The Pennsylvania System of School Assessment

Mathematics
Item and Scoring Sampler

2016–2017
Grade 6

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INFORMATION ABOUT MATHEMATICS

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* [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.[1] 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.[1]

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[1] 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.

• 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 6.

- A-N = The Number System

- A-R = Ratios and Proportional Relationships

- B-E = Expressions and Equations

- C-G = Geometry

- D-S = Statistics and Probability

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[2] 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
Alignment	Assigned AAEC			Brief answer option analysis or rationale
Answer Key	Correct Answer			
Depth of Knowledge	Assigned DOK			
***p*-values**				
A	B	C	D	
Percentage of students who selected each option				

Example Open-Ended Item Information Table

Alignment	Assigned AAEC	**Depth of Knowledge**	Assigned DOK	**Mean Score**	

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

Grade 6 Formula Sheet

Formulas 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 6

Triangle
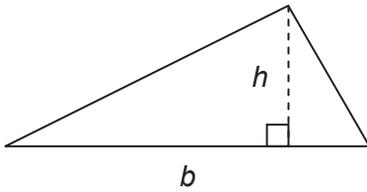
$$A = \frac{1}{2}\,bh$$

Rectangle
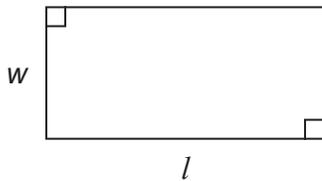
$$A = lw$$

Square
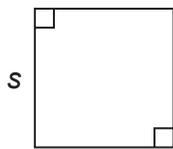
$$A = s^2$$

Parallelogram
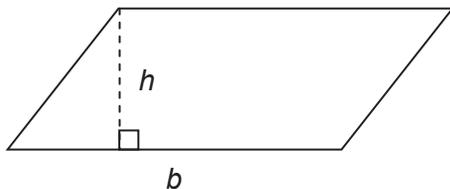
$$A = bh$$

Trapezoid
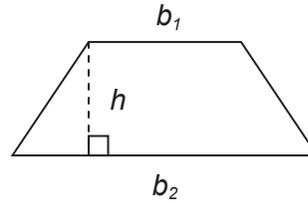
$$A = \frac{1}{2}\,h(b_1 + b_2)$$

Rectangular Prism
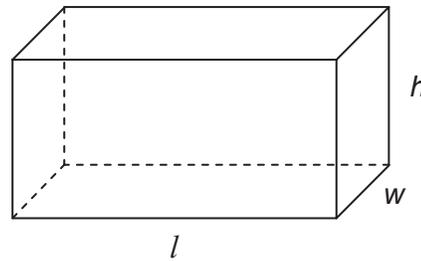
$$V = lwh \qquad SA = 2lw + 2lh + 2wh$$

Cube
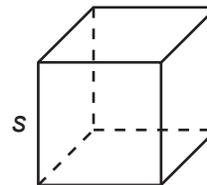
$$V = s \cdot s \cdot s \qquad SA = 6s^2$$

Triangular Prism
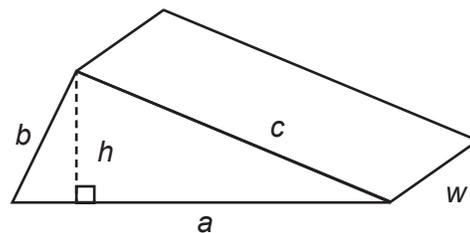
$$SA = ah + aw + bw + cw$$

MATHEMATICS TEST DIRECTIONS

On the following pages are the mathematics questions.

- You may <u>not</u> use a calculator for question 1. You may use a calculator for all other 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 <u>without</u> the use of a calculator.

MULTIPLE-CHOICE ITEMS

1. Divide: $\dfrac{3}{4} \div \dfrac{2}{3}$

    A. $\dfrac{1}{2}$

    B. $\dfrac{8}{9}$

    C. $\dfrac{9}{8}$

    D. 2

Item Information		Option Annotations
Alignment	A-N.1.1.1	A. multiplies 3/4 × 2/3
Answer Key	C	B. inverts 3/4 instead of 2/3 prior to multiplying
		C. correct
Depth of Knowledge	1	D. inverts both fractions prior to multiplying

p-values			
A	**B**	**C**	**D**
28%	12%	52%	8%

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

2. Greg's social studies grade is based on two quizzes, two tests, and one project. The table below shows Greg's scores on these items, as well as each item's weight in determining his final grade.

