MASSACHUSETTS DEPARTMENT OF
ELEMENTARY AND SECONDARY
EDUCATION

Release of Spring 2022 MCAS Test Items

from the

Grade 6 Mathematics Paper-Based Test

June 2022
Massachusetts Department of Elementary and Secondary Education

Grade 6 Mathematics

SESSION 1

This session contains 10 questions.

You may use your reference sheet during this session.
*You may **not** use a calculator during this session.*

Directions

Read each question carefully and then answer it as well as you can. You must record all answers in this Test & Answer Booklet.

For some questions, you will mark your answers by filling in the circles in your Test & Answer Booklet. Make sure you darken the circles completely. Do not make any marks outside of the circles. If you need to change an answer, be sure to erase your first answer completely.

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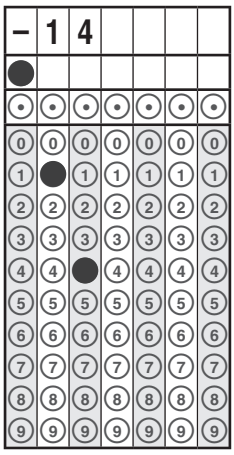
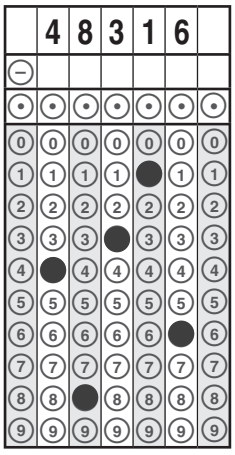
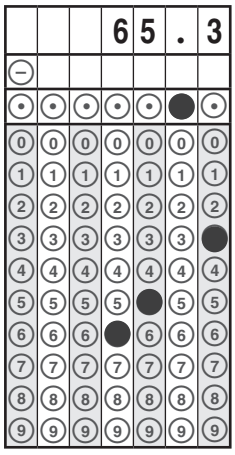
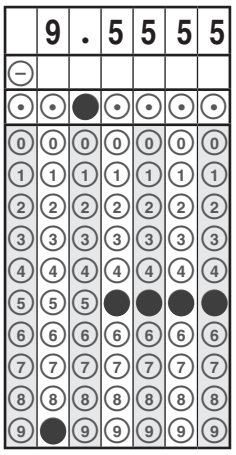
8. See below for examples of how to correctly complete an answer grid.

EXAMPLES









MASSACHUSETTS DEPARTMENT OF ELEMENTARY AND SECONDARY EDUCATION

Massachusetts Comprehensive Assessment System
Grade 6 Mathematics Reference Sheet

CONVERSIONS

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts
1 gallon ≈ 3.785 liters
1 liter ≈ 0.264 gallon
1 liter = 1000 cubic centimeters

1 inch = 2.54 centimeters
1 meter ≈ 39.37 inches
1 mile = 5280 feet
1 mile = 1760 yards
1 mile ≈ 1.609 kilometers
1 kilometer ≈ 0.62 mile

1 pound = 16 ounces
1 pound ≈ 0.454 kilogram
1 kilogram ≈ 2.2 pounds
1 ton = 2000 pounds

AREA (*A*) FORMULAS

square . . . . . $A = s^2$

rectangle . . . . . $A = bh$

OR

$A = lw$

parallelogram . . . . . $A = bh$

triangle . . . . . $A = \frac{1}{2}bh$

(b = length of base; h = height)

VOLUME (*V*) FORMULAS

right rectangular prism . . . . . $V = lwh$

(l = length; w = width; h = height)

OR

$V = Bh$

(B = area of base; h = height)

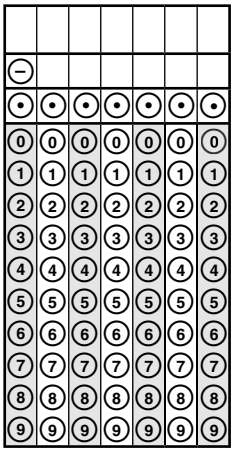
1 Members of a club are selling boxes of cookies. Each box of cookies costs the same amount. This table shows the total cost for different numbers of boxes of cookies.

