XI. Mathematics, Grade 6

Grade 6 Mathematics Test

The spring 2018 grade 6 Mathematics test was an assessment that was administered as a computer-based version, though a paper-based version was available as an accommodation for eligible students. The test included both operational items, which count toward a student's score, and matrix items. The matrix portion of the test consisted of field-test and equating questions that do not count toward a student's score.

Most of the operational items on the grade 6 Mathematics test were the same, regardless of whether a student took the computer-based version or the paper-based version. In some instances, the wording of a paper item differed slightly from the computer-based version. In places where a technology-enhanced item was used on the computer-based test, that item was typically replaced with one or more alternative items on the paper test. These alternative items sometimes assessed the same standard as the technology-enhanced item, or other standards from the same reporting category.

This document displays the **paper-based versions** of the 2018 operational items that have been released. The **computer-based versions** of the released items are available on the RICAS Resource Center website at ricas.pearsonsupport.com/released-items.

The Scoring Guides can be found at www.doe.mass.edu/mcas/student/. They provide the released constructed-response questions, a unique scoring guide for each question, and samples of student work at each score point.

Test Sessions and Content Overview

The grade 6 Mathematics test was made up of two separate test sessions. Each session included selected-response, short-answer, and constructed-response questions. On the paper-based test, the selected-response questions were multiple-choice items and multiple-select items, in which students select the correct answer(s) from among several answer options.

Standards and Reporting Categories

The grade 6 Mathematics test was based on standards in the five domains for grade 6 in the *Massachusetts Curriculum Framework for Mathematics* (2017). The five domains are listed below.

- Ratios and Proportional Relationships

- The Number System

- Expressions and Equations

- Geometry

- Statistics and Probability

The *Massachusetts Curriculum Framework* is strongly aligned with Rhode Island's Mathematics standards: the Common Core State Standards (CCSS). The RICAS Mathematics assessment tables articulate this alignment and are available on the RIDE website at www.ride.ri.gov/ricas. The *Massachusetts Curriculum Framework for Mathematics* is available on the Department website at www.doe.mass.edu/frameworks/.

Mathematics test results are reported under five RICAS reporting categories, which are identical to the five framework domains listed above.

The tables at the conclusion of this chapter provide the following information about each released and unreleased operational item: reporting category, standard(s) covered, item type, and item description. The correct answers for released selected-response and short-answer questions are also displayed in the released item table.

Reference Materials and Tools

Each student taking the paper-based version of the grade 6 Mathematics test was provided with a plastic ruler and a grade 6 Mathematics Reference Sheet. A copy of the reference sheet follows the final question in this chapter. An image of the ruler is not reproduced in this publication.

During both Mathematics test sessions, the use of bilingual word-to-word dictionaries was allowed for current and former English learner students only. No calculators, other reference tools, or materials were allowed.

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 your Student Answer Booklet.

For some questions, you will mark your answers by filling in the circles in your Student 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.

For other questions, you will need to fill in an answer grid. Directions for completing questions with answer grids are provided on the next page.

If a question asks you to show or explain your work, you must do so to receive full credit. Write your response in the space provided in your Student Answer Booklet. Only responses written within the provided space will be scored.

Directions for Completing Questions with Answer Grids

1. Work the question and find an answer.

2. Enter your answer in the answer boxes at the top of the answer grid.

3. Print only one number or symbol in each box. Do not leave a blank box in the middle of an answer.

4. Under each answer box, fill in the circle that matches the number or symbol you wrote above. Make a solid mark that completely fills the circle.

5. Do not fill in a circle under an unused answer box.

6. Fractions cannot be entered into an answer grid and will not be scored. Enter fractions as decimals.

7. If you need to change an answer, be sure to erase your first answer completely.

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

EXAMPLES

1 Bill's flower garden has an area of 28 square feet. The rectangular garden is 7 feet long. What is the width of the garden?

