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Our Students. Their Moment.

New York State Testing Program
Grade 8
Mathematics Test

Released Questions

June 2019

New York State administered the Mathematics Tests in May 2019 and is now making approximately 75% of the questions from these tests available for review and use.

New York State Testing Program
Grades 3–8 Mathematics

Released Questions from 2019 Exams

Background

In 2013, New York State began administering tests designed to assess student performance in accordance with the instructional shifts and rigor demanded by the new New York State P-12 Learning Standards in Mathematics. To help in this transition to new assessments, the New York State Education Department (SED) has been releasing an increasing number of test questions from the tests that were administered to students across the State in the spring. This year, SED is again releasing large portions of the 2019 NYS Grades 3-8 English Language Arts and Mathematics test materials for review, discussion, and use.

For 2019, included in these released materials are at least 75 percent of the test questions that appeared on the 2019 tests (including all constructed-response questions) that counted toward students' scores. Additionally, SED is also providing a map that details what each released question measures and the correct response to each question. These released materials will help students, families, educators, and the public better understand the tests and the New York State Education Department's expectations for students.

Understanding Math Questions

Multiple-Choice Questions

Multiple-choice questions are designed to assess the New York State P-12 Learning Standards for Mathematics. Mathematics multiple-choice questions will be used mainly to assess standard algorithms and conceptual standards. Multiple-choice questions incorporate both the grade-level standards and the "Standards for Mathematical Practices." Many questions are framed within the context of real-world applications or require students to complete multiple steps. Likewise, many of these questions are linked to more than one standard, drawing on the simultaneous application of multiple skills and concepts.

Short-Response Questions

Short-response questions require students to complete tasks and show their work. Like multiple-choice questions, short-response questions will often require multiple steps, the application of multiple mathematics skills, and real-world applications. Many of the short-response questions will cover conceptual and application of the standards.

Extended-Response Questions

Extended-response questions ask students to show their work in completing two or more tasks or a more extensive problem. Extended-response questions allow students to show their understanding of mathematical procedures, conceptual understanding, and application. Extended-response questions may also assess student reasoning and the ability to critique the arguments of others.

The scoring rubric for short and extended constructed-response questions can be found in the grade-level Educator Guides at https://www.engageny.org/resource/test-guides-english-language-arts-andmathematics.

New York State P-12 Learning Standards Alignment

The alignment(s) to the New York State P-12 Learning Standards for Mathematics is/are intended to identify the primary analytic skills necessary to successfully answer each question. However, some questions measure proficiencies described in multiple standards, including a balanced combination of procedure and conceptual understanding. For example, two-point and three-point constructed-response questions require students to show an understanding of mathematical procedures, concepts, and applications.

These Released Questions Do Not Comprise a "Mini Test"

To ensure future valid and reliable tests, some content must remain secure for possible use on future exams. As such, this document is *not* intended to be representative of the entire test, to show how operational tests look, or to provide information about how teachers should administer the test; rather, its purpose is to provide an overview of how the test reflects the demands of the New York State P-12 Learning Standards.

The released questions do not represent the full spectrum of the standards assessed on the State tests, nor do they represent the full spectrum of how the standards should be taught and assessed in the classroom. It should not be assumed that a particular standard will be measured by an identical question in future assessments. Specific criteria for writing test questions, as well as additional assessment information, are available at http://www.engageny.org/common-core-assessments.

Name: _____

New York State Testing Program

2019
Mathematics Test
Session 1

Grade 8

May 1–3, 2019

RELEASED QUESTIONS

Grade 8 Mathematics Reference Sheet

CONVERSIONS

1 inch = 2.54 centimeters

1 meter = 39.37 inches

1 mile = 5,280 feet

1 mile = 1,760 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 = 2,000 pounds

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 = 1,000 cubic centimeters

FORMULAS

|	
Triangle	$A = \dfrac{1}{2}bh$
Parallelogram	$A = bh$
Circle	$A = \pi r^2$
Circle	$C = \pi d$ or $C = 2\pi r$
General Prisms	$V = Bh$
Cylinder	$V = \pi r^2 h$
Sphere	$V = \dfrac{4}{3}\pi r^3$
Cone	$V = \dfrac{1}{3}\pi r^2 h$
Pythagorean Theorem	$a^2 + b^2 = c^2$

Session 1

TIPS FOR TAKING THE TEST

Here are some suggestions to help you do your best:

- Read each question carefully and think about the answer before making your choice.

- You have been provided with mathematics tools (a ruler, a protractor, and a calculator) and a reference sheet to use during the test. It is up to you to decide when each tool and the reference sheet will be helpful. You should use mathematics tools and the reference sheet whenever you think they will help you to answer the question.

1 Which graph represents a linear function of x?

A

C

B

D
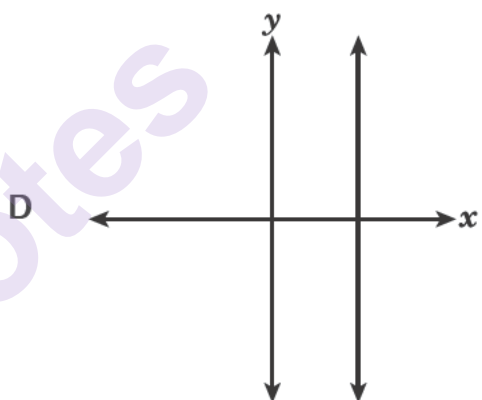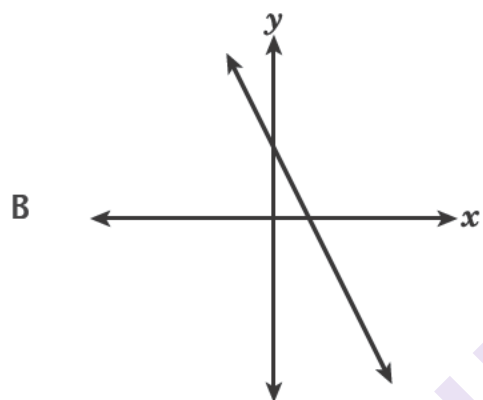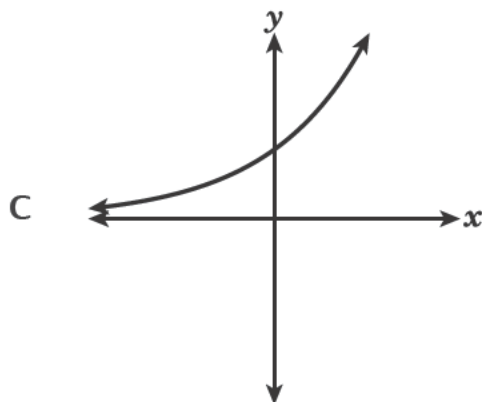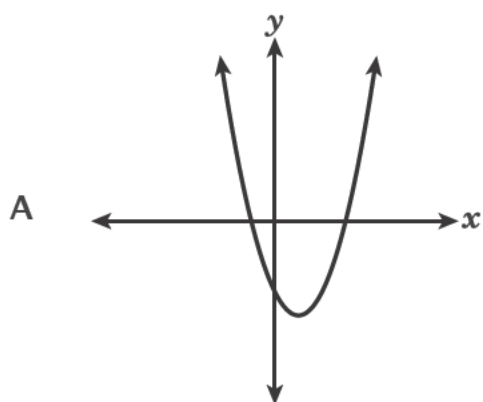
2 What is the value of the expression shown below?