Costs of Cookie Boxes

Number of Boxes of Cookies	Total Cost
1	$3.50
2	$7.00
3	$10.50
4	$14.00

Based on the data in the table, what would be the total cost, in dollars, of 10 boxes of cookies?

Enter your answer in the answer boxes at the top of the answer grid **and** completely fill the matching circles.

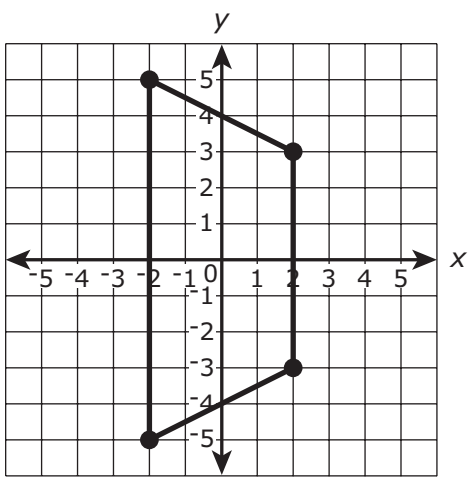


2 A quadrilateral has these vertices.

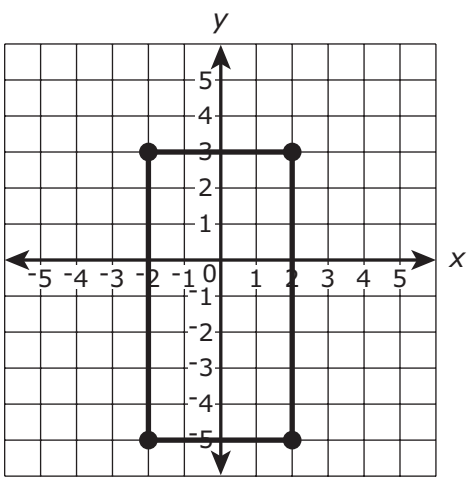
$H(-3, 2)$, $I(3, 2)$, $J(5, -2)$, $K(-5, -2)$

Which of the following graphs shows quadrilateral *HIJK*?

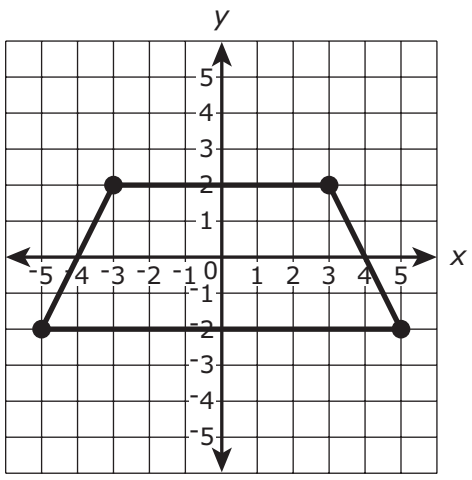
Ⓐ



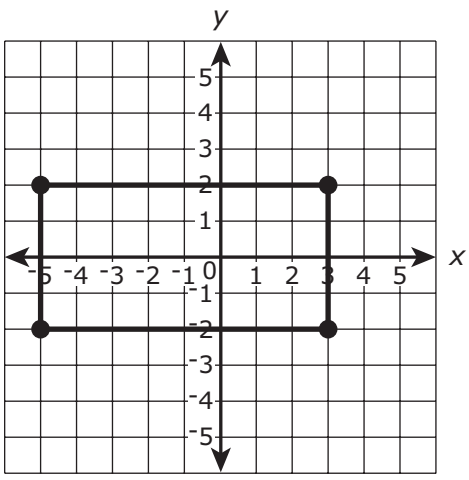
Ⓑ



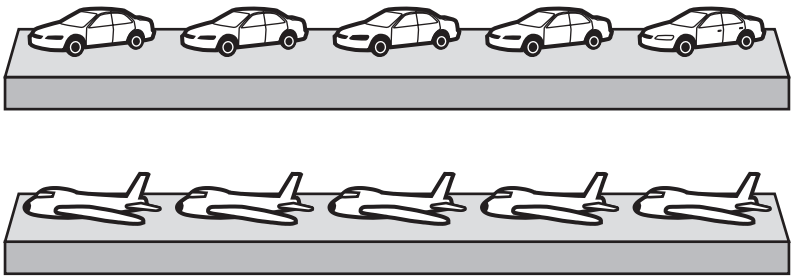
Ⓒ



Ⓓ



3 This picture shows a display of model cars and model airplanes at a store.



Which ratios show the relationship of the number of model cars to the number of model airplanes in the picture?