A. 4 feet

B. 8 feet

C. 21 feet

D. 35 feet

4 A freight train traveled 144 miles in 6 hours. At what rate, in miles per hour, did the train travel?

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

5 A student has $10. She will save $5 each week. The student wrote the expression shown to represent the amount of money she will have after w weeks.

$$5w + 10$$

Which of the following expressions is equivalent to the student's expression for any value of w?

A. $15w$

B. $50w$

C. $5(w + 2)$

D. $5(w + 10)$

8   What is the value of this expression when $g = 1.5$?

$$5g^2$$

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

9   A pumpkin patch has a width of 432 inches. What is the width of the pumpkin patch in **yards**?

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

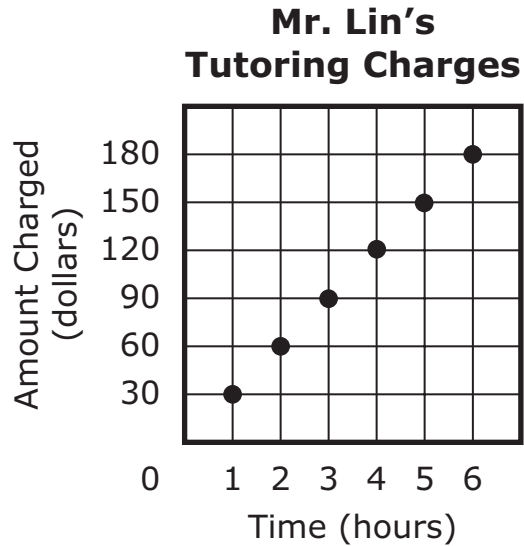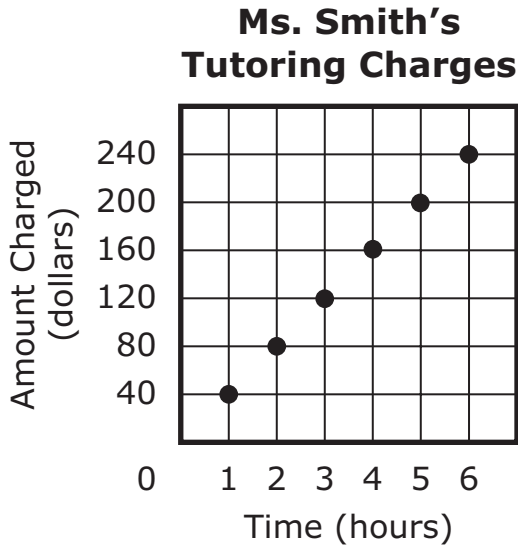**10**   What is the value of this expression?

$$-(-8)$$

A. -8

B. $-\dfrac{1}{8}$

C. $\dfrac{1}{8}$

D. 8

11 Ms. Smith and Mr. Lin are both mathematics teachers. These graphs show the amounts of money Ms. Smith and Mr. Lin charge for different numbers of hours of tutoring.

Ms. Smith's Tutoring Charges

Mr. Lin's Tutoring Charges

Based on the graphs, how much **more** does Ms. Smith charge for 6 hours of tutoring than Mr. Lin charges for 6 hours of tutoring?

A. $50

B. $60

C. $180

D. $240

This question has four parts.

12 These circle graphs represent the number of sixth-grade and seventh-grade students on academic teams at two middle schools.

South Middle School Students on Academic Teams

sixth-grade students

seventh-grade students 64%
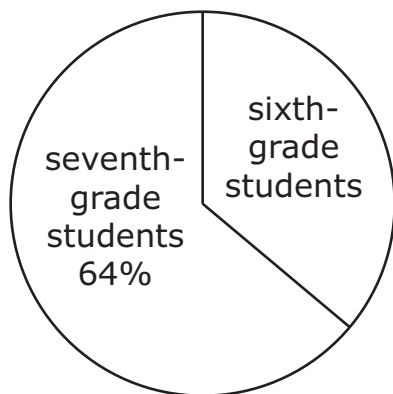
Total Students: 75

