Grade 8 Mathematics Test

The spring 2018 grade 8 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 8 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 8 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 8 Mathematics test was based on standards in the five domains for grade 8 in the *Massachusetts Curriculum Framework for Mathematics* (2017). The five domains are listed below.

- The Number System
- Expressions and Equations
- Functions
- 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 8 Mathematics test was provided with a plastic ruler and a grade 8 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 Session 2, each student had sole access to a calculator. Calculator use was not allowed during Session 1.

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

Grade 8 Mathematics

SESSION 1

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.

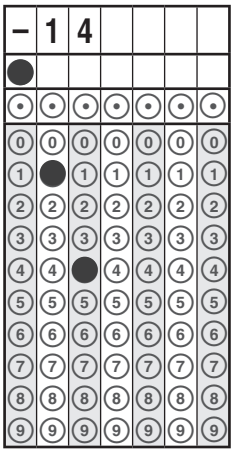
For some questions, you will mark your answers by filling in the circles in your Student Answer Booklet. Make sure you darken the circles completely. Do not make any marks outside of the circles. If you need to change an answer, be sure to erase your first answer completely.

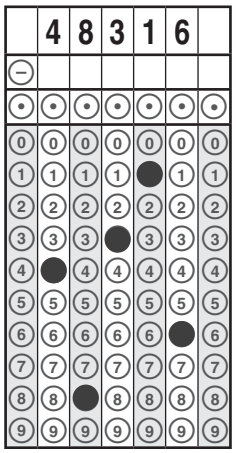
For other questions, you will need to fill in an answer grid. Directions for completing questions with answer grids are provided on the next page.

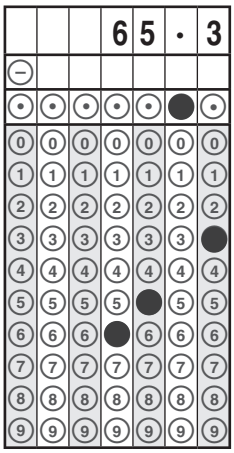
Directions for Completing Questions with Answer Grids

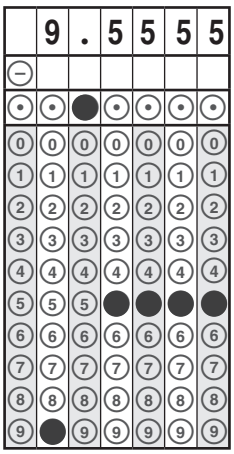
1. Work the question and find an answer.
2. Enter your answer in the answer boxes at the top of the answer grid.
3. Print only one number or symbol in each box. Do not leave a blank box in the middle of an answer.
4. Under each answer box, fill in the circle that matches the number or symbol you wrote 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









RIDE Rhode Island Department of Education

Rhode Island Comprehensive Assessment System
Grade 8 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 . . . . . $A = \frac{1}{2}bh$

trapezoid . . . . . $A = \frac{1}{2}h(b_1 + b_2)$

circle . . . . . $A = \pi r^2$

CIRCLE FORMULAS

area. . . . . $A = \pi r^2$

circumference . . . . . $C = 2\pi r$
OR
$C = \pi d$

VOLUME (*V*) FORMULAS

cube . . . . . $V = s^3$
(s = length of an edge)

sphere . . . . . $V = \frac{4}{3}\pi r^3$

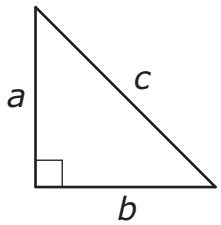
cone . . . . . $V = \frac{1}{3}\pi r^2 h$

right circular cylinder . . . . . $V = \pi r^2 h$

right prism . . . . . $V = Bh$

PYTHAGOREAN THEOREM

$a^2 + b^2 = c^2$



2 What is 2.03×10^{11} written in standard notation?

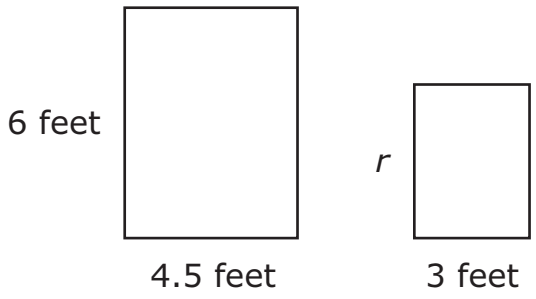
A. 20,300,000,000

B. 203,000,000,000

C. 2,030,000,000,000

D. 20,300,000,000,000

4 Two rectangles and some of their dimensions are shown.



The rectangles are similar. What is *r*, the length in feet of the smaller rectangle?