Greg's Social Studies Scores

Item	Score	Weight
quiz 1	78	1
quiz 2	90	1
test 1	85	2
test 2	89	2
project	92	4

To determine his final grade, Greg's teacher multiplies each score by its weight, adds the products together, and then divides the sum by 10. What is Greg's final grade?

A. 79.9

B. 86.8

C. 88.4

D. 92.0

Item Information		Option Annotations
Alignment	A-N.2.1.1	A. enters (78 + 90 × 1) + (85 + 89 × 2) + (92 × 4); order of operations error
Answer Key	C	B. finds the average of the scores
Depth of Knowledge	2	C. correct
		D. thinks project grade is final grade because it has greatest weight

p-values

A	B	C	D
8%	13%	69%	10%

3. Kiah plotted the locations of her home and the city of Huntingdon on the number line shown below.

Kiah's Home   Huntingdon

6.75
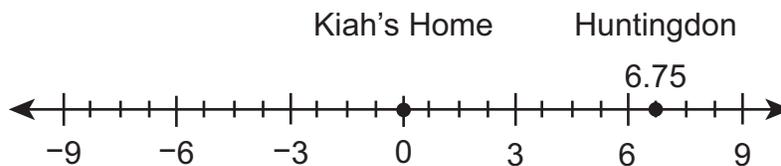
Williamsburg is the same distance from Kiah's home as Huntingdon, but it is in the opposite direction. Which statement best describes how to find the location of Williamsburg on the number line?

A. The opposite of 6.75 is ⁻6.75, so Williamsburg is at ⁻6.75.

B. The sum of 6.75 and 6.75 is 13.5, so Williamsburg is at 13.5.

C. The numbers 6.75 and ⁻6.75 are the same, so Williamsburg is at 6.75.

D. Opposites, such as 6.75 and ⁻6.75, sum to zero, so Williamsburg is at 0.

Item Information		Option Annotations
Alignment	A-N.3.1	A. correct
Answer Key	A	B. sums the measurements together
Depth of Knowledge	2	C. thinks of absolute values
		D. wrong property, fails to identify Kiah's home as 0

p-values			
A	**B**	**C**	**D**
76%	8%	8%	8%

4. James measures the water level from the top of a dock twice a day. The water level in the morning is −2 feet. The water level in the afternoon is −6.5 feet. Which statement about the relationship between the two measurements is true?

    A. A water level of −6.5 feet is higher than a water level of −2 feet, as −6.5 > −2.

    B. A water level of −2 feet is lower than a water level of −6.5 feet, as −2 > −6.5.

    C. A water level of −6.5 feet is the same as a water level of −2 feet, as −6.5 = −2.

    D. A water level of −2 feet is higher than a water level of −6.5 feet, as −2 > −6.5.

Item Information				Option Annotations
Alignment	A-N.3.2.1			A. thinks −6.5 feet is higher than −2 feet because −6.5 is "more" negative than −2
Answer Key	D			B. thinks −2 is lower than −6.5 in terms of water level, but inequality is correct
Depth of Knowledge	1			C. thinks measurements are the same since they are both negative
				D. correct

p-values			
A	**B**	**C**	**D**
15%	11%	6%	68%

5. The ratio of the number of boys to the number of girls in the cast of a school play is 1 : 5. Which statement **must** describe the cast of the play?