Jefferson Middle School Students on Academic Teams

sixth-grade students 45%

seventh-grade students 55%
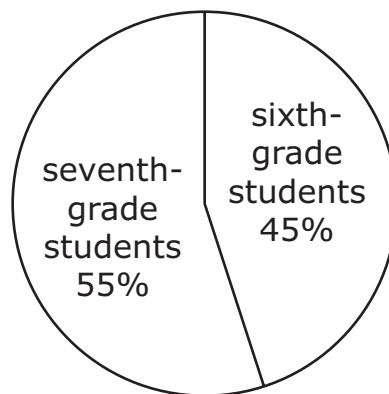
Total Students: 80

Part A

Based on the data in the circle graph for South Middle School, what percent of students on academic teams are sixth-grade students? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

Part B

Based on the data in the circle graph for South Middle School, what is the total number of sixth-grade students on academic teams? Show or explain how you got your answer.

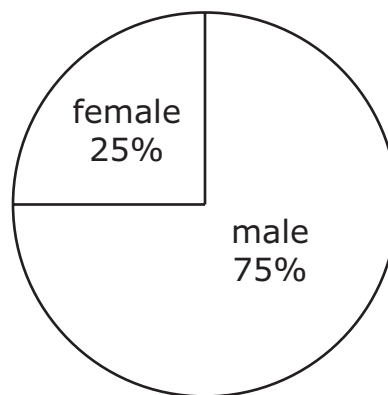Enter your answer and your work or explanation in the space provided.

Part C

Based on the data in both circle graphs, which school has a **greater** number of sixth-grade students on academic teams? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

Part D

This circle graph represents the number of male and female seventh-grade students on academic teams at Jefferson Middle School.

**Jefferson Middle School
Seventh-Grade Students
on Academic Teams**

Based on the data in the circle graph, what is the total number of seventh-grade female students on academic teams at Jefferson Middle School? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

18   Wendy plotted points *J* and *K* on a coordinate plane, as shown.
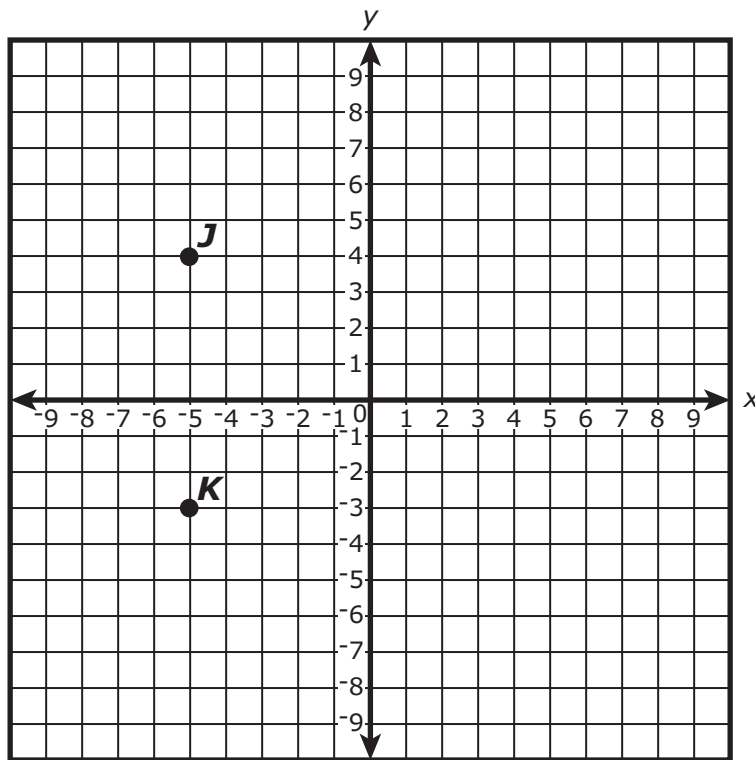
Wendy will plot point *L* so that when connected, points *J*, *K*, and *L* will form a right triangle. Which of the following could be the location of point *L*?

A. (−7, 1)

B. (−1, 7)

C. (2, 4)

D. (4, 2)

20 Victoria scored a total of 9 points in the first basketball game of the season. She scored 5 points per game in each of the other *x* basketball games she played that season.