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

6 Jocinda determined that the diagonal of her laptop screen is $2\sqrt{42}$ inches long. What is the approximate length, to the nearest inch, of the diagonal of her laptop screen?

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

8 Which of the following is an irrational number?

A. $\sqrt{0}$

B. $\sqrt{3}$

C. $1.\overline{36}$

D. -0.19

10 Which of the following equations represents a linear function?

A. $y = \frac{x}{12}$

B. $y = \frac{1}{2}x^2$

C. $y = 3^x$

D. $y = x(x + 3)$

11 This table represents a linear relationship between x and y.

x	y
−6	−3
−4	−2
−2	−1
0	0

Based on the linear relationship in this table, what is the value of y when x is 4?

A. 1

B. 2

C. 3

D. 4

This question has four parts.

12 A student wrote the equation shown.

$$x^y = z$$

Part A

What is the value of z in the equation when $x = 3$ and $y = 4$? 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 value of x in the equation when $y = 3$ and $z = 125$? Show or explain how you got your answer.

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

Part C

The student rewrote the equation as shown.

$$\sqrt[y]{z} = x$$

Is the value of x a rational number when $y = 2$ and $z = 2$? Explain your reasoning.

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

Part D

Write an integer value of y and an integer value of z that make the equation true when $x = 8$. Show or explain how you got your answers.

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

14 Which pair of steps can be used to completely solve this equation?

$$4x - 5 = 17$$

A. Add 5 to both sides. Then divide both sides by 4.

B. Divide both sides by 4. Then add 5 to both sides.

C. Subtract 5 from both sides. Then multiply both sides by 4.

D. Multiply both sides by 4. Then subtract 5 from both sides.

17 Which of the following represents the linear relationship with the greatest rate of change?

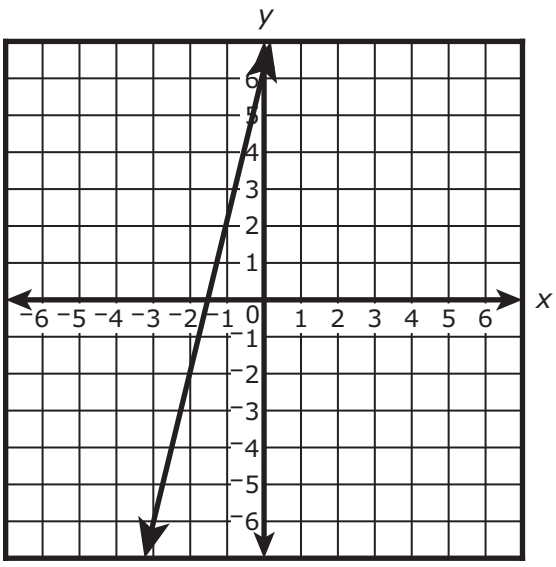
A. $y = 2x + 7$

B.

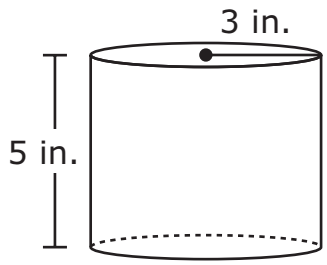
x	y
−2	−13
−1	−8
0	−3
1	2
2	7

C. A line rises 9 units for every 3 units it moves to the right.

D.



18 This diagram shows a cylinder that has a radius of 3 inches and a height of 5 inches.



What is the volume, in cubic inches, of the cylinder?

A. 15π

B. 30π

C. 45π

D. 60π

20 Which of the following is equivalent to this expression?

$$7^2 \cdot 7^{-4}$$

A. $\frac{1}{7^6}$

B. $\frac{1}{7^2}$

C. -7^2

D. 7^{-8}

Grade 8 Mathematics
SESSION 2

This session contains 10 questions.

You may use your reference sheet during this session.
You may 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.

22 The total cost of Gary's cell phone plan includes a one-time cost for a phone plus a monthly fee. This table shows the total cost of Gary's cell phone plan as it accumulates from month 1 through month 5.