$$\frac{1.6 \times 10^5}{0.2 \times 10^2}$$

A 0.8×10^3

B 8×10^3

C 0.8×10^7

D 8×10^7

GO ON

3   At a factory, the cost of making different numbers of toothbrushes is shown in the table below.

COST OF TOOTHBRUSHES

Number of Toothbrushes	3	6	9	12
Cost (dollars)	$4.50	$9.00	$13.50	$18.00

A linear function models the cost based on the number of toothbrushes made. Which statement about the rate of change of this function is true?

A   The cost increases by $1.50 for each additional toothbrush made.

B   The cost increases by $4.50 for each additional toothbrush made.

C   The cost increases by $9.00 for each additional 3 toothbrushes made.

D   The cost increases by $18.00 for each additional 3 toothbrushes made.

4   A company makes two different-sized ice cream cones. The smaller cones are 3.5 inches tall and have a diameter of 3 inches. The larger cones are 5.1 inches tall and have a diameter of 4.5 inches. About how much greater, to the nearest tenth of a cubic inch, is the volume of the larger cone than the volume of the smaller cone?

A   18.8

B   56.4

C   75.2

D   225.5

7 Which equation represents a function of x that is **not** linear?
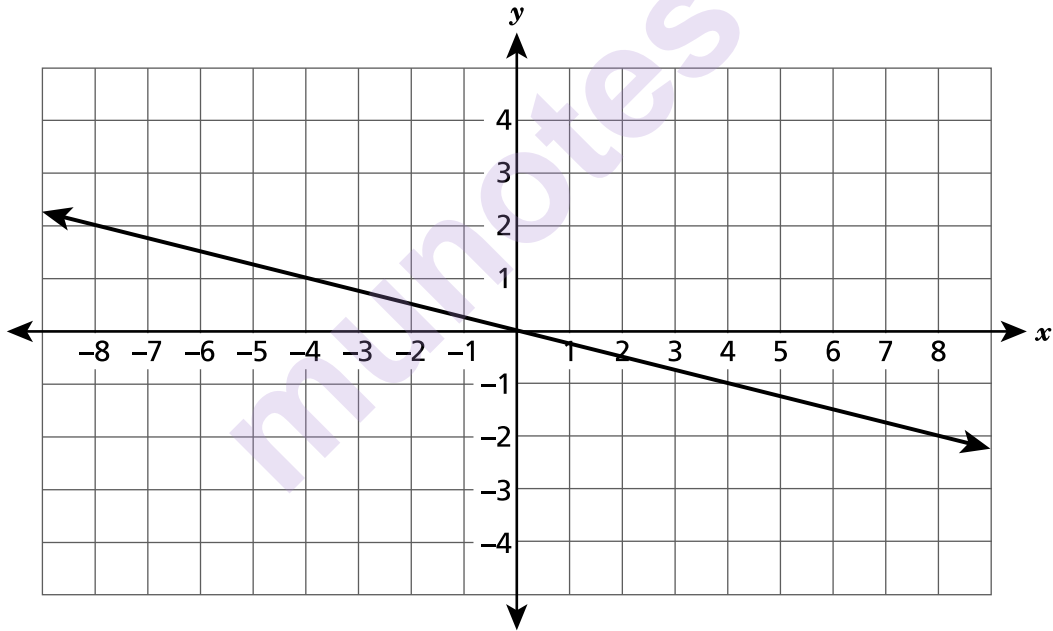
A $y = 4(x + 3)$

B $y = 4^2 + 3x$

C $y = 4x + 3x^2$

D $y = \dfrac{4 + x}{3}$

8 Which equation represents the line shown on the coordinate plane below?

A $y = 4x$

B $y = -4x$

C $y = \dfrac{1}{4}x$

D $y = -\dfrac{1}{4}x$

9 The closest distance between Earth and Mars is approximately 3.39×10^7 miles. The fastest rocket leaving Earth travels at an average speed of approximately 3.6×10^4 miles per hour. At that rate, which expression could be used to determine the approximate number of hours it would take the rocket to travel that distance?