    A. There are exactly 6 students in the cast.

    B. There is 1 boy for every 5 girls in the cast.

    C. There are 4 more girls than boys in the cast.

    D. There is 1 boy out of the 5 students in the cast.

Item Information			Option Annotations
Alignment	A-R.1.1.1		A. thinks ratio shows total number
Answer Key	B		B. correct
Depth of Knowledge	1		C. thinks 5 – 1
			D. mistakes ratio of boys to girls for ratio of boys to all students in the cast

p-values			
A	**B**	**C**	**D**
15%	64%	8%	13%

6. For a recipe, Harris uses 2 cups of white sugar for each cup of brown sugar. How many cups of brown sugar does Harris use when he uses 1 cup of white sugar?

A. $\frac{1}{2}$

B. 1

C. $1\frac{1}{2}$

D. 2

Item Information		Option Annotations
Alignment	A-R.1.1.2	A. correct
Answer Key	A	B. thinks the cups of brown sugar is a constant
Depth of Knowledge	2	C. subtracts 1/2 from 2
		D. reverses the original ratio

p-values			
A	**B**	**C**	**D**
71%	10%	10%	9%

7. Jasmine earns $36 for 4 hours of baby-sitting. She charges a constant hourly rate. Which table correctly shows the amount Jasmine earns baby-sitting for different numbers of hours?

A. **Jasmine's Baby-Sitting Earnings**

Number of Hours	Amount Earned ($)
2	18
4	36
6	54
8	72

B. **Jasmine's Baby-Sitting Earnings**

Number of Hours	Amount Earned ($)
2	34
4	36
6	38
8	40

C. **Jasmine's Baby-Sitting Earnings**

Number of Hours	Amount Earned ($)
2	27
4	36
6	45
8	54

D. **Jasmine's Baby-Sitting Earnings**

Number of Hours	Amount Earned ($)
2	32
4	36
6	42
8	50

Item Information		Option Annotations
Alignment	A-R.1.1.4 A-R.1.1.3	A. correct B. adds/subtracts change in hours from earnings C. finds rate is $9 per hour, but assumes hours in table are in increments of 1 D. adds/subtracts amount in hours from earnings
Answer Key	A	
Depth of Knowledge	2	

p-values			
A	**B**	**C**	**D**
78%	8%	9%	5%

8. Alon started in 60% of his team's basketball games this season. He started a total of 12 games. How many games did Alon's team play this season?

   A. 6

   B. 7

   C. 18

   D. 20

Item Information		Option Annotations
Alignment	A-R.1.1.5	A. subtracts 12 − 6
Answer Key	D	B. finds 60% of 12, rounding down to 7
Depth of Knowledge	2	C. adds 12 + 6
		D. correct

p-values			
A	**B**	**C**	**D**
13%	23%	18%	46%

9. An inequality is shown below.

$$x + 2.5 < 20$$

What is the **greatest** value of x from the set {10.5, 12.5, 17.5, 19.5} that makes the inequality true?

A. 10.5

B. 12.5

C. 17.5

D. 19.5

Item Information		Option Annotations
Alignment	B-E.2.1.1	A. 10.5 + 2.5 = 13; makes the inequality true but is not the greatest value from the set to do so
Answer Key	B	B. correct
Depth of Knowledge	1	C. 17.5 + 2.5 = 20; makes the inequality not true
		D. 19.5 + 2.5 = 22; though 19.5 is the greatest value in the set that is less than 20, adding the value to 2.5 makes the inequality not true

p-values			
A	**B**	**C**	**D**
11%	55%	19%	15%

10. There are 150 children playing in a park.

- The number of boys (x) playing in the park is **greater** than 50.
- The number of girls (y) playing in the park is **less** than 100.

Which values of x and y could be the numbers of boys and girls playing in the park?

A. $x = 35$
$y = 115$

B. $x = 50$
$y = 100$

C. $x = 55$
$y = 85$

D. $x = 60$
$y = 90$

Item Information			Option Annotations
Alignment	B-E.2.1.3 B-E.2.1.4		A. reverses inequality statements B. uses numbers given, does not consider inequality statements C. does not consider total number of boys and girls D. correct
Answer Key	D		
Depth of Knowledge	2		

p-values			
A	**B**	**C**	**D**
3%	9%	11%	77%

11. Gary saves $2.50 each day. Which equation describes the relationship between the number of days (d) Gary saves money and the total amount of money (m), in dollars, that he saves?