Gary's Cell Phone Plan

Month	Total Cost
1	$100
2	$120
3	$140
4	$160
5	$180

What is the monthly fee for Gary's cell phone plan?

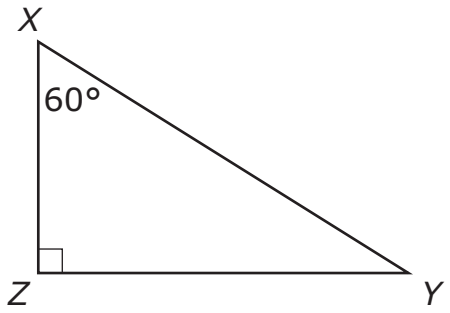
A. $20

B. $30

C. $80

D. $100

24 Triangle *XYZ* and some of its measurements are shown.



Triangle *MNO*, not shown, is similar to triangle *XYZ*. What is the measure, in degrees, of $\angle N$?

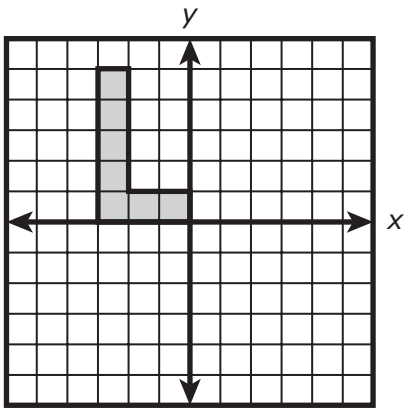
A. 30°

B. 45°

C. 60°

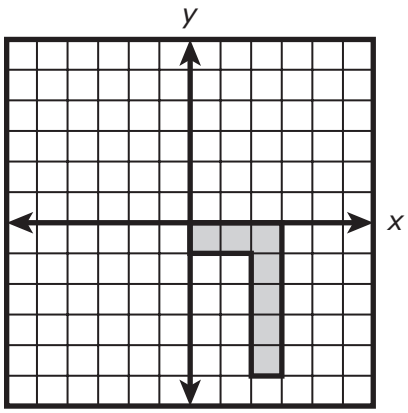
D. 90°

26 Trevor drew the design shown on this coordinate plane.

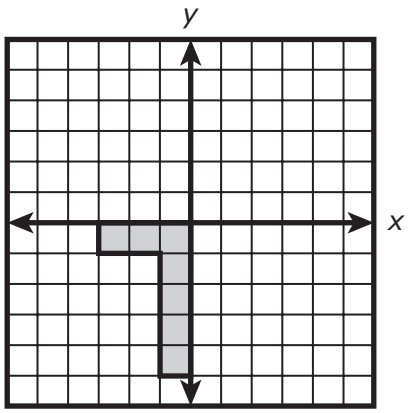


Then he rotated his design 180° clockwise about the origin. Which of the following is the image of Trevor's design after he rotated it?

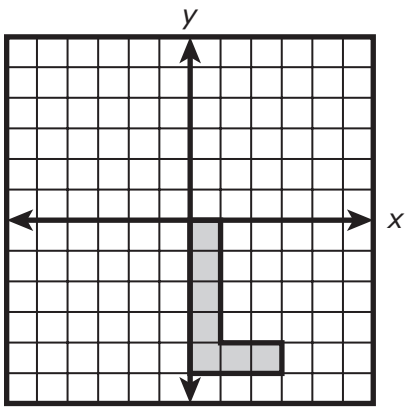
A.



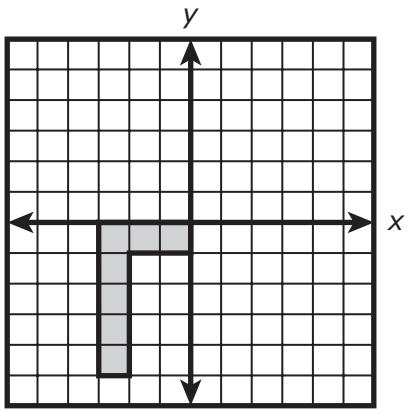
B.



C.



D.



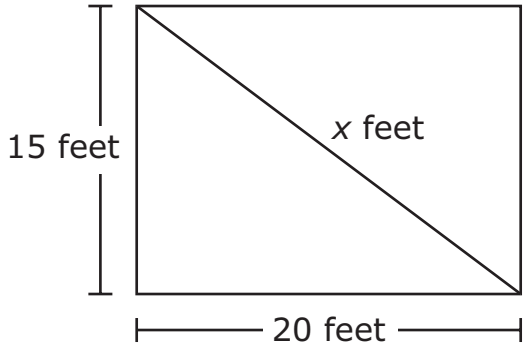
27 Amy and Simon each bought a pair of shorts and some T-shirts. Each pair of shorts cost the same amount, and each T-shirt cost the same amount.