Which of the following expressions represents the total number of points Victoria scored in the basketball games for the whole season?

A. 5*x*

B. 14*x*

C. 5 + 9*x*

D. 9 + 5*x*

Grade 6 Mathematics
SESSION 2

This session contains 11 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 your Student Answer Booklet.

For some questions, you will mark your answers by filling in the circles in your Student 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.

For other questions, you will need to fill in an answer grid. Directions for completing questions with answer grids are provided on the next page.

If a question asks you to show or explain your work, you must do so to receive full credit. Write your response in the space provided in your Student Answer Booklet. Only responses written within the provided space will be scored.

Directions for Completing Questions with Answer Grids

1. Work the question and find an answer.

2. Enter your answer in the answer boxes at the top of the answer grid.

3. Print only one number or symbol in each box. Do not leave a blank box in the middle of an answer.

4. Under each answer box, fill in the circle that matches the number or symbol you wrote above. Make a solid mark that completely fills the circle.

5. Do not fill in a circle under an unused answer box.

6. Fractions cannot be entered into an answer grid and will not be scored. Enter fractions as decimals.

7. If you need to change an answer, be sure to erase your first answer completely.

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

EXAMPLES

21   Ling earns $12 each time he shovels his neighbor's driveway. He earned a total of $108 shoveling the driveway last winter. Which of the following equations could be used to find w, the number of times Ling shoveled his neighbor's driveway last winter?

A. $108w = 12$

B. $12w = 108$

C. $w + 12 = 108$

D. $108 + w = 12$

23   Sophia mixed paint in a bucket. For every three cups of yellow paint she put in the bucket, she mixed in one cup of white paint.

What is the ratio of yellow paint to white paint in Sophia's mixture?

A. 3:1

B. 1:3

C. 3:4

D. 4:3

24   A figure is built out of 9 cubes, as shown.
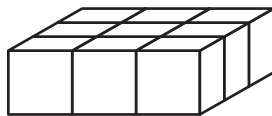
The edge length of each cube is $\frac{1}{2}$ foot. What is the volume of the figure?

A. $1\frac{1}{8}$ cubic feet

B. $2\frac{1}{4}$ cubic feet

C. $3\frac{1}{2}$ cubic feet

D. $4\frac{1}{2}$ cubic feet

This question has three parts.

25   At the grand opening of a store, the owner gave away stickers and T-shirts to some of the customers.

- A total of 180 customers visited the store at the grand opening.

- Every 10th customer received a free sticker.

- Every 25th customer received a free T-shirt.

Part A

What is the total number of customers who received a free sticker? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

Part B

What is the total number of customers who received a free T-shirt? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

Part C

What is the total number of customers who received both a free sticker **and** a free T-shirt? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

26   Consider this inequality.

$$2x + 5.5 < 20$$

Select **two** values of x that would make the inequality true.

A. $\dfrac{9}{4}$

B. $\dfrac{19}{2}$

C. 5

D. 7.25

E. 8.5

27 Carmen's living room floor has the shape and dimensions shown in this diagram.
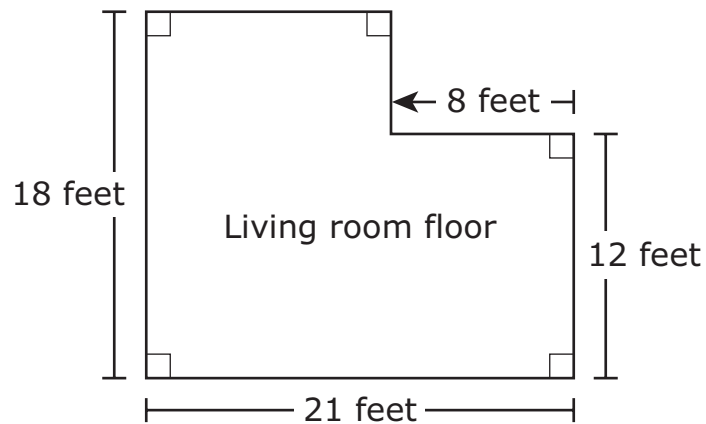
What is the area of Carmen's living room floor?