Select the **two** correct answers.

Ⓐ 1:1

Ⓑ 1:2

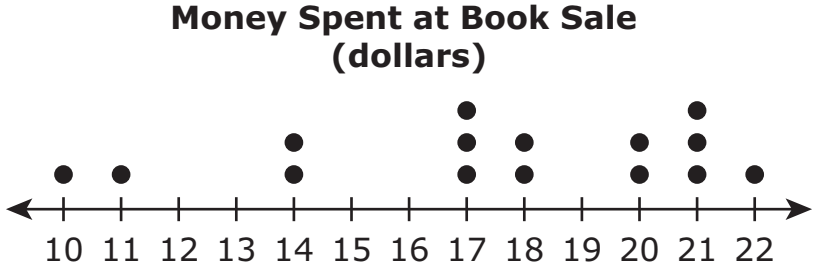
Ⓒ 1:5

Ⓓ 5:5

Ⓔ 5:10

This question has four parts. Be sure to label each part of your response.

4 There were 15 customers at a book sale. This dot plot shows the amount of money, in dollars, that each customer spent at the book sale.



A. Based on the dot plot, how many customers at the book sale spent exactly 17 dollars? Explain your reasoning.

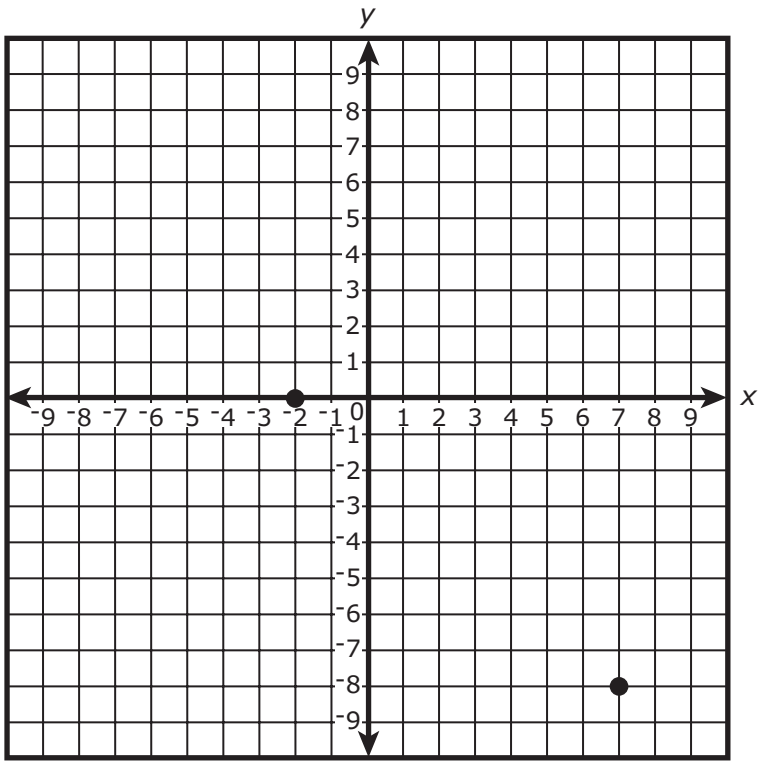
B. How many customers at the book sale spent **less** than the median amount of money spent at the book sale? Show or explain how you got your answer.

C. How many customers at the book sale spent more than 14 dollars but less than 22 dollars? Show or explain how you got your answer.

D. What **percent** of the customers at the book sale spent less than 20 dollars? Show or explain how you got your answer.

4

5 Two points are graphed on this coordinate plane.



Which of the following ordered pairs represent the locations of the points on the coordinate plane?

Select the **two** correct answers.

Ⓐ (–2, –2)

Ⓑ (–2, 0)

Ⓒ (0, –2)

Ⓓ (–8, 7)

Ⓔ (7, –8)

6 At a carnival, only people taller than 48 inches are allowed to ride the roller coaster.

Which of the following inequalities best describes all the possible heights, h, in inches, of people who are allowed to ride the roller coaster?

