Off task
- LOE .....Response in a language other than English
- IL .....Illegible

## Item and Scoring Sampler Format

This sampler includes the test directions and scoring guidelines that appear in the PSSA Mathematics assessments. Each multiple-choice item is followed by a table that includes the alignment, the answer key, the depth of knowledge (DOK) level, the percentage<sup>2</sup> of students who chose each answer option, and a brief answer option analysis or rationale. The open-ended item is followed by a table that includes the item alignment, DOK level, and 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 Questions* 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.

**Example Multiple-Choice Item Information Table**

Item Information		Option Annotations					
<b>Alignment</b>	Assigned AAEC	Brief answer option analysis or rationale					
<b>Answer Key</b>	Correct Answer						
<b>Depth of Knowledge</b>	Assigned DOK						
<b><i>p</i>-values</b>							
<b>A</b>	<b>B</b>					<b>C</b>	<b>D</b>
Percentage of students who selected each option							

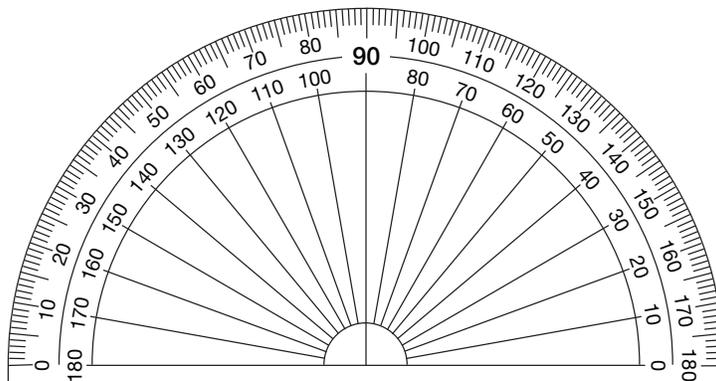
**Example Open-Ended Item Information Table**

<b>Alignment</b>	Assigned AAEC	<b>Depth of Knowledge</b>	Assigned DOK	<b>Mean Score</b>	
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<sup>2</sup> All *p*-value percentages listed in the item information tables have been rounded.

### Grade 4 Protractor

The protractor shown below is not intended to be used to measure. It has been included as a representation of the protractors that will be provided for students when they take the test. Due to differences in printers, the protractor may not accurately reproduce to scale.



## Grade 4 Formula Sheet

Formulas and conversions that you may need to work questions on this test are found below. You may refer back to this page at any time during the mathematics test. 2016 Grade 4

**Standard Conversions**

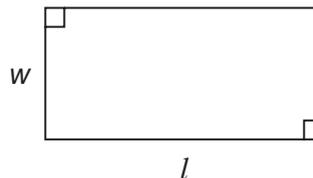
- 1 yard (yd) = 3 feet (ft)
- 1 foot = 12 inches (in.)
  
- 1 pound (lb) = 16 ounces (oz.)
  
- 1 gallon (gal) = 4 quarts (qt)
- 1 quart = 2 pints (pt)
- 1 pint = 2 cups (c)

**Metric Conversions**

- 1 kilometer (km) = 1,000 meters (m)
- 1 meter = 100 centimeters (cm)
  
- 1 kilogram (kg) = 1,000 grams (g)
  
- 1 liter (L) = 1,000 milliliters (mL)

**Time Conversions**

- 1 year (yr) = 12 months (mo)
- 1 year = 52 weeks (wk)
- 1 year = 365 days
- 1 week = 7 days
- 1 day = 24 hours (hr)
- 1 hour = 60 minutes (min)
- 1 minute = 60 seconds (sec)

**Rectangle**

Area = length  $\times$  width

$$A = l \times w$$

Perimeter = length + length + width + width

$$P = l + l + w + w$$

**MATHEMATICS TEST DIRECTIONS**

On the following pages are the mathematics questions.

- You may not use a calculator for question 1. You may use a calculator for all other questions on this test.
- You may need a protractor for questions 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 answer 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 answer 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 answer booklet.

Question 1 in this sampler is to be solved without the use of a calculator.