A. $m = 2.50d$

B. $m = d - 2.50$

C. $d = 2.50m$

D. $d = \dfrac{2.50}{m}$

Item Information		Option Annotations
Alignment	B-E.3.1.1	A. correct
Answer Key	A	B. equation creates incorrect relationship
Depth of Knowledge	2	C. equation switches d and m
		D. equation creates incorrect relationship

	p-values		
A	**B**	**C**	**D**
55%	10%	24%	11%

12. A trapezoid is shown below.
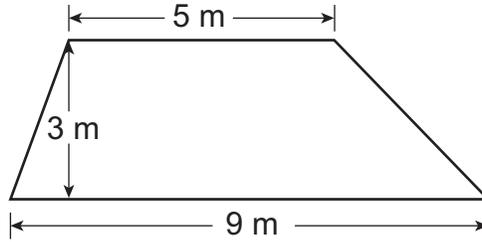
What is the area of the trapezoid?

A. 21 m^2

B. 27 m^2

C. 34 m^2

D. 42 m^2

Item Information		Option Annotations
Alignment	C-G.1.1.1	A. correct
Answer Key	A	B. 3 × 9
Depth of Knowledge	1	C. (5 + 9 + 3) × 2; incorrect formula
		D. (5 + 9) × 3; forgot to multiply by 1/2

p-values			
A	**B**	**C**	**D**
60%	19%	9%	12%

13. The vertices of a parallelogram are plotted on the coordinate plane shown below.
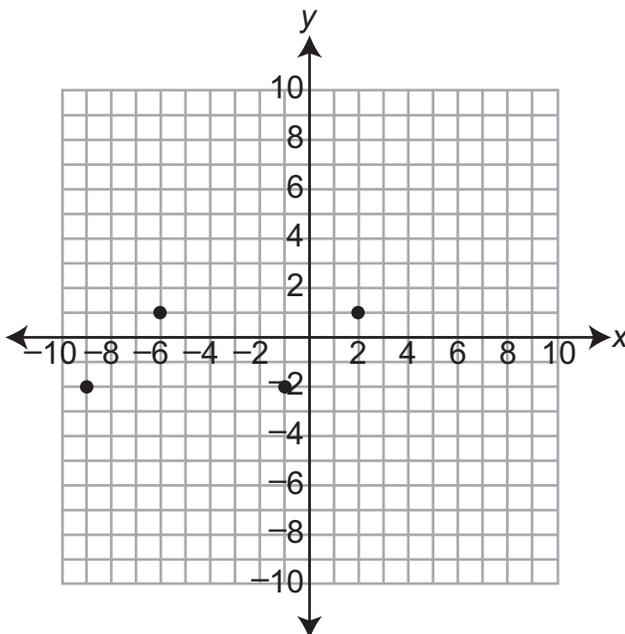
What is the area, in square units, of the parallelogram?

A. 8

B. 9

C. 12

D. 24

Item Information		Option Annotations
Alignment	C-G.1.1.4	A. uses (−9, 2) and (−1, 2) instead of (−9, −2) and (−1, −2)
Answer Key	D	B. uses the vertical and horizontal distances between (−6, 1) and (−9, −2)
Depth of Knowledge	2	C. thinks the formula is (1/2) × bh
		D. correct