A. 234 square feet

B. 252 square feet

C. 330 square feet

D. 378 square feet

28 Ethan's car can travel 30 miles per gallon of gasoline. Gasoline costs $4 per gallon, including tax. Ethan drove his car 180 miles on a trip.

What was the total cost, in dollars, of the gasoline that the car used for Ethan's trip?

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

32 Which of the following statements best describes the solution of this inequality?

$$x < 9$$

A. There is no solution.

B. There is exactly one solution.

C. There are exactly eight solutions.

D. There are infinitely many solutions.

33 Ms. Ashley planned to stay at a hotel that charges $88 per night for a room and $20 per night in fees and taxes. She used this expression to calculate the total cost of staying in the hotel for n nights.

$$88n + 20n$$

Which of the following expressions is equivalent to the expression that Ms. Ashley used?

A. $108n$

B. $108n^2$

C. $108 + n$

D. $108 + n^2$

34 A bowl of punch is made by mixing 3 parts juice to 1 part soda. Which of the following statements about the punch is **not** true?

A. Soda makes up $\frac{1}{4}$ of the punch.

B. Juice makes up $\frac{3}{4}$ of the punch.

C. The amount of soda in the punch is $\frac{1}{2}$ the amount of juice in the punch.

D. The amount of juice in the punch is 3 times the amount of soda in the punch.

37 The scale on a map shows that 1 inch represents 18 miles. The distance on the map between Olivia's town and her grandmother's town is 4.5 inches.

What is the actual distance between the two towns?

A. 4 miles

B. 22.5 miles

C. 72.5 miles

D. 81 miles

Rhode Island Comprehensive Assessment System
Grade 6 Mathematics Reference Sheet

CONVERSIONS

1 cup = 8 fluid ounces	1 inch = 2.54 centimeters	1 pound = 16 ounces
1 pint = 2 cups	1 meter ≈ 39.37 inches	1 pound ≈ 0.454 kilogram
1 quart = 2 pints	1 mile = 5280 feet	1 kilogram ≈ 2.2 pounds
1 gallon = 4 quarts	1 mile = 1760 yards	1 ton = 2000 pounds
1 gallon ≈ 3.785 liters	1 mile ≈ 1.609 kilometers	
1 liter ≈ 0.264 gallon	1 kilometer ≈ 0.62 mile	
1 liter = 1000 cubic centimeters		

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)

Grade 6 Mathematics
Spring 2018 Released Operational Items:
Reporting Categories, Standards, Item Descriptions, and Correct Answers