**MULTIPLE-CHOICE ITEMS**

1. Which value is **closest** to  $79 \times 4$ ?

- A. 280
- B. 320
- C. 350
- D. 400

Item Information				Option Annotations
<b>Alignment</b>		A-T.2.1.4		A. rounds 79 down to 70 B. correct C. rounds 79 down to 70 and 4 up to 5 D. rounds both multiplicands up 1
<b>Answer Key</b>		B		
<b>Depth of Knowledge</b>		1		
<b>p-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
13%	73%	7%	7%	

A calculator is permitted for use in solving questions 2–17 in this sampler.

2. Asia covers about  $\frac{3}{10}$  of the land on Earth. South America covers about  $\frac{12}{100}$  of the land on Earth. Which statement correctly compares the land sizes of Asia and South America?
- A. Since  $\frac{12}{100}$  is equivalent to  $\frac{12}{10}$  and  $\frac{3}{10} < \frac{12}{10}$ , Asia covers less land than South America.
- B. Since  $\frac{3}{10}$  is equivalent to  $\frac{3}{100}$  and  $\frac{3}{100} < \frac{12}{100}$ , Asia covers less land than South America.
- C. Since  $\frac{3}{10}$  is equivalent to  $\frac{30}{100}$  and  $\frac{30}{100} > \frac{12}{100}$ , Asia covers more land than South America.
- D. Since  $\frac{3}{10}$  is equivalent to  $\frac{93}{100}$  and  $\frac{93}{100} > \frac{12}{100}$ , Asia covers more land than South America.

Item Information				Option Annotations
Alignment		A-F.1.1.2 A-F.1.1.1		A. does not convert denominator B. does not convert denominator C. correct D. converts 3/10 to hundredths by adding 90 to both numerator and denominator
Answer Key		C		
Depth of Knowledge		2		
<i>p</i> -values				
A	B	C	D	
21%	19%	52%	8%	

3. In a box of 24 chocolate pieces,  $\frac{2}{3}$  of the pieces have peanuts in them. How many of the chocolate pieces have peanuts in them?
- A. 8
  - B. 12
  - C. 16
  - D. 19

Item Information				Option Annotations
<b>Alignment</b>		A-F.2.1.6		A. 24/3 B. 24/2 C. correct D. 24 - 2 - 3
<b>Answer Key</b>		C		
<b>Depth of Knowledge</b>		1		
<b>p-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
24%	22%	42%	12%	

4. Miguel went to a baseball stadium and a football stadium.
- The baseball stadium has thirty-seven thousand, four hundred ninety-five seats.
  - The football stadium has sixty-nine thousand, one hundred forty-three seats.

How many times greater is the value of the digit 3 in the number of seats at the baseball stadium than the value of the digit 3 in the number of seats at the football stadium?

- A. 10 times
- B. 100 times
- C. 1,000 times
- D. 10,000 times

Item Information				Option Annotations
<b>Alignment</b>		A-T.1.1.2 A-T.1.1.1		A. states mathematical rule rather than applying it (each place to the left is 10 times greater) B. incorrectly counts number of places C. counts 3 places between the ones and tens thousands place, thus $10 \times 10 \times 10$ D. correct
<b>Answer Key</b>		D		
<b>Depth of Knowledge</b>		2		
<b>p-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
13%	13%	17%	57%	

5. Rounded to the nearest ten, 8,300 books were read by the students at Matilda’s school during a read-a-thon. Which value could be the actual total number of books read?
- A. 8,289
  - B. 8,296
  - C. 8,307
  - D. 8,312

Item Information				Option Annotations			
<b>Alignment</b>		A-T.1.1.4		A. rounds to nearest hundred B. correct C. rounds down to the nearest ten D. rounds to nearest hundred			
<b>Answer Key</b>		B					
<b>Depth of Knowledge</b>		1					
<b>p-values</b>							
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>				
11%	53%	20%	16%				

6. Each team in a football league has 53 players on it. There are 32 teams in the league. How many total players are in the league?
- A. 256
  - B. 265
  - C. 1,506
  - D. 1,696

Item Information				Option Annotations
<b>Alignment</b>		A-T.2.1.2		A. does $32 \times 53$ and when multiplying $2 \times 5$ does not put down the 0 since there is already a (placeholder) 0 there B. does $53 \times 32$ and when multiplying $3 \times 3$ does not put in a placeholder 0 C. multiplies $5 \times 3$ and $2 \times 3$ D. correct
<b>Answer Key</b>		D		
<b>Depth of Knowledge</b>		1		
<b>p-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
5%	5%	5%	85%	