A $\left(3.39 \times 10^7\right) - \left(3.6 \times 10^4\right)$

B $\left(3.6 \times 10^4\right) - \left(3.39 \times 10^7\right)$

C $\left(3.39 \times 10^7\right) \div \left(3.6 \times 10^4\right)$

D $\left(3.6 \times 10^4\right) \div \left(3.39 \times 10^7\right)$

11 Triangle A and triangle B are graphed on the coordinate plane below.
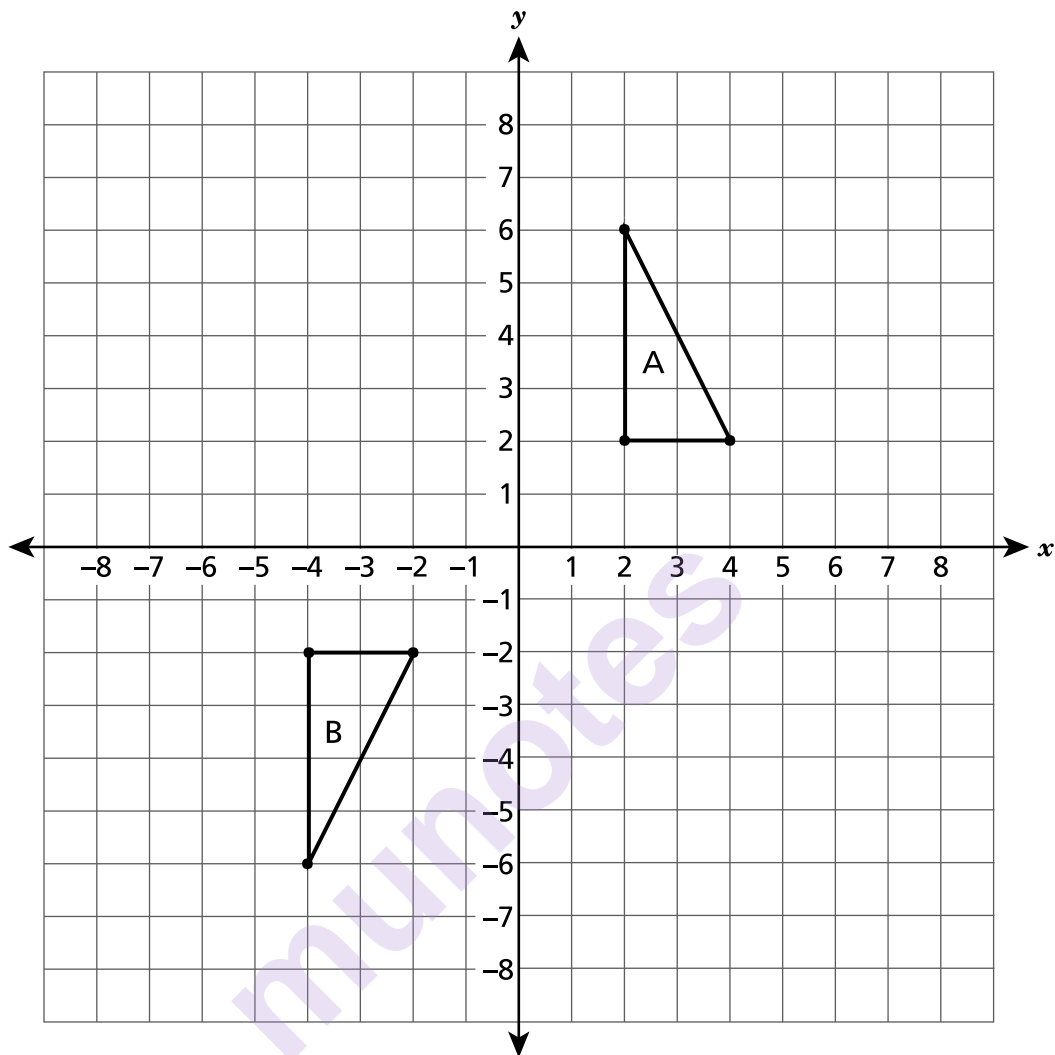
Which sequence of transformations will map triangle A onto its congruent image, triangle B ?

A   a reflection over the x-axis, then a reflection over the y-axis

B   a translation 8 units down, then a reflection over the y-axis

C   a reflection over the x-axis, then a translation 6 units to the left

D   a rotation 90° clockwise about the origin, then a translation 6 units to the left

GO ON

12 Which system of equations has no solution?

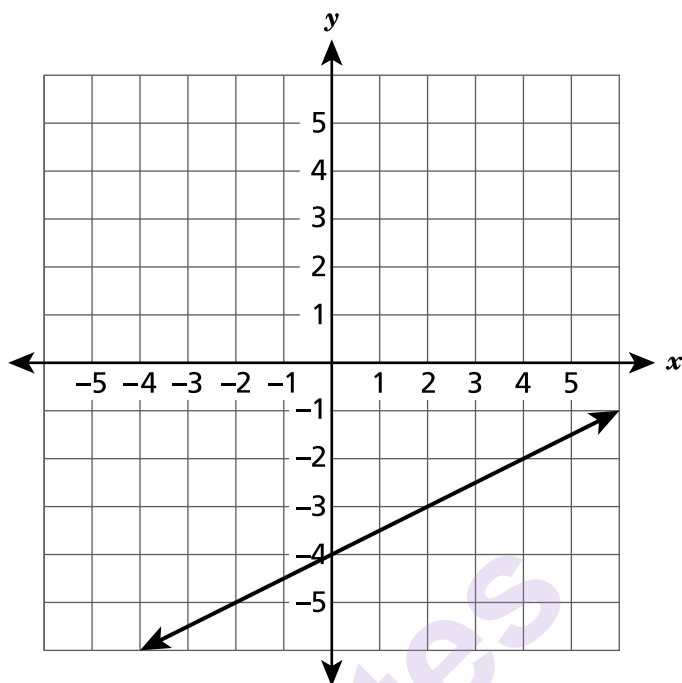**A** $\begin{cases} 3x + 4y = 5 \\ 6x + 8y = 10 \end{cases}$

B $\begin{cases} 7x - 2y = 9 \\ 7x - 2y = 13 \end{cases}$

C $\begin{cases} 2x - y = -11 \\ -2x + y = 11 \end{cases}$

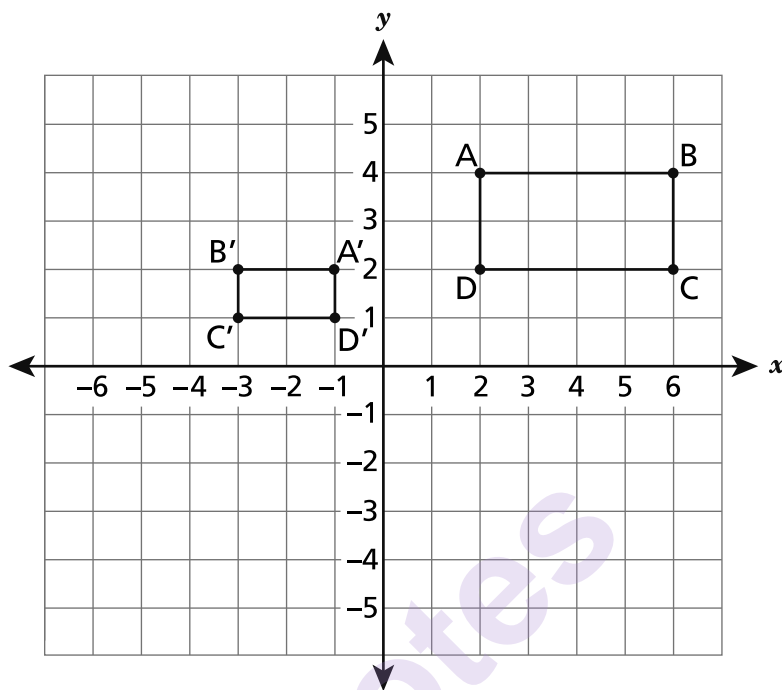**D** $\begin{cases} 3x + 6y = 1 \\ x + y = 0 \end{cases}$