- Amy paid $60 for 1 pair of shorts and 2 T-shirts.
- Simon paid $75 for 1 pair of shorts and 3 T-shirts.

What was the cost, in dollars, of 1 pair of shorts?

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

29 A rectangle and one of its diagonals are shown in this diagram.



Based on the dimensions in the diagram, what is the value of x?

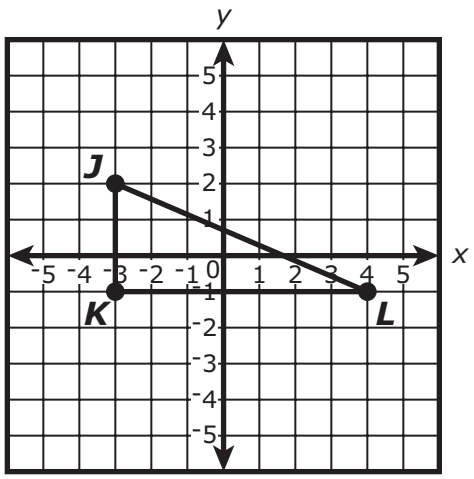
A. 17.5

B. 25

C. 35

D. 37.5

31 Triangle *JKL* is shown on this coordinate plane.



Triangle *JKL* will be translated 2 units up and 5 units to the right. What will be the coordinates of the image of point *K* after the translation?

A. (−1, 4)

B. (1, 2)

C. (2, 1)

D. (4, −1)

This question has four parts.

32 Colton is heating a pot of water. He records the temperature of the water in the pot every minute. This equation models Colton's data, where x represents the number of minutes the water has been heated, and y represents the temperature of the water in degrees Fahrenheit.

$$y = 7.5x + 40$$

Part A

What does the coefficient 7.5 in the equation represent in the context of this situation?

Enter your explanation in the space provided.

Part B

What does the value 40 in the equation represent in the context of this situation?

Enter your explanation in the space provided.

Part C

What is the temperature, in degrees Fahrenheit, of Colton's pot of water after 16 minutes? Show or explain how you got your answer.

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

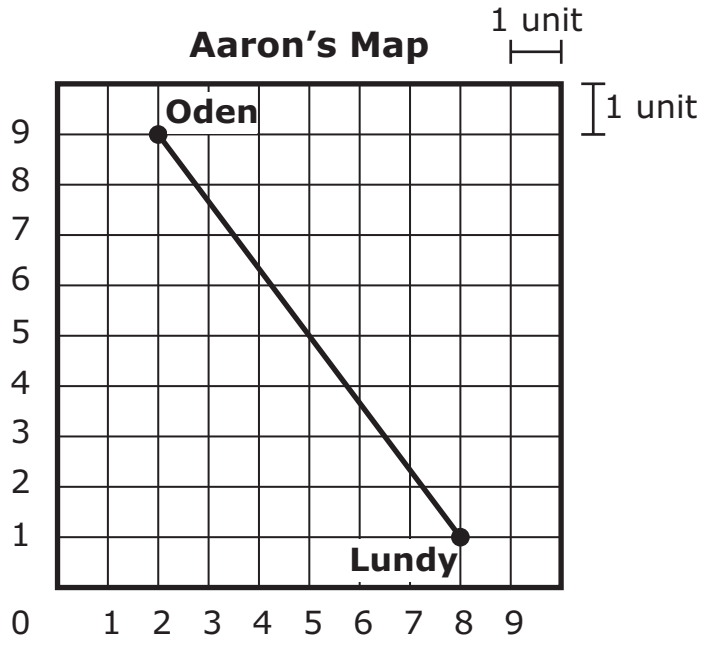
Part D

Water boils at a temperature of 212°F.

After 16 minutes of heating, how much additional time, to the nearest minute, will be needed for the water to boil? Show or explain how you got your answer.

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

36 Aaron drew a map showing the locations of two cities, Oden and Lundy, on a grid. The map and its scale are shown.



Scale
1 unit = 1 mile

Aaron drew a straight line from Oden to Lundy. Which of the following is closest to the distance between Oden and Lundy along the straight line?