7. Albert has been a chef for  $y$  years. Maria has been a chef for 3 years more than 2 times as many years as Albert. Which expression shows how many years Maria has been a chef?
- A.  $3 + 2 + y$
  - B.  $3 + 2 \times y$
  - C.  $3 \times y + 2$
  - D.  $3 \times y \times 2$

Item Information				Option Annotations							
Alignment		B-O.1.1		A. adds all the values B. correct C. does 3 times as many plus 2 D. multiplies all the values							
Answer Key		B									
Depth of Knowledge		2									
<p style="text-align: center;"><i>p</i>-values</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>A</th> <th>B</th> <th>C</th> <th>D</th> </tr> </thead> <tbody> <tr> <td>14%</td> <td style="background-color: #cccccc;">31%</td> <td>27%</td> <td>28%</td> </tr> </tbody> </table>						A	B	C	D	14%	31%
A	B	C	D								
14%	31%	27%	28%								

8. Kara, Lynn, and Molly each play on a basketball team. The points scored in their last game are listed below.
- Kara scored 3 points.
  - Lynn scored 5 times as many points as Kara.
  - Molly scored 7 times as many points as Kara.

How many more points did Molly score than Lynn in their last game?

- A. 2
- B. 6
- C. 8
- D. 16

Item Information		Option Annotations			
<b>Alignment</b>	B-O.1.1.1 B-O.1.1.3	A. $7 - 5$ B. correct C. $(3 \times 5) - 7$ D. $(3 \times 7) - 5$			
<b>Answer Key</b>	B				
<b>Depth of Knowledge</b>	2				
<b>p-values</b>					
<b>A</b>	<b>B</b>				
24%	49%	10%	17%		

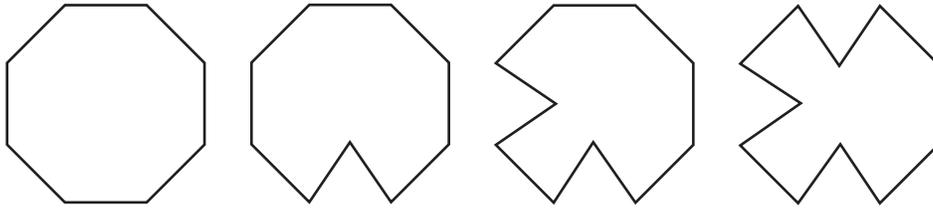
9. Rosie, Stella, and Tiffany are all on a bowling team. In a recent game, Stella scored twice as many points as Rosie. Tiffany scored 2 more points than Rosie. Rosie scored 70 points. What is the total number of points scored by all three women?
- A. 177
  - B. 216
  - C. 282
  - D. 350

Item Information		Option Annotations			
<b>Alignment</b>	B-O.1.1.2 B-O.1.1.3	A. thinks Stella scored half as many points (35) not twice as many B. thinks Tiffany, Stella, and Rosie all scored 72 C. correct D. thinks Tiffany and Stella both scored 140			
<b>Answer Key</b>	C				
<b>Depth of Knowledge</b>	2				
<b>p-values</b>					
<b>A</b>	<b>B</b>				
14%	16%	64%	6%		

10. Frank made a pattern starting with the number 7. He used the rule “add 7.” What is true about every number in Frank’s pattern?
- A. Every number is a multiple of 7.
  - B. The last digit of every number is a 7.
  - C. The first digit of every number is a 7.
  - D. The digits in every number add up to 7.

Item Information		Option Annotations			
<b>Alignment</b>		A. correct B. only true of the 1st term, 11th term, 21st term, 31st term, etc. C. is true for some but not all D. only true for some of the terms but not all the terms			
B-O.2.1.1 B-O.3.1.1					
<b>Answer Key</b>					
A					
<b>Depth of Knowledge</b>					
1					
<b>p-values</b>					
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>		
70%	4%	6%	20%		

11. Starting with an octagon, Hillary used the rule “Replace one side with two new sides” to create the pattern shown below.



How many sides will the next shape in Hillary’s pattern have?

- A. 8
- B. 11
- C. 12
- D. 16

Item Information				Option Annotations
<b>Alignment</b>		B-O.3.1.1		A. assumes each shape has 8 sides because it starts with an octagon B. gives the number of sides of the last shape given C. correct D. thinks the number of sides is increasing by 2 with each iteration and not 1
<b>Answer Key</b>		C		
<b>Depth of Knowledge</b>		1		
<b>p-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
21%	13%	58%	8%	

12. In a video game, players can collect a special item that is worth different points based on what level of the game they are on, as shown in the table below.