p-values			
A	**B**	**C**	**D**
11%	7%	14%	68%

14. Rosa built a jewelry box. She first cut out all the pieces she would need by using the pattern shown below.
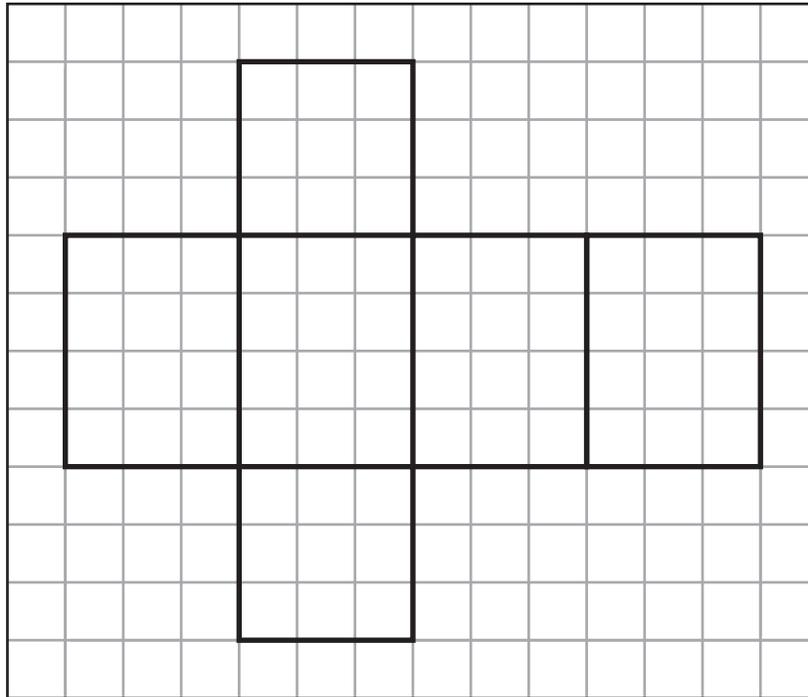

Based on the pattern, which phrase **best** describes the shape of the completed jewelry box?

A. a cube with a box top

B. a cube with no box top

C. a rectangular prism with a box top

D. a rectangular prism with no box top

Item Information		Option Annotations
Alignment	C-G.1.1.5	A. thinks any six-sided solid is a cube
Answer Key	C	B. thinks any six-sided solid is a cube and does not realize that the top is included
Depth of Knowledge	2	C. correct
		D. does not see that the row of four sides eventually folds around to make the top

p-values			
A	**B**	**C**	**D**
21%	4%	64%	11%

15. A rectangular prism is pictured below.


6 cm

5 cm

13 cm
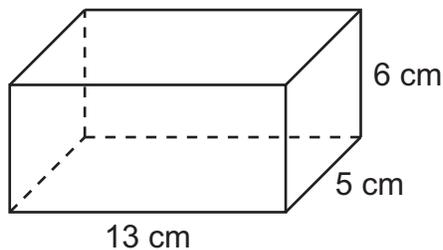
What is the surface area of the rectangular prism?

A. 173 cm^2

B. 320 cm^2

C. 346 cm^2

D. 390 cm^2

Item Information		Option Annotations
Alignment	C-G.1.1.6	A. does not multiply by 2
Answer Key	C	B. uses 5 × 13 face 4 times instead of twice, forgetting that 2 faces are 6 × 13
Depth of Knowledge	1	C. correct
		D. calculates volume instead of surface area

p-values			
A	**B**	**C**	**D**
10%	7%	46%	37%

16. Franco asked his soccer team how many glasses of milk and how many glasses of water each player drinks per day. The line plots below show his data.

Amount of Milk Each Player Drinks
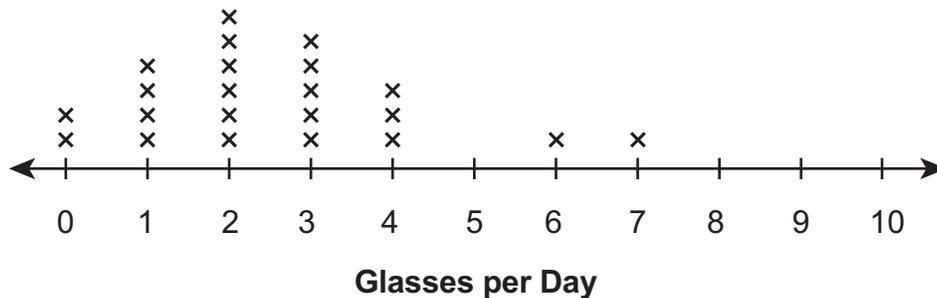
Glasses per Day