13 A line is graphed on the coordinate plane below.

Line $y = -x + 2$ will be graphed on the same coordinate plane to create a system of equations. What is the solution to that system of equations?

A $(-2, 4)$

B $(0, -4)$

C $(2, -4)$

D $(4, -2)$

GO ON

Session 1

16 Rectangle $A'B'C'D'$ is similar to rectangle $ABCD$, as shown on the coordinate plane below.

Which sequence of transformations maps rectangle $ABCD$ onto rectangle $A'B'C'D'$?

A a translation 8 units to the left, then a dilation by a scale factor of $\dfrac{1}{2}$ with a center of dilation at the origin

B a reflection over the y-axis, then a dilation by a scale factor of $\dfrac{1}{2}$ with a center of dilation at the origin

C a dilation by a scale factor of $\dfrac{1}{2}$ with a center of dilation at the origin, then a $90°$ counterclockwise rotation about the origin

D a $90°$ counterclockwise rotation about the origin, then a dilation by a scale factor of $\dfrac{1}{2}$ with a center of dilation at the origin

GO ON

Session 1

17 Patty has a flower box in the shape of a rectangular prism with interior dimensions that are 15 inches in length, 8 inches in width, and 6 inches in height. Patty will fill the flower box $\frac{3}{4}$ full of soil. How many cubic inches of soil will be in the flower box?

    A   387

    B   516

    C   540

    D   720

24 Which statement **best** describes the data in a scatter plot where the *y*-values are decreasing as the *x*-values are increasing?

A   The data can best be modeled by a vertical line.

B   The data can best be modeled by a horizontal line.

C   The data can best be modeled by a line with a positive slope.

D   The data can best be modeled by a line with a negative slope.

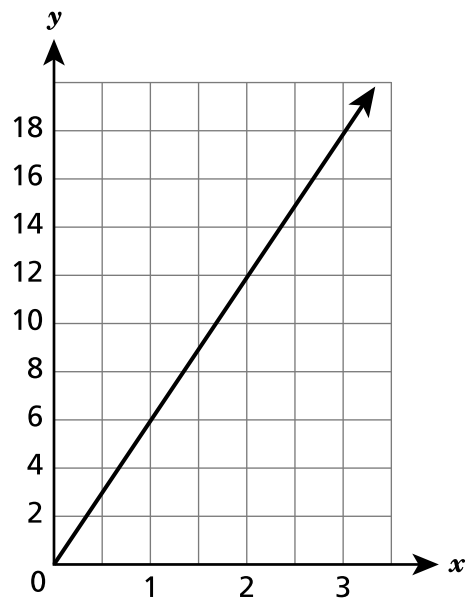**25** Which proportional relationship has the greatest rate of change?

A $y = 7x$

C

x	y
0	0
2	8
4	16
6	24

B   The value of y increases by 12 for every increase of 4 in the value of x.

D

GO ON

29 Which expression is equivalent to $\left(5^{-2}\right)^{5} \times 5^{4}$?

    A 5^{12}

    B 5^{7}

    C $\dfrac{1}{5^{6}}$

    D $\dfrac{1}{5^{40}}$

30 Linear functions M and P are shown below.

FUNCTION M   **FUNCTION P**

| x	y
−2	−9
0	1
2	11
4	21

$y = 7x + 9$

In comparing the rates of change, which statement about Function M and Function P is true?

    A   Their rates of change differ by 2.

    B   Their rates of change differ by 4.

    C   Function M has a greater rate of change than Function P.

   **D**   Function M and Function P have the same rate of change.

31 The scatter plot below shows the average number of customers who visit a food truck per day, depending on the number of days the food truck stays in the same location.

FOOD TRUCK CUSTOMERS
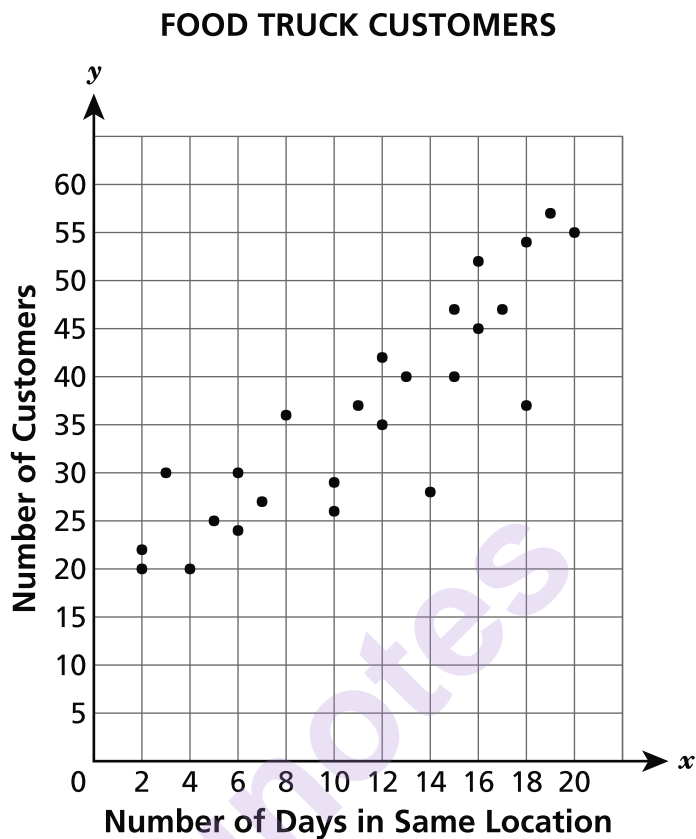
Which statement **best** describes the association between the number of days the food truck is in the same location and the number of customers who visit the food truck per day?