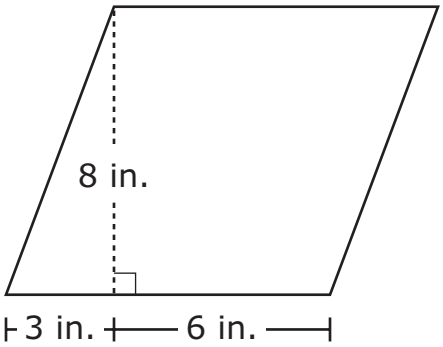
Ⓐ $h > 49$

Ⓑ $h < 49$

Ⓒ $h > 48$

Ⓓ $h < 48$

7 Jana drew a parallelogram that has the dimensions shown.



What is the area of Jana's parallelogram?

Ⓐ 24 sq. in.

Ⓑ 36 sq. in.

Ⓒ 48 sq. in.

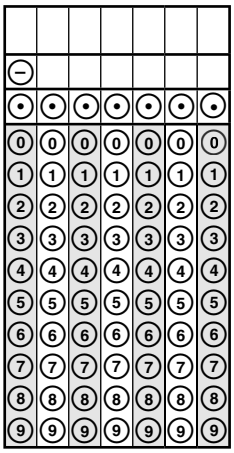
Ⓓ 72 sq. in.

8 Consider this expression.

$$(5^2 - 7) + 4^3 \div 8$$

What is the value of the expression?

Enter your answer in the answer boxes at the top of the answer grid **and** completely fill the matching circles.



9 In 1999, the U.S. Postal Service sold 15 stamps for $4.95. In 2018, the U.S. Postal Service sold 12 stamps for $6.00. Which of the following statements correctly show the unit rate, in dollars, per stamp for each year?

Select the **two** correct answers.

Ⓐ In 1999, the unit rate was $0.33 per stamp.

Ⓑ In 1999, the unit rate was $0.41 per stamp.

Ⓒ In 1999, the unit rate was $0.50 per stamp.

Ⓓ In 2018, the unit rate was $0.33 per stamp.

Ⓔ In 2018, the unit rate was $0.41 per stamp.

Ⓕ In 2018, the unit rate was $0.50 per stamp.

10 A box has a mass of 50 grams. Marbles will be added to the box. Each marble has a mass of 3 grams.

If n represents any number of marbles in the box, which expression can be used to find the total mass, in grams, of the box and the marbles?

Ⓐ $50n - 3$

Ⓑ $50 - 3n$

Ⓒ $50n + 3$

Ⓓ $50 + 3n$

Grade 6 Mathematics

SESSION 2

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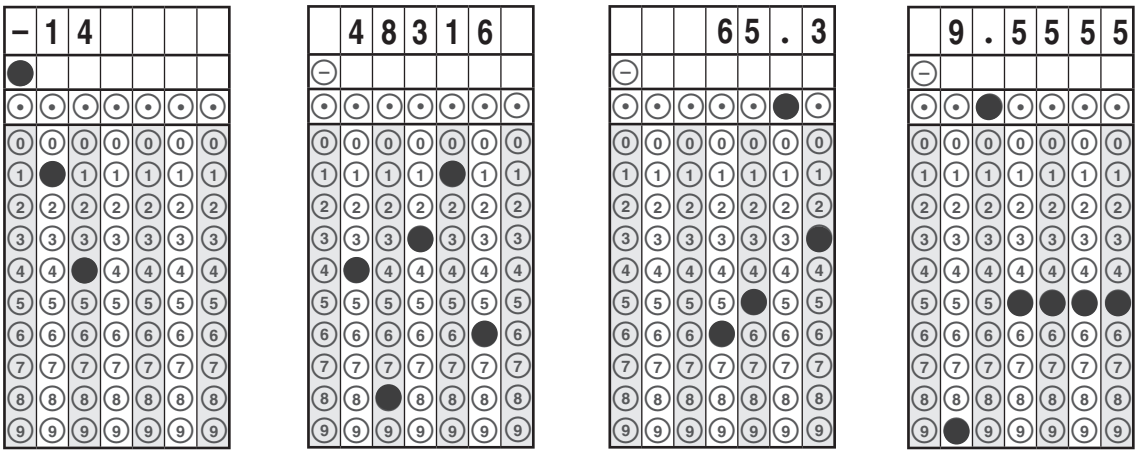