Amount of Water Each Player Drinks
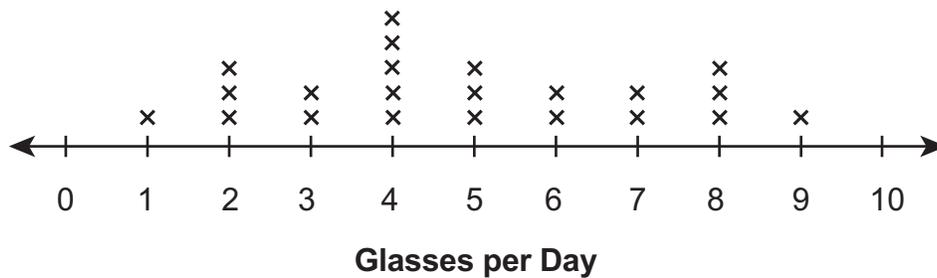
Glasses per Day

Which statement correctly describes the number of glasses of milk and the number of glasses of water each player drinks per day?

A. The mean would be a better measure of center than the median for the number of glasses of milk the players drink.

B. There is less variability in the number of glasses of milk the players drink than the number of glasses of water they drink.

C. The median number of glasses of milk the players drink is greater than the mean number of glasses of milk the players drink.

D. The range for the number of glasses of milk and the range for the number of glasses of water the players drink are the same.

Item Information			
Alignment	D-S.1		
Answer Key	B		
Depth of Knowledge	3		

p-values			
A	**B**	**C**	**D**
21%	50%	19%	10%

Option Annotations

A. confuses mean and median
B. correct
C. thinks extreme values affect the median more than the mean
D. forgets the × on the 9 for glasses of water

OPEN-ENDED QUESTION

17. Sam and Annika ride their bikes to school. Sam rides his bike *k* kilometers. Annika rides her bike 2 less than 4 times as many kilometers as Sam rides.

A. Write an expression to represent how many kilometers Annika rides her bike to school.

Sam rides his bike at most 2 kilometers to school.

B. What is the **greatest** distance, in kilometers, Annika could ride her bike to school? 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.

> **C.** Explain why Sam must ride his bike more than $\frac{1}{2}$ kilometer to school.

Item-Specific Scoring Guideline

#17 Item Information

Alignment	B-E.1	Depth of Knowledge	3	Mean Score	1.40

Assessment Anchor this item will be reported under:

M06.B-E.1—Apply and extend previous understandings of arithmetic to numerical and algebraic expressions.

Specific Anchor Descriptor addressed by this item:

M06.B-E.1.1—Identify, write, and evaluate numerical and algebraic expressions.

Scoring Guide

Score	In this item, the student . . .
4	Demonstrates a thorough understanding of identifying, writing, and evaluating numerical and algebraic expressions by correctly solving problems and clearly explaining procedures.
3	Demonstrates a general understanding of identifying, writing, and evaluating numerical and algebraic expressions by correctly solving problems and clearly explaining procedures with only minor errors or omissions.
2	Demonstrates a partial understanding of identifying, writing, and evaluating numerical and algebraic expressions by correctly performing a significant portion of the required task.
1	Demonstrates minimal understanding of identifying, writing, and evaluating numerical and algebraic expressions.
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 identifying, writing, and evaluating numerical and algebraic expressions.
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?
$4k - 2$ **OR equivalent**	

Part B (2 points):

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

What?	Why?
6 (kilometers) [Note: Carry over any error from Part A unless it is blank.]	**Sample Work:** $4(2) - 2 = 8 - 2 = 6$ **OR** **Sample Explanation:** Since Annika rides her bicycle 2 less than 4 times as many kilometers as Sam, she rides her bike 2 less than $4(2) = 8$ kilometers, which is $8 - 2 = 6$ kilometers.

Part C (1 point):

1 point for complete explanation

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

What?	Why?
	Sample Explanation: If Sam were to ride his bike $\frac{1}{2}$ kilometer, that means that Annika would ride her bike $4\left(\frac{1}{2}\right) - 2 = 2 - 2 = 0$ kilometers. Then she would not be riding her bike to school at all. So Sam must ride a distance greater than $\frac{1}{2}$ kilometer from his home to school. [Note: Carry over any error from Part A unless it is blank.]