A   There is no association.

B   There is a nonlinear association.

C   There is a positive linear association.

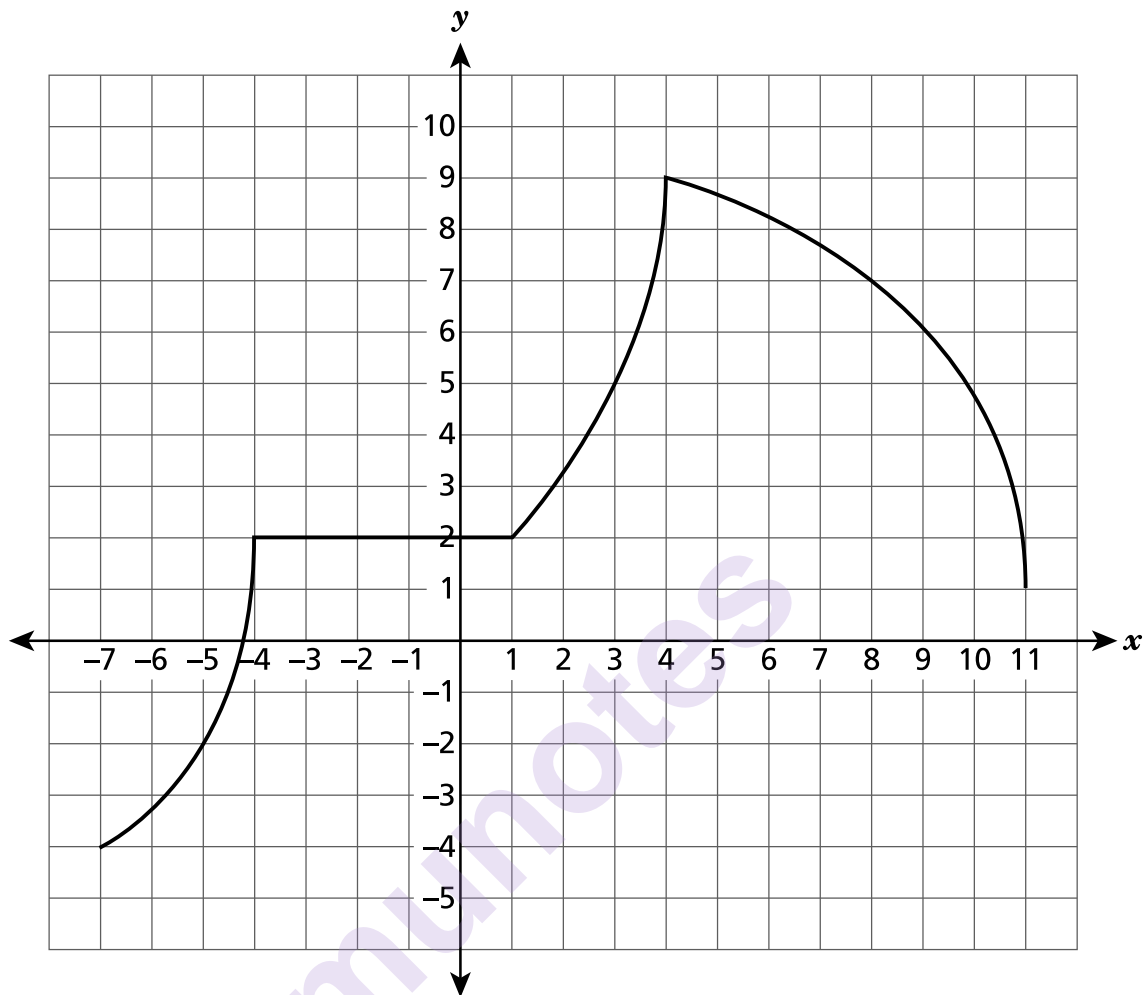**D**   There is a negative linear association.

GO ON

32 The measures of the angles in triangle UVW are shown in the diagram below.
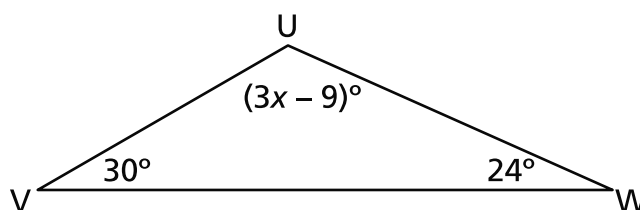
What is the value of x?

A   21

B   39

C   45

D   126

33 The graph of a function is shown on the coordinate plane below.

Which statement correctly describes the function on a given interval?

A   The function is decreasing and nonlinear between $x = -7$ and $x = -4$.

B   The function is increasing and linear between $x = -4$ and $x = 1$.

C   The function is increasing and linear between $x = 1$ and $x = 4$.

D   The function is decreasing and nonlinear between $x = 4$ and $x = 11$.

STOP

Grade 8
2019
Mathematics Test
Session 1
May 1–3, 2019

Name: _____

New York State Testing Program

2019 Mathematics Test Session 2

Grade 8

May 1–3, 2019

RELEASED QUESTIONS

Grade 8 Mathematics Reference Sheet

CONVERSIONS

1 inch = 2.54 centimeters	1 kilometer = 0.62 mile	1 cup = 8 fluid ounces
1 meter = 39.37 inches	1 pound = 16 ounces	1 pint = 2 cups
1 mile = 5,280 feet	1 pound = 0.454 kilogram	1 quart = 2 pints
1 mile = 1,760 yards	1 kilogram = 2.2 pounds	1 gallon = 4 quarts
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		1 liter = 0.264 gallon
		1 liter = 1,000 cubic centimeters

FORMULAS

Triangle	$A = \dfrac{1}{2}bh$
Parallelogram	$A = bh$
Circle	$A = \pi r^2$
Circle	$C = \pi d$ or $C = 2\pi r$
General Prisms	$V = Bh$
Cylinder	$V = \pi r^2 h$
Sphere	$V = \dfrac{4}{3}\pi r^3$
Cone	$V = \dfrac{1}{3}\pi r^2 h$
Pythagorean Theorem	$a^2 + b^2 = c^2$

Session 2

TIPS FOR TAKING THE TEST

Here are some suggestions to help you do your best:

- Read each question carefully and think about the answer before making your choice or writing your response.