**Special Item Points**

Level	Number of Points
1	10
2	20
3	40
4	80

The pattern for the number of points for collecting the special item continues. Which statement explains how to find the correct number of points for collecting the special item while on level 5?

- A. Add 10 to 80 to get 90 points.
- B. Add 40 to 80 to get 120 points.
- C. Multiply 80 by 2 to get 160 points.
- D. Multiply 80 by 5 to get 400 points.

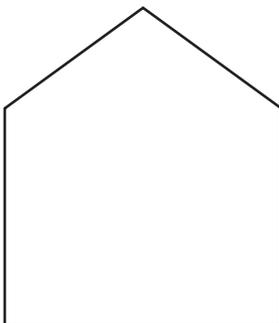
Item Information		Option Annotations	
<b>Alignment</b>	B-O.3.1.3 B-O.3.1.2	A. returns to idea of adding 10, which only works going from level 1 to 2 B. adds the previous value C. correct D. multiplies by the new level	
<b>Answer Key</b>	C		
<b>Depth of Knowledge</b>	2		
<b>p-values</b>			
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
22%	18%	53%	7%

13. As part of a map, Lewis drew a ray with three points labeled A, B, and C on it. The ray Lewis drew started at point A. Which could be the part of the map Lewis drew?



Item Information		Option Annotations	
<b>Alignment</b>	C-G.1.1.1	A. confuses a ray and a line B. correct C. confuses a ray with a line segment D. confuses a ray with a line segment and chooses a starting point that is neither at the left-most nor right-most point	
<b>Answer Key</b>	B		
<b>Depth of Knowledge</b>	1		
<b>p-values</b>			
<b>A</b>	<b>B</b>		
16%	75%	6%	3%

14. Eric is making a design for a school flag. He draws the pentagon shown below.

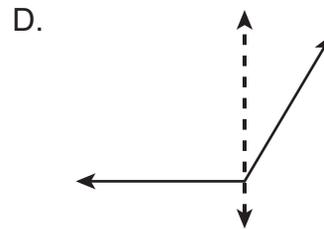
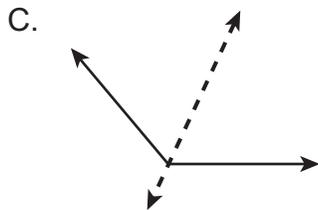
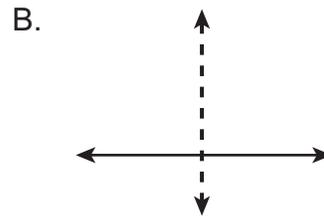
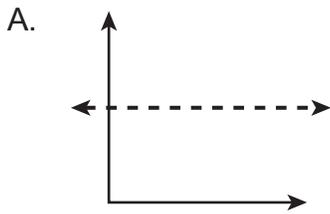


Eric will cut the figure along a line of symmetry of the shape. What are the two shapes Eric will make?

- A. two trapezoids
- B. two parallelograms
- C. a rectangle and a triangle
- D. a rectangle and a pentagon

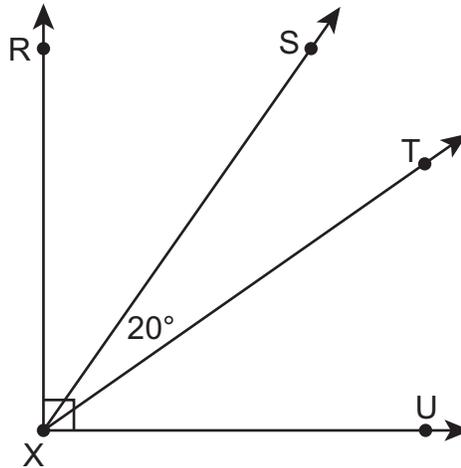
Item Information		Option Annotations			
<b>Alignment</b>		A. correct B. sees a set of parallel lines C. draws a horizontal line through 2 vertices D. draws a horizontal line halfway through the shape			
C-G.1.1.2 C-G.1.1.3					
<b>Answer Key</b>					
A					
<b>Depth of Knowledge</b>					
2					
<b>p-values</b>					
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>		
51%	20%	19%	10%		

15. A designer drew a line of symmetry in an angle to create two acute angles. Which figure could the designer have drawn?