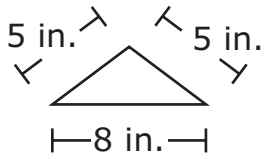
A. 8 miles

B. 10 miles

C. 12 miles

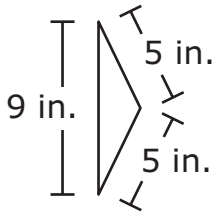
D. 14 miles

39 Laura drew a triangle with the dimensions shown.

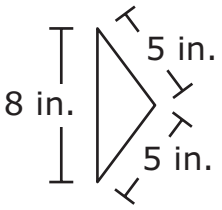


Which of the following triangles is congruent to Laura's triangle?

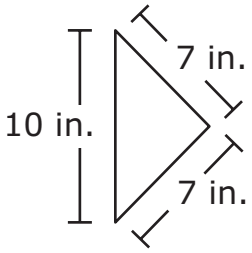
A.



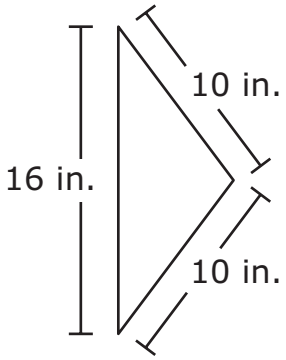
B.



C.

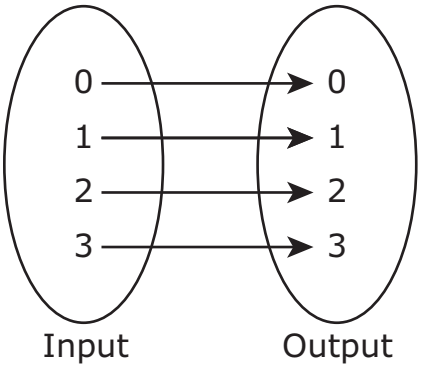


D.

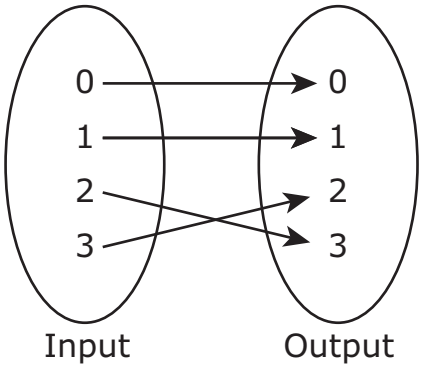


40 Which of the following is **not** a function?

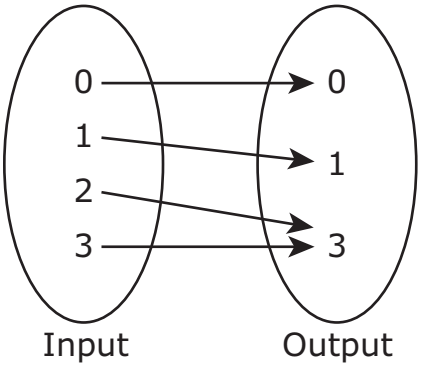
A.



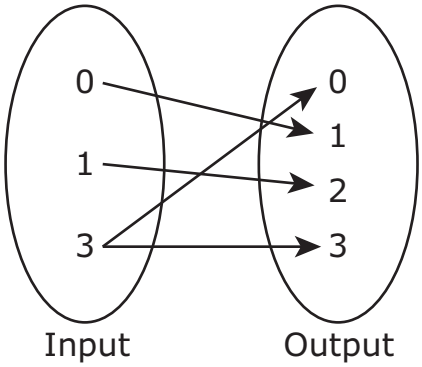
B.



C.



D.