- You have been provided with mathematics tools (a ruler, a protractor, and a calculator) and a reference sheet to use during the test. It is up to you to decide when each tool and the reference sheet will be helpful. You should use mathematics tools and the reference sheet whenever you think they will help you to answer the question.

- Be sure to show your work when asked.

34 Which set of ordered pairs does **not** represent a function?

A $\{(1,10),\ (3,18),\ (5,26),\ (7,34),\ (9,42)\}$

B $\{(2,10),\ (3,20),\ (4,15),\ (5,5),\ (6,25)\}$

C $\{(0,8),\ (5,4),\ (10,0),\ (15,4),\ (20,8)\}$

D $\{(9,1),\ (6,2),\ (3,3),\ (6,4),\ (9,5)\}$

35 Two solids are described in the list below.

- One solid is a sphere and has a radius of 6 inches.

- The other solid is a cylinder with a radius of 6 inches and a height of 6 inches.
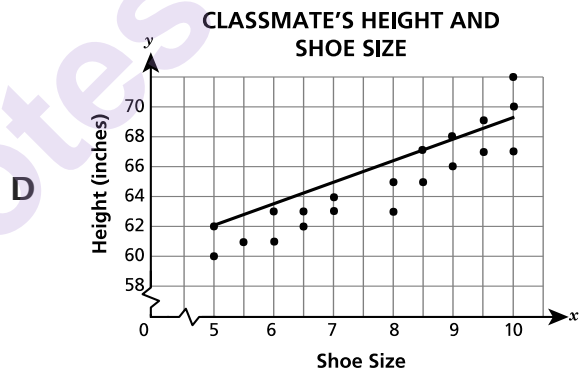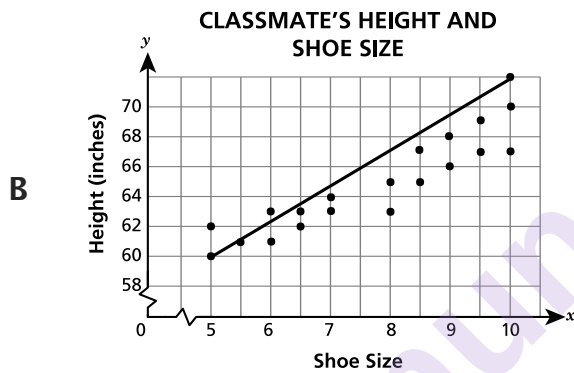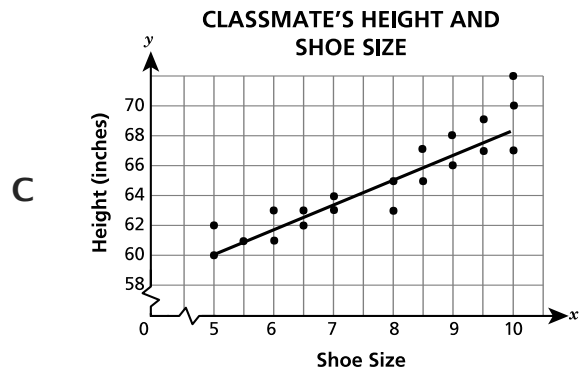
What is the difference between the volumes, in cubic inches, of the solids in terms of π?

A 72π

B 144π

C 216π

D 288π

GO ON

Session 2

36 The shoe sizes and the heights for 20 classmates were plotted as ordered pairs on a scatter plot. A line of best fit was drawn to model the data. Which scatter plot shows the most accurate line of best fit?

A

CLASSMATE'S HEIGHT AND SHOE SIZE

C

CLASSMATE'S HEIGHT AND SHOE SIZE

B

CLASSMATE'S HEIGHT AND SHOE SIZE

D

CLASSMATE'S HEIGHT AND SHOE SIZE
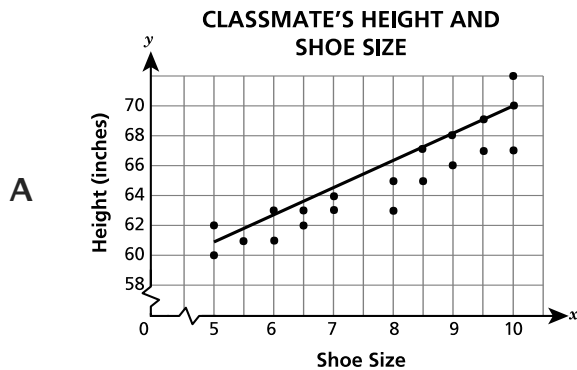
37 Which expression is equivalent to $\left(7^{-8}\right)\left(7^{3}\right)$?

A 49^{-5}

B 49^{-11}

C 7^{-5}

D 7^{-11}

GO ON

38 The scatter plot below shows the relationship between the outside temperature and the number of cups of hot chocolate sold at an event.
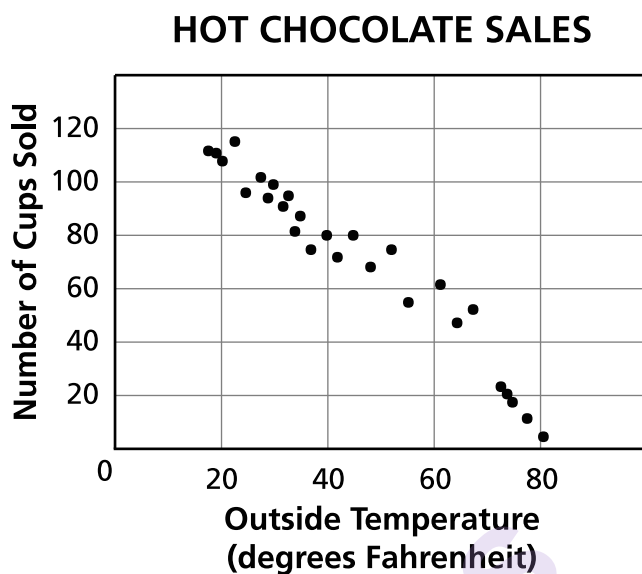
HOT CHOCOLATE SALES

Which statement describes the data?