11 Which of the following numbers are on opposite sides of zero on the number line?

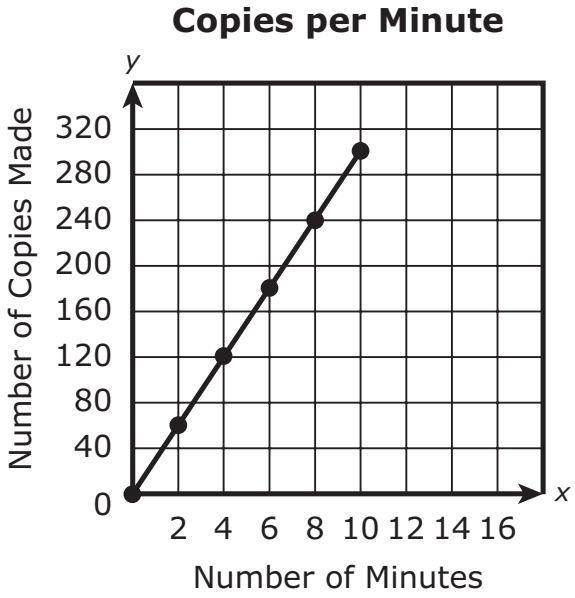
Ⓐ 0 and 2

Ⓑ 4 and 3

Ⓒ 5 and −6

Ⓓ −7 and −8

12 This graph represents the number of copies a copy machine can make in different numbers of minutes.



Based on the graph, which of the following is closest to the total number of copies the machine can make in 5 minutes?

Ⓐ 125

Ⓑ 150

Ⓒ 175

Ⓓ 200

13 A farmer is planting carrot seeds and pepper seeds in his garden. For every 60 carrot seeds the farmer plants, he plants 12 pepper seeds.

Based on this information, which of the following statements is true?

Ⓐ The ratio of pepper seeds to carrot seeds is 60:12 because 60 pepper seeds are planted for every 12 carrot seeds.

Ⓑ The ratio of pepper seeds to carrot seeds is 60:12 because there are always 48 fewer carrot seeds planted than pepper seeds.

Ⓒ The ratio of pepper seeds to carrot seeds is 12:60 because 12 pepper seeds are planted for every 60 carrot seeds.

Ⓓ The ratio of pepper seeds to carrot seeds is 12:60 because there are always 48 fewer pepper seeds planted than carrot seeds.

This question has four parts. Be sure to label each part of your response.

14 Molly, Ryan, and Bianca are cousins.

- Molly is m years old.
- Ryan is 4 years older than Molly.
- Bianca's age is y years less than twice Ryan's age.

A. Write an expression that represents Ryan's age in terms of m.

B. Molly is 5 years old. Use your expression from Part A to find Ryan's age, in years. Show or explain how you got your answer.

C. Use your answer from Part B to write an expression that represents Bianca's age in terms of y.

D. Use your expression from Part C to find Bianca's age, in years, if $y = 6$. Show or explain how you got your answer.

14

15 Which of the following equations is true?

Ⓐ $0.34 + 5.2 = 8.6$

Ⓑ $0.56 \div 0.07 = 8$

Ⓒ $0.12 \times 0.3 = 0.36$

Ⓓ $0.97 - 0.05 = 0.47$

16 Emilio has a bag of dog food. The bag contains $24\frac{3}{4}$ cups of dog food.

Emilio feeds his dog $2\frac{3}{4}$ cups of dog food each day.

What is the total number of days Emilio can feed his dog from this bag of dog food?

Ⓐ 9

Ⓑ 12

Ⓒ 22

Ⓓ 48

This question has two parts.

17 A piece of wire has a length of 110 inches.

Part A

Which of the following measures is equivalent to the length of the wire?

Ⓐ 9 feet

Ⓑ 9 feet 2 inches

Ⓒ 9 feet 10 inches

Ⓓ 10 feet

Part B

The wire is cut into two pieces. The first piece of wire has a length of 64 **centimeters**. Which of the following is the approximate length of the second piece of wire?