Item Information		Option Annotations	
<b>Alignment</b>	C-G.1.1.3 C-G.1.1.1	A. does not create a line of symmetry B. creates two right angles, not acute angles C. correct D. does not create a line of symmetry	
<b>Answer Key</b>	C		
<b>Depth of Knowledge</b>	2		
<b>p-values</b>			
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
6%	12%	69%	13%

16. A  $90^\circ$  angle is divided into three smaller angles, as shown below.



The middle angle is  $20^\circ$ . The other two angles have the same measure. What is the measure of one of the other two angles?

- A.  $35^\circ$
- B.  $45^\circ$
- C.  $30^\circ$
- D.  $70^\circ$

Item Information				Option Annotations
<b>Alignment</b>		D-M.3.1.2		A. correct B. 90 divided by 2 (does not subtract the 20) C. 90 divided by 3 (thinks all three angles are equal) D. 90 minus 20 (does not divide the difference)
<b>Answer Key</b>		A		
<b>Depth of Knowledge</b>		2		
<b>p-values</b>				
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
47%	20%	14%	19%	

## OPEN-ENDED QUESTION

17. Curt has two pieces of rope. The first piece of rope is  $\frac{4}{10}$  meter long. The second piece of rope is  $\frac{42}{100}$  meter long.

A. Write the length, in meters as a decimal, of the first piece of rope.

B. Write the total length, in meters as a fraction, of both pieces of rope. Show or explain all your work.

Go to the next page to finish question 17.

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

The length of a third piece of rope is between the lengths of the first and second pieces of rope. The length of the third piece is expressed as a decimal to the hundredths place.

- C. Explain why there is only one possible length for the third piece of rope. As part of the explanation, find the length, in meters, of the third piece of rope and express it as a decimal to the hundredths place.

## Item-Specific Scoring Guideline

### #17 Item Information

<b>Alignment</b>	A-F.3	<b>Depth of Knowledge</b>	3	<b>Mean Score</b>	1.75
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### Assessment Anchor this item will be reported under:

M04.A-F.3—Understand decimal notation for fractions, and compare decimal fractions.

### Specific Anchor Descriptor addressed by this item:

M04.A-F.3.1—Use operations to solve problems involving decimals, including converting between fractions and decimals (may include word problems).

### Scoring Guide

Score	In this item, the student . . .
4	Demonstrates a thorough understanding of decimal notation for fractions and comparing decimal fractions by correctly solving problems and clearly explaining procedures.
3	Demonstrates a general understanding of decimal notation for fractions and comparing decimal fractions by correctly solving problems and clearly explaining procedures with only minor errors or omissions.
2	Demonstrates a partial understanding of decimal notation for fractions and comparing decimal fractions by correctly performing a significant portion of the required task.
1	Demonstrates minimal understanding of decimal notation for fractions and comparing decimal fractions.
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. 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 decimal notation for fractions and comparing decimal fractions.
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?
0.4 (meter)	

Part B (2 points):

1 point for correct answer

1 point for complete support

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

What?	Why?
$\frac{82}{100}$ (meter) <b>OR equivalent</b>	<p><b>Sample Work:</b></p> $\frac{4}{10} = \frac{40}{100}$ $\frac{40}{100} + \frac{42}{100} = \frac{82}{100}$ <p><b>OR</b></p> <p><b>Sample Explanation:</b></p> <p>First, I changed <math>\frac{4}{10}</math> to <math>\frac{40}{100}</math> by multiplying the numerator and denominator by 10. Then I added <math>\frac{40}{100} + \frac{42}{100}</math> to get <math>\frac{82}{100}</math>.</p> <p><b>OR equivalent</b></p>

**Part C (1 point):**

1 point for complete explanation

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

What?	Why?
	<p><b>Sample Explanation:</b></p> <p>The first piece of rope is equal to <math>\frac{40}{100}</math> meter and the second piece of rope is <math>\frac{42}{100}</math> meter. There is only one possible length between these two lengths since 41 is the only whole number between 40 and 42. So the length of the third piece of rope must be <math>\frac{41}{100}</math> meter, which can also be written as 0.41 meter.</p> <p><b>OR equivalent</b></p>

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## STUDENT RESPONSE

Response Score: 4 points

17. Curt has two pieces of rope. The first piece of rope is  $\frac{4}{10}$  meter long. The second piece of rope is  $\frac{42}{100}$  meter long.