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STUDENT RESPONSE

Response Score: 4 points

17. Sam and Annika ride their bikes to school. Sam rides his bike *k* kilometers. Annika rides her bike 2 less than 4 times as many kilometers as Sam rides.

A. Write an expression to represent how many kilometers Annika rides her bike to school.

$$K4-2$$

> The student has given a correct expression.

Sam rides his bike at most 2 kilometers to school.

B. What is the **greatest** distance, in kilometers, Annika could ride her bike to school? Show or explain all your work.

the gretest distance is 6 Kilometers because if you insert 2 into the Epression it would be 2·4−2= A So 2 times 4 is 8 and 2 subtracted from 8 is six

$$\begin{array}{r} 4 \\ \times 2 \\ \hline 8 \end{array} \qquad \begin{array}{r} 8 \\ - 2 \\ \hline 6 \end{array}$$

6 Kilometers

> 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.

C. Explain why Sam must ride his bike more than $\frac{1}{2}$ kilometer to school.

if Sam doesn't ride his bike more than $\frac{1}{2}$ Kilometer then annika won't be able to ride her bike at all, So if you insert half in the expression you will get this.

$$\boxed{\frac{1}{2} \cdot 4 - 2 = A}$$

So $\frac{1}{2} \cdot 4 = 2$ and $2 - 2 = 0$ So annika couldn't go anywhere unless he rides more than $\frac{1}{2}$ Kilometer.

> The student has given a complete explanation.

STUDENT RESPONSE

Response Score: 3 points

PARTS A AND B

Question 17
Page 1 of 2

Sam and Annika ride their bikes to school. Sam rides his bike k kilometers. Annika rides her bike 2 less than 4 times as many kilometers as Sam rides.

A. Write an expression to represent how many kilometers Annika rides her bike to school.

EQ

$k2 - 2 =$

> The student has given an incorrect expression.

Sam rides his bike at most 2 kilometers to school.

B. What is the **greatest** distance, in kilometers, Annika could ride her bike to school? Show or explain all your work.

EQ

The greatest distance she could ride is 2 kilometers. I used the expression $k2 - 2 = 2$. First, I plugged 2 in for k,
$2 \cdot 2 = 4$ and $4 - 2 = 2$. That is how I got my answer.

> The student has given a correct answer and complete support, based on the expression given in Part A.

158 / 1000

PART C

Question 17
Page 2 of 2

Sam and Annika ride their bikes to school. Sam rides his bike k kilometers. Annika rides her bike 2 less than 4 times as many kilometers as Sam rides.

C. Explain why Sam must ride his bike more than $\frac{1}{2}$ kilometer to school.

Sam must ride more than $\frac{1}{2}$ to school because $\frac{1}{2} \cdot 2 - 2 = -1$ and Anika can not ride negative 1 kilometers to school. that is why Sam must ride more than $\frac{1}{2}$ kilometer to school.

The student has given a complete explanation, based on the expression given in Part A.

167 / 1000

STUDENT RESPONSE

Response Score: 2 points

PARTS A AND B

Question 17
Page 1 of 2

Sam and Annika ride their bikes to school. Sam rides his bike *k* kilometers. Annika rides her bike 2 less than 4 times as many kilometers as Sam rides.

A. Write an expression to represent how many kilometers Annika rides her bike to school.

EQ

$2 \cdot 4 - k = 6$

The student has given an incorrect expression.

Sam rides his bike at most 2 kilometers to school.

B. What is the **greatest** distance, in kilometers, Annika could ride her bike to school? Show or explain all your work.

EQ

Annika could ride her bike 6 kilometers to school.
$2 \cdot 4 = 8$
$8 - 2 = 6$

The student has given a correct answer and complete support.

62 / 1000

PART C

Item ID

Sam and Annika ride their bikes to school. Sam rides his bike k kilometers. Annika rides her bike 2 less than 4 times as many kilometers as Sam rides.