Ⓐ 46 inches

Ⓑ 116.8 centimeters

Ⓒ 215.4 centimeters

Ⓓ 266 inches

18 Which of the following shows a list of absolute value expressions ordered from least to greatest value?

Ⓐ $|1|, |\frac{5}{4}|, |-2|, |-4|$

Ⓑ $|1|, |\frac{5}{4}|, |-4|, |-2|$

Ⓒ $|-4|, |-2|, |1|, |\frac{5}{4}|$

Ⓓ $|-4|, |-2|, |\frac{5}{4}|, |1|$

19 The coach of a soccer team recorded the number of goals the team scored in each game last season. The coach determined the measures of center for the data.

Which of the following statistics are measures of center for the data?

Select the **three** correct answers.

Ⓐ the mean number of goals

Ⓑ the median number of goals

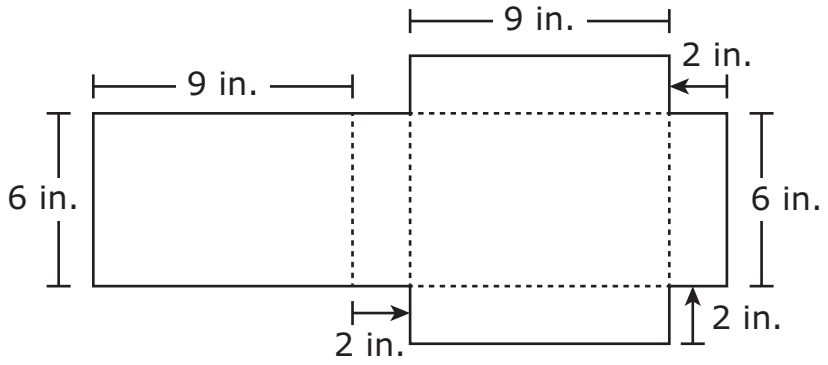
Ⓒ the maximum number of goals

Ⓓ the mode of the number of goals

Ⓔ the range of the number of goals

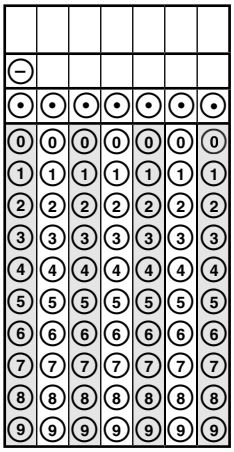
Ⓕ the interquartile range of the number of goals

20 A student will paint the outside of a gift box that is in the shape of a rectangular prism. She will use this net to determine the surface area of the gift box.



What is the total surface area, in square inches, of the gift box?

Enter your answer in the answer boxes at the top of the answer grid **and** completely fill the matching circles.