PBT Item No.*	Page No.	Reporting Category	Standard	Item Type**	Description	Correct Answer***
1	206	*Geometry*	6.G.A.01	SR	Given the area and the length of a rectangle in a real-world context, determine the width.	A
4	206	*Ratios and Proportional Relationships*	6.RP.A.02	SA	Determine a unit rate, given a real-world context.	24
5	206	*Expressions and Equations*	6.EE.A.03	SR	Determine which expression is equivalent to a given expression that represents a real-world context.	C
8	207	*Expressions and Equations*	6.EE.A.02	SA	Determine the value of an expression given the value of the variable.	11.25
9	207	*Ratios and Proportional Relationships*	6.RP.A.03	SA	Use ratio reasoning to convert between inches and yards in a real-world context.	12
10	207	*The Number System*	6.NS.C.06	SR	Determine the opposite value of a given expression.	D
11	208	*Expressions and Equations*	6.EE.C.09	SR	Given two graphs that represent a real-world context, analyze the relationship between the representations.	B
12	209–210	*Statistics and Probability*	6.SP.B.04	CR	Interpret circle graphs to solve problems.	
18	211	*Geometry*	6.G.A.03	SR	Given the locations of two vertices of a right triangle, determine the coordinates of the third vertex.	C
20	212	*Expressions and Equations*	6.EE.B.06	SR	Identify an expression that represents a given real-world context.	D
21	215	*Expressions and Equations*	6.EE.B.07	SR	Determine which equation represents a given real-world context.	B
23	215	*Ratios and Proportional Relationships*	6.RP.A.01	SR	Determine the ratio of two ingredients in a mixture.	A
24	216	*Geometry*	6.G.A.02	SR	Find the volume of a right rectangular prism.	A
25	217	*The Number System*	6.NS.B.04	CR	Use understanding of greatest common factors and least common multiples to solve problems.	
26	218	*Expressions and Equations*	6.EE.B.05	SR	Choose two rational solutions of an inequality.	A,C
27	219	*Geometry*	6.G.A.01	SR	Find the area of a composite figure.	C
28	219	*Ratios and Proportional Relationships*	6.RP.A.03	SA	Solve a unit rate problem based on a given real-world context.	24
32	220	*Expressions and Equations*	6.EE.B.08	SR	Describe the solution set of a given inequality.	D
33	220	*Expressions and Equations*	6.EE.A.04	SR	Identify an expression equivalent to a given variable expression that represents a real-world context.	A
34	221	*Ratios and Proportional Relationships*	6.RP.A.01	SR	Determine which statement does not describe a given ratio relationship in a real-world context.	C
37	221	*Ratios and Proportional Relationships*	6.RP.A.03	SR	Solve a ratio problem based on a given real-world context.	D

* "PBT Item Number" refers to the position of the item on the operational paper-based test. This is the item number that is referred to when reporting student results for a PBT item.

** 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 RIDE's website later this year.

Grade 6 Mathematics
Spring 2018 Unreleased Operational Items:
Reporting Categories, Standards, and Item Descriptions

PBT Item No.*	Reporting Category	Standard	Item Type**	Description
2	*Statistics and Probability*	6.SP.B.05	SR	Find the mean of a set of data.
3	*The Number System*	6.NS.C.06	SR	Determine which numbers are on opposite sides of zero on a number line.
6	*The Number System*	6.NS.B.03	SR	Find the sum and product of two multi-digit decimals.
7	*Ratios and Proportional Relationships*	6.RP.A.03	CR	Solve real-world problems involving finding a fraction and percents.
13	*Ratios and Proportional Relationships*	6.RP.A.02	SA	Determine a unit rate, given a real-world context.
14	*Geometry*	6.G.A.01	SR	Find the area of a composite figure.
15	*Statistics and Probability*	6.SP.B.04	SA	Use information given in a table to determine the quartiles for a dot plot.
16	*The Number System*	6.NS.C.07	SA	Identify a rational number that is within a range of other rational numbers.
17	*Expressions and Equations*	6.EE.C.09	SA	Identify an equation that represents a real-world relationship given in a table, and determine the value of one variable given the other.
19	*The Number System*	6.NS.B.04	SR	Determine the prime factorization of a number.
22	*The Number System*	6.NS.C.08	SR	Find the distance between two points on a coordinate plane.
29	*Expressions and Equations*	6.EE.A.03	CR	Generate and simplify variable expressions to represent the perimeter and the area of a rectangle.
30	*Statistics and Probability*	6.SP.B.05	SR	Determine the interquartile range of a set of data.
31	*The Number System*	6.NS.B.02	SA	Divide multi-digit numbers to solve a problem.
35	*Geometry*	6.G.A.04	SA	Identify the shape and determine the surface area of a three-dimensional figure given its net.
36	*Statistics and Probability*	6.SP.B.04	SR	Interpret a line plot to solve a problem involving a fractional answer.
38	*Expressions and Equations*	6.EE.A.03	SR	Identify an expression that is equivalent to a given variable expression that represents a real-world context.
39	*Geometry*	6.G.A.01	SA	Solve a problem that involves finding the area of a rectangle.
40	*Expressions and Equations*	6.EE.A.02	SR	Determine the value of an expression given the value of the variable.

* "PBT Item Number" refers to the position of the item on the operational paper-based test. This is the item number that is referred to when reporting student results for a PBT item.

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