C. Explain why Sam must ride his bike more than $\frac{1}{2}$ kilometer to school.

EQ

Sam must ride his bike $\frac{1}{2}$ kilometer to school because Anika rides 2 less than 4 times as many kilometers as as Sam. Also it is because Annika is riding 6 kilometers to school.

The student has given an incorrect explanation.

171 / 1000

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Review/End Test   Pause   Flag   Options

STUDENT RESPONSE

Response Score: 1 point

17. Sam and Annika ride their bikes to school. Sam rides his bike k kilometers. Annika rides her bike 2 less than 4 times as many kilometers as Sam rides.

A. Write an expression to represent how many kilometers Annika rides her bike to school.

$$K \cdot 4 - 2$$

$$\bullet = \text{mulption}$$

> The student has given a correct expression.

Sam rides his bike at most 2 kilometers to school.

B. What is the **greatest** distance, in kilometers, Annika could ride her bike to school? Show or explain all your work.

the greatest distence Annika could ride her bike to school is Ok. because sam rides 2k. and Annika rides 2k less than sam, making it (Ok.)

> 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.

C. Explain why Sam must ride his bike more than $\frac{1}{2}$ kilometer to school.

because his house is further than 1/2 kilo. to

school? ?
I'm confused.

> The student has given an incorrect explanation.

STUDENT RESPONSE

Response Score: 0 points

PARTS A AND B

Question 17
Page 1 of 2

Sam and Annika ride their bikes to school. Sam rides his bike k kilometers. Annika rides her bike 2 less than 4 times as many kilometers as Sam rides.

A. Write an expression to represent how many kilometers Annika rides her bike to school.

EQ

k - 2 x 4 = kilometers

The student has given an incorrect answer.

Sam rides his bike at most 2 kilometers to school.

B. What is the **greatest** distance, in kilometers, Annika could ride her bike to school? Show or explain all your work.

EQ

If Sam ride his bike for almost 2 kilometers than Annika rides for almost 4 kilometers because 2 - 2 = 0 + 4 = 4 kilometers

The student has given an incorrect answer and incorrect support.

123 / 1000

PART C

Sam and Annika ride their bikes to school. Sam rides his bike *k* kilometers. Annika rides her bike 2 less than 4 times as many kilometers as Sam rides.

C. Explain why Sam must ride his bike more than $\frac{1}{2}$ kilometer to school.

Because he has to Annika rides 6 kilometers than 2 less than Sam she x by 2 so she gets 4.

The student has given an incorrect explanation.

91 / 1000

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Review/End Test   Pause   Flag   Options

MATHEMATICS—SUMMARY DATA

MULTIPLE-CHOICE

Sample Number	Alignment	Answer Key	Depth of Knowledge	p-values			
				A	**B**	**C**	**D**
1	A-N.1.1.1	C	1	28%	12%	52%	8%
2	A-N.2.1.1	C	2	8%	13%	69%	10%
3	A-N.3.1	A	2	76%	8%	8%	8%
4	A-N.3.2.1	D	1	15%	11%	6%	68%
5	A-R.1.1.1	B	1	15%	64%	8%	13%
6	A-R.1.1.2	A	2	71%	10%	10%	9%
7	A-R.1.1.4 A-R.1.1.3	A	2	78%	8%	9%	5%
8	A-R.1.1.5	D	2	13%	23%	18%	46%
9	B-E.2.1.1	B	1	11%	55%	19%	15%
10	B-E.2.1.3 B-E.2.1.4	D	2	3%	9%	11%	77%
11	B-E.3.1.1	A	2	55%	10%	24%	11%
12	C-G.1.1.1	A	1	60%	19%	9%	12%
13	C-G.1.1.4	D	2	11%	7%	14%	68%
14	C-G.1.1.5	C	2	21%	4%	64%	11%
15	C-G.1.1.6	C	1	10%	7%	46%	37%
16	D-S.1	B	3	21%	50%	19%	10%

OPEN-ENDED

Sample Number	Alignment	Points	Depth of Knowledge	Mean Score
17	B-E.1	4	3	1.40

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PSSA Grade 6 Mathematics
Item and Scoring Sampler