A. Write the length, in meters as a decimal, of the first piece of rope.

0.4 meters long

The student has given a correct answer.

B. Write the total length, in meters as a fraction, of both pieces of rope. Show or explain all your work.

$$\frac{4}{10} + \frac{42}{100} =$$

LCM: 100

$$\frac{40}{100} + \frac{42}{100} = \frac{82}{100}$$

$\frac{82}{100}$  meters

The student has given a correct answer and complete support.

Go to the next page to finish question 17.

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

The length of a third piece of rope is between the lengths of the first and second pieces of rope. The length of the third piece is expressed as a decimal to the hundredths place.

- C. Explain why there is only one possible length for the third piece of rope. As part of the explanation, find the length, in meters, of the third piece of rope and express it as a decimal to the hundredths place.

0.41

The one possible length is 0.41. It is because in hundredths of 0.4 is also 0.40. Then the other one is 0.42. Then I thought it was 0.41. That's how I got my answer.

The student has given a complete explanation.

STUDENT RESPONSE

Response Score: 3 points



PARTS A AND B

Question 17  
Page 1 of 2

Item ID

?

Line Guide

Calculator

Ruler

EQ

0.4

The student has given a correct answer.

Curt has two pieces of rope. The first piece of rope is  $\frac{4}{10}$  meter long. The second piece of rope is  $\frac{42}{100}$  meter long.

**A.** Write the length, in meters as a decimal, of the first piece of rope.

**B.** Write the total length, in meters as a fraction, of both pieces of rope. Show or explain all your work.

EQ

$$\frac{82}{100}$$

$$\begin{array}{r} 0.42 \\ + 0.4 \\ - - - \\ 0.82 \end{array}$$

The student has given a correct answer and complete support.

Next

Options

Flag

Pause

Review/End Test

PART C

Question 17  
Page 2 of 2

Item ID

?

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Curt has two pieces of rope. The first piece of rope is  $\frac{4}{10}$  meter long. The second piece of rope is  $\frac{42}{100}$  meter long.

The length of a third piece of rope is between the lengths of the first and second pieces of rope. The length of the third piece is expressed as a decimal to the hundredths place.

**C.** Explain why there is only one possible length for the third piece of rope. As part of the explanation, find the length, in meters, of the third piece of rope and express it as a decimal to the hundredths place.

BC

Beacuse it's between the first and second rope, and there could only be one answer for the length of the third rope the length is 0.20.

The student has given an incorrect explanation ("between the first and second rope" is given information and is insufficient for any credit).

135 / 1000

Review/End Test

Pause

Flag

Options

Back

## STUDENT RESPONSE

Response Score: 2 points

17. Curt has two pieces of rope. The first piece of rope is  $\frac{4}{10}$  meter long. The second piece of rope is  $\frac{42}{100}$  meter long.

A. Write the length, in meters as a decimal, of the first piece of rope.

0.41

The student has given an incorrect answer.

B. Write the total length, in meters as a fraction, of both pieces of rope. Show or explain all your work.

$$\frac{42}{100} + \frac{\cancel{4} \times 10}{\cancel{10} \times 10} = \frac{40}{100} =$$

$\frac{82}{100}$  Meters

The student has given a correct answer and complete support.

Go to the next page to finish question 17.

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

The length of a third piece of rope is between the lengths of the first and second pieces of rope. The length of the third piece is expressed as a decimal to the hundredths place.

- C. Explain why there is only one possible length for the third piece of rope. As part of the explanation, find the length, in meters, of the third piece of rope and express it as a decimal to the hundredths place.

there is only one possible length for the rope to be because I changed  $\frac{4}{10}$  to an equivalent fraction so I could add them. I multiplied by 10 to get  $\frac{40}{100}$ . I also have  $\frac{42}{100}$ . therefore the only possible answer could be  $\frac{41}{100}$ .

The student has given a correct but incomplete explanation (has not expressed the length as a decimal).

STUDENT RESPONSE

Response Score: 1 point



PARTS A AND B

Question 17  
Page 1 of 2

Item ID ?