A   There is no association between the outside temperature, in degrees Fahrenheit, and the number of cups of hot chocolate sold.

B   There is a nonlinear association between the outside temperature, in degrees Fahrenheit, and the number of cups of hot chocolate sold.

C   There is a positive linear association between the outside temperature, in degrees Fahrenheit, and the number of cups of hot chocolate sold.

D   There is a negative linear association between the outside temperature, in degrees Fahrenheit, and the number of cups of hot chocolate sold.

39 Triangle ABC is graphed on a coordinate plane, as shown below.
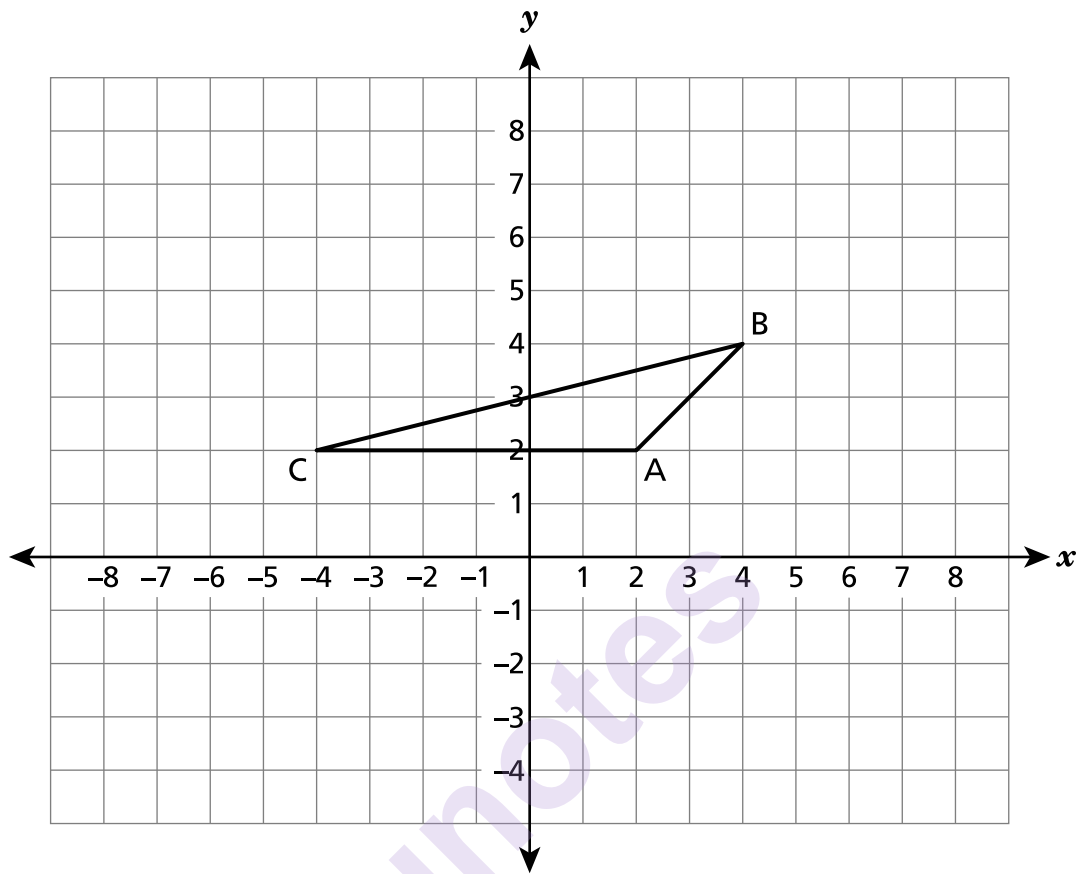
Triangle ABC is dilated by a scale factor of 2 with a center of dilation at the origin to create △A′B′C′. What are the coordinates of the vertices of △A′B′C′?

A $(1, 1)$, $(2, 2)$, $(-2, 1)$

B $(4, 2)$, $(8, 6)$, $(-8, 2)$

C $(4, 4)$, $(6, 6)$, $(-2, 4)$

D $(4, 4)$, $(8, 8)$, $(-8, 4)$

40 The set of ordered pairs below represents a relation that is a function.

$$\{(-2, 8),\ (4, 6),\ (10, 4)\}$$

Which point, when added to the set, would form a relation that is **not** a function?

A $(0, 6)$

B $(4, 2)$

C $(-6, 8)$

D $(-8, 10)$

41 The approximate areas of two states are listed below.

- Texas: 2.69×10^5 square miles

- Rhode Island: 1.21×10^3 square miles

Determine the difference, in square miles, between the area of Texas and the area of Rhode Island. Write your answer in scientific notation.

Show your work.

Answer _____ square miles

42 The set of ordered pairs below represents a linear function.

$$\{(-2, -3)\,,\ (0, -2)\,,\ (2, -1)\,,\ (x, y)\}$$

What is one other pair of coordinates that could be the missing ordered pair, (x, y), in this set?

Show your work.

Answer $x = $ _____

   $y = $ _____

GO ON

43 Solve the system of equations shown below.

$$2x - 6y = -12$$
$$x + 2y = 14$$

Show your work.
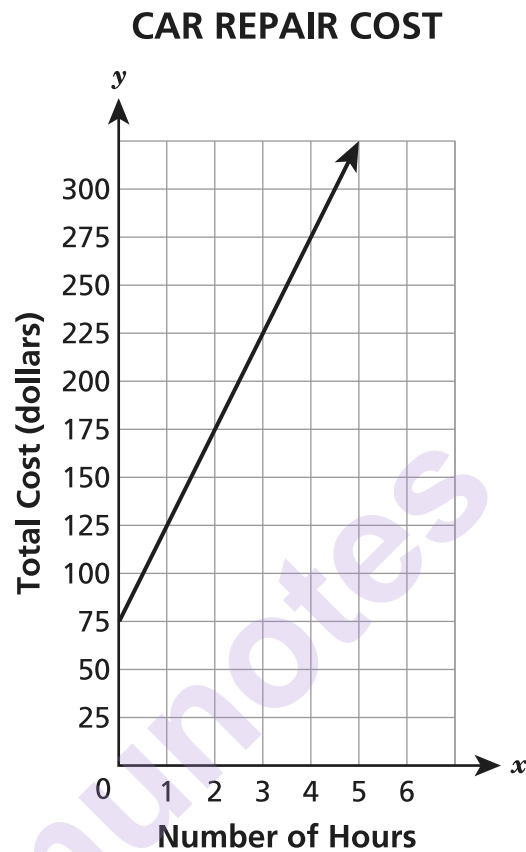
Answer _____

44 A car repair shop charges an hourly rate plus a pickup and delivery fee. The graph below represents the relationship between the total cost of the repair, including pickup and delivery fee, and the number of hours it takes the shop to complete the repairs.