Grade 8 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***
2	255	*Expressions and Equations*	8.EE.A.04	SR	Convert a number in scientific notation to standard notation.	B
4	255	*Geometry*	8.G.A.04	SA	Given two similar rectangles, find the length of a corresponding side.	4
6	255	*The Number System*	8.NS.A.02	SA	Approximate the value of a square root expression in a given context.	13
8	256	*The Number System*	8.NS.A.01	SR	Identify which number in a list of numbers is irrational.	B
10	256	*Functions*	8.F.A.03	SR	Determine which equation in a list of equations represents a linear function.	A
11	257	*Functions*	8.F.A.01	SR	Find the value of y given a value of x for a linear relationship expressed as a table of values.	B
12	258	*Expressions and Equations*	8.EE.A.02	CR	Find the value of the unknown variable in a given equation for different situations.	
14	259	*Expressions and Equations*	8.EE.C.07	SR	Determine the steps to solve a simple equation.	A
17	260	*Functions*	8.F.A.02	SR	Determine the linear relationship with the greatest rate of change from among different linear representations.	B
18	261	*Geometry*	8.G.C.09	SR	Find the volume of a cylinder given its radius and height.	C
20	261	*Expressions and Equations*	8.EE.A.01	SR	Use the properties of exponents to determine which expression is equivalent to the given expression.	B
22	264	*Functions*	8.F.B.04	SR	Given a table of values, find the initial value (y-intercept) of a linear function that models a given context.	A
24	265	*Geometry*	8.G.A.05	SR	Given two triangles are similar, find the measurement of a corresponding angle.	A
26	266	*Geometry*	8.G.A.01	SR	Determine which graph shows the image of a figure after a given transformation.	A
27	267	*Expressions and Equations*	8.EE.C.08	SA	Find the value of one variable in a system of linear equations that represent a given context.	30
29	267	*Geometry*	8.G.B.07	SR	Use the Pythagorean theorem to find the missing side length of a triangle.	B
31	268	*Geometry*	8.G.A.03	SR	Determine the coordinates of one vertex of an image of a given figure after a series of transformations.	C
32	269	*Statistics and Probability*	8.SP.A.03	CR	Use the equation of a line that models a given context to interpret the slope and intercept, and to solve problems related to the context.	
36	270	*Geometry*	8.G.B.08	SR	Use the Pythagorean theorem to find the distance between two points on a map.	B
39	271	*Geometry*	8.G.A.02	SR	Determine which triangle is congruent to a given triangle.	B
40	272	*Functions*	8.F.A.01	SR	Determine which mapping is not a function.	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 8 Mathematics
Spring 2018 Unreleased Operational Items:
Reporting Categories, Standards, and Item Descriptions

PBT Item No.*	Reporting Category	Standard	Item Type**	Description
1	*Expressions and Equations*	8.EE.B.05	SR	Compare characteristics of two different proportional relationships represented by lines on a coordinate plane.
3	*Expressions and Equations*	8.EE.C.07	SR	Find the value of the unknown variable in a given equation.
5	*Functions*	8.F.B.04	CR	Determine output values of a graphed function for given input values, and write an expression that represents the output values for a given context.
7	*Expressions and Equations*	8.EE.B.05	SR	Compare characteristics of two different proportional relationships.
9	*Statistics and Probability*	8.SP.A.04	SR	Determine the relative frequency of an event given a two-way table.
13	*The Number System*	8.NS.A.02	SR	Order a list of rational and irrational numbers from least to greatest.
15	*Geometry*	8.G.A.03	SR	Select the graph of an image after a series of transformations, and determine the rule for finding the coordinates of an image after a series of transformations.
16	*Expressions and Equations*	8.EE.A.03	SR	Convert a number in standard notation to scientific notation.
19	*Expressions and Equations*	8.EE.B.06	SR	Find the equation of a line that has the same slope as a given line graphed on a coordinate plane.
21	*Expressions and Equations*	8.EE.B.05	SR	Determine which graph represents a proportional relationship in a given context.
23	*Expressions and Equations*	8.EE.B.06	SR	Use similar triangles to compare the slope of two line segments on the same line.
25	*Geometry*	8.G.A.02	CR	Describe the transformation that produced a given result and understand that transformations preserve congruence.
28	*Expressions and Equations*	8.EE.B.05	SR	Determine which equation represents a proportional relationship in a given context.
30	*Functions*	8.F.B.04	SR	Identify the equation that represents a given context.
33	*Statistics and Probability*	8.SP.A.01	SR	Use a trend line to make predictions about a given context.
34	*Expressions and Equations*	8.EE.C.08	SR	Determine the number of solutions that a given system of equations has.
35	*Geometry*	8.G.A.02	SR	Describe the sequence of transformations to map a figure to its image and understand that transformations preserve congruence.
37	*Expressions and Equations*	8.EE.C.07	SA	Find the value of the unknown variable in a given equation.
38	*Functions*	8.F.A.03	SR	Determine which graph represents a linear function.

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