Curt has two pieces of rope. The first piece of rope is  $\frac{4}{10}$  meter long. The second piece of rope is  $\frac{42}{100}$  meter long.

**A.** Write the length, in meters as a decimal, of the first piece of rope.

Eq

0.4

Eq

The student has given a correct answer.

**B.** Write the total length, in meters as a fraction, of both pieces of rope. Show or explain all your work.

Eq

$$\frac{42}{100} \frac{4}{10}$$

I made 42 hundrths into fourdndrths so it would look more like a fraction not a decimal.

Eq

The student has given an incorrect answer and incorrect support.

95 / 1000

Next

Review/End Test

Pause

Flag

Options

PART C

Question 17  
Page 2 of 2

Item ID

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Curt has two pieces of rope. The first piece of rope is  $\frac{4}{10}$  meter long. The second piece of rope is  $\frac{42}{100}$  meter long.

The length of a third piece of rope is between the lengths of the first and second pieces of rope. The length of the third piece is expressed as a decimal to the hundredths place.

**C.** Explain why there is only one possible length for the third piece of rope. As part of the explanation, find the length, in meters, of the third piece of rope and express it as a decimal to the hundredths place.

The student has given an incorrect explanation.

EC

231 / 1000

Review/End Test

Pause

Flag

Options

Back

## STUDENT RESPONSE

Response Score: 0 points

17. Curt has two pieces of rope. The first piece of rope is  $\frac{4}{10}$  meter long. The second piece of rope is  $\frac{42}{100}$  meter long.

A. Write the length, in meters as a decimal, of the first piece of rope.

4.1

The student has given an incorrect answer.

B. Write the total length, in meters as a fraction, of both pieces of rope. Show or explain all your work.

$\frac{46}{100}$

I put the answer because I added the 4 to 42 and got 46 then I added 10 to 100 and got 110.

The student has given an incorrect answer and incorrect support.

Go to the next page to finish question 17.

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

The length of a third piece of rope is between the lengths of the first and second pieces of rope. The length of the third piece is expressed as a decimal to the hundredths place.

- C. Explain why there is only one possible length for the third piece of rope. As part of the explanation, find the length, in meters, of the third piece of rope and express it as a decimal to the hundredths place.

$$\frac{4}{10} \quad \frac{28}{100} \quad \frac{42}{100} \quad 28.0$$

I put 26.0 because I cut the 42 in half and got 26 then I cut 4 in half and got 2 so I added the 26 and the 2 together and got 28 then I put the 28 in meters like this  $\frac{28}{100}$  because it said hundreds.

When I put the 28 in decimal form to the hundredths it looks like this.

The student has given an incorrect explanation.

**MATHEMATICS—SUMMARY DATA**

**MULTIPLE-CHOICE**

Sample Number	Alignment	Answer Key	Depth of Knowledge	p-values			
				A	B	C	D
1	A-T.2.1.4	B	1	13%	73%	7%	7%
2	A-F.1.1.2 A-F.1.1.1	C	2	21%	19%	52%	8%
3	A-F.2.1.6	C	1	24%	22%	42%	12%
4	A-T.1.1.2 A-T.1.1.1	D	2	13%	13%	17%	57%
5	A-T.1.1.4	B	1	11%	53%	20%	16%
6	A-T.2.1.2	D	1	5%	5%	5%	85%
7	B-O.1.1	B	2	14%	31%	27%	28%
8	B-O.1.1.1 B-O.1.1.3	B	2	24%	49%	10%	17%
9	B-O.1.1.2 B-O.1.1.3	C	2	14%	16%	64%	6%
10	B-O.2.1.1 B-O.3.1.1	A	1	70%	4%	6%	20%
11	B-O.3.1.1	C	1	21%	13%	58%	8%
12	B-O.3.1.3 B-O.3.1.2	C	2	22%	18%	53%	7%
13	C-G.1.1.1	B	1	16%	75%	6%	3%
14	C-G.1.1.2 C-G.1.1.3	A	2	51%	20%	19%	10%
15	C-G.1.1.3 C-G.1.1.1	C	2	6%	12%	69%	13%
16	D-M.3.1.2	A	2	47%	20%	14%	19%

**OPEN-ENDED**

Sample Number	Alignment	Points	Depth of Knowledge	Mean Score
17	A-F.3	4	3	1.75

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# **PSSA Grade 4 Mathematics Item and Scoring Sampler**

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