Grade 6 Mathematics
Spring 2022 Released Operational Items

PBT Item No.	Page No.	Reporting Category	Standard	Item Type*	Item Description	Correct Answer**
1	4	*Ratios and Proportional Relationships*	6.RP.A.3	SA	Use the unit rate from a table to solve a real-world problem involving ratios.	35
2	5	*Geometry*	6.G.A.3	SR	Determine which graph represents a quadrilateral given the coordinates of the vertices.	C
3	6	*Ratios and Proportional Relationships*	6.RP.A.1	SR	Determine which part/part or part/whole ratios represent a given real-world situation.	A,D
4	7–8	*Statistics and Probability*	6.SP.B.5	CR	Given a dot plot representing a real-world context, answer questions related to measures of center and distribution of the data.	
5	9	*The Number System*	6.NS.C.6	SR	Identify two ordered pairs represented on a coordinate plane.	B,E
6	10	*Expressions and Equations*	6.EE.B.8	SR	Identify the inequality that represents a constraint within a real-world context.	C
7	10	*Geometry*	6.G.A.1	SR	Find the area of a figure by decomposing it into triangles and rectangles.	D
8	11	*Expressions and Equations*	6.EE.A.1	SA	Evaluate a numerical expression with exponents, using order of operations.	26
9	11	*Ratios and Proportional Relationships*	6.RP.A.2	SR	Determine unit rates in a real-world situation.	A,F
10	12	*Expressions and Equations*	6.EE.B.6	SR	Determine which mathematical expression can be used to represent a given situation with a real-world context.	D
11	15	*The Number System*	6.NS.C.6	SR	Determine which numbers are on opposite sides of zero on a number line.	C
12	15	*Expressions and Equations*	6.EE.C.9	SR	Given the value of one variable, determine the value of another variable by analyzing the relationship of data shown on a coordinate plane.	B
13	16	*Ratios and Proportional Relationships*	6.RP.A.1	SR	Determine which statement describes a given ratio relationship in a real-world context.	C
14	17–18	*Expressions and Equations*	6.EE.A.2	CR	Write expressions using substitution and use the expressions to solve real-world problems.	
15	19	*The Number System*	6.NS.B.3	SR	Determine which of the given division equations involving multi-digit decimals is correct.	B
16	19	*The Number System*	6.NS.A.1	SR	Solve a word problem with real-world context using division of mixed numbers by mixed numbers.	A
17	20	*Ratios and Proportional Relationships*	6.RP.A.3	SR	Use ratio reasoning to convert between customary and metric measurement units in a real-world context.	B;C
18	21	*The Number System*	6.NS.C.7	SR	Determine which list of absolute value expressions is ordered from least to greatest value.	A
19	22	*Statistics and Probability*	6.SP.A.3	SR	Recognize measures of center for a real-world situation.	A,B,D
20	23	*Geometry*	6.G.A.4	SA	Use the net of a rectangular prism to find its surface area.	168

* Mathematics item types are: selected-response (SR), short-answer (SA), and constructed-response (CR).

**Answers are provided here for selected-response and short-answer items only. Sample responses and scoring guidelines for any constructed-response items will be posted to the Department's website later this year.

Grade 6 Mathematics
Spring 2022 Unreleased Operational Items

PBT Item No.	Reporting Category	Standard	Item Type*	Item Description
21	*The Number System*	6.NS.C.7	SA	Find the absolute value of a number.
22	*Ratios and Proportional Relationships*	6.RP.A.3	SR	Solve a ratio problem using conversion of units within a measurement system.
23	*Ratios and Proportional Relationships*	6.RP.A.2	SR	Determine the unit cost in a real-world situation.
24	*Statistics and Probability*	6.SP.A.2	SR	Determine which statement about the mean and the mode of a given data set is true.
25	*Ratios and Proportional Relationships*	6.RP.A.1	SR	Given descriptions of real-world situations, determine which situation can be represented by a part/part ratio.
26	*Geometry*	6.G.A.2	CR	Solve a real-world problem involving volumes of right rectangular prisms.
27	*The Number System*	6.NS.B.2	SA	Determine the quotient of a four-digit dividend and a two-digit divisor.
28	*Expressions and Equations*	6.EE.B.7	SA	Determine the correct equation to model a real-world scenario, and use that equation to solve a real-world problem.
29	*Statistics and Probability*	6.SP.A.1	SR	Determine which questions are statistical questions.
30	*Statistics and Probability*	6.SP.B.4	SR	Identify the box plot that represents a set of data.
31	*Expressions and Equations*	6.EE.A.1	SR	Represent the value of a given number as an expression with a whole-number exponent.
32	*Geometry*	6.G.A.1	SR	Find the area of a composite figure.
33	*Expressions and Equations*	6.EE.A.2	SR	Identify the parts of a mathematical expression and evaluate the expression for a specific value.
34	*Ratios and Proportional Relationships*	6.RP.A.3	SR	Solve a unit rate problem based on a given real-world context.
35	*The Number System*	6.NS.B.4	CR	Use the greatest common factor and least common multiple to solve a real-world problem.
36	*Ratios and Proportional Relationships*	6.RP.A.3	SR	Use rate reasoning to solve a real-world problem involving fractions.
37	*Expressions and Equations*	6.EE.B.5	SR	Given a real-world context, find the possible values of the variable in an inequality.
38	*Expressions and Equations*	6.EE.A.3	SR	Use the properties of operations to factor an expression into an equivalent expression.
39	*Expressions and Equations*	6.EE.A.4	SR	Given an expression, select an equivalent expression.
40	*Expressions and Equations*	6.EE.A.4	SR	Determine which expression is equivalent to a given expression.

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