CAR REPAIR COST

What equation represents this linear function?

Show your work.

Equation _____

45 Billy is comparing gasoline prices at two different gas stations.

- At the first gas station, the equation $c = 2.80g$ gives the relationship between g, the number of gallons of gasoline, and c, the total cost, in dollars.

- At the second gas station, the cost of 2.5 gallons of gasoline is $\$8.30$, and the cost of 5 gallons of gasoline is $\$16.60$.

How much money, per gallon, would Billy save by going to the less expensive gas station?

Show your work.

Answer $\$$_____ per gallon

46 Triangle ABC goes through a series of three transformations, resulting in triangle $A'B'C'$. The three transformations are listed below.

- a rotation $180°$ clockwise about the origin

- a reflection over the x-axis

- a reflection over the y-axis

Triangle ABC has vertex A located at $(2, -3)$. Using the coordinates of this point, explain how the three transformations map vertex A onto vertex A'.

Explain your answer.

Session 2

GO ON

47 Two students, Matt and Billy, each calculated the volume of a spherical ball with a diameter of 15 centimeters. Their work is shown below.

MATT'S WORK	BILLY'S WORK
Step 1: $V = \dfrac{4}{3}\pi r^3$	Step 1: $V = \dfrac{4}{3}\pi r^3$
Step 2: $V = \dfrac{4}{3}\pi(15)^3$	Step 2: $V = \dfrac{4}{3}\pi(7.5)^3$
Step 3: $V = \dfrac{4}{3}\pi(3375)$	Step 3: $V = \dfrac{4}{3}\pi\left(\dfrac{3375}{8}\right)$
Step 4: $V = 4500\pi$	Step 4: $V = \dfrac{1125}{2}\pi$

Which student made an error and what error did that student make?

Explain your answer.

_____

_____

_____

48 The two equations shown below represent different functions.

Function P: $y = \dfrac{3}{x} + 2$

Function Q: $y = \dfrac{1}{3}x + 2$

Identify each function as linear or nonlinear. State a reason why each function is linear or nonlinear.

Function P _____

State your reason.

_____

_____

_____

Function Q _____

State your reason.

_____

_____

_____

STOP

Grade 8
2019
Mathematics Test
Session 2
May 1–3, 2019

Question	Type	Key	Points	Standard	Cluster	Multiple Choice Questions: Percentage of Students Who Answered Correctly (P-Value)	Constructed Response Questions: Average Points Earned	Constructed Response Questions: P-Value (Average Points Earned ÷ Total Possible Points)
Session 1								
1	Multiple Choice	B	1	CCSS.Math.Content.8.F.A.3	Functions	0.61		
2	Multiple Choice	B	1	CCSS.Math.Content.8.EE.A.4	Expressions and Equations	0.58		
3	Multiple Choice	A	1	CCSS.Math.Content.8.F.B.4	Functions	0.65		
4	Multiple Choice	A	1	CCSS.Math.Content.8.G.C.9	Geometry	0.65		
7	Multiple Choice	C	1	CCSS.Math.Content.8.F.A.3	Functions	0.56		
8	Multiple Choice	D	1	CCSS.Math.Content.8.EE.B.6	Expressions and Equations	0.56		
9	Multiple Choice	C	1	CCSS.Math.Content.8.EE.A.4	Expressions and Equations	0.58		
11	Multiple Choice	C	1	CCSS.Math.Content.8.G.A.2	Geometry	0.54		
12	Multiple Choice	B	1	CCSS.Math.Content.8.EE.C.8b	Expressions and Equations	0.38		
13	Multiple Choice	D	1	CCSS.Math.Content.8.EE.C.8b	Expressions and Equations	0.44		
16	Multiple Choice	B	1	CCSS.Math.Content.8.G.A.4	Geometry	0.56		
17	Multiple Choice	C	1	CCSS.Math.Content.7.G.B.6	Geometry	0.59		
24	Multiple Choice	D	1	CCSS.Math.Content.8.SP.A.2	Statistics and Probability	0.51		
25	Multiple Choice	A	1	CCSS.Math.Content.8.EE.B.5	Expressions and Equations	0.47		
29	Multiple Choice	C	1	CCSS.Math.Content.8.EE.A.1	Expressions and Equations	0.51		
30	Multiple Choice	A	1	CCSS.Math.Content.8.F.A.2	Functions	0.43		
31	Multiple Choice	C	1	CCSS.Math.Content.8.SP.A.1	Statistics and Probability	0.7		
32	Multiple Choice	C	1	CCSS.Math.Content.8.G.A.5	Geometry	0.53		

33	Multiple Choice	D	1	CCSS.Math.Content.8.F.B.5	Functions	0.5		
Session 2								
34	Multiple Choice	D	1	CCSS.Math.Content.8.F.A.1	Functions	0.6		
35	Multiple Choice	A	1	CCSS.Math.Content.8.G.C.9	Geometry	0.57		
36	Multiple Choice	C	1	CCSS.Math.Content.8.SP.A.2	Statistics and Probability	0.69		
37	Multiple Choice	C	1	CCSS.Math.Content.8.EE.A.1	Expressions and Equations	0.6		
38	Multiple Choice	D	1	CCSS.Math.Content.8.SP.A.1	Statistics and Probability	0.69		
39	Multiple Choice	D	1	CCSS.Math.Content.8.G.A.3	Geometry	0.48		
40	Multiple Choice	B	1	CCSS.Math.Content.8.F.A.1	Functions	0.59		
41	Constructed Response		2	CCSS.Math.Content.8.EE.A.4	Expressions and Equations		0.91	0.45
42	Constructed Response		2	CCSS.Math.Content.8.F.A.3	Functions		1.06	0.53
43	Constructed Response		2	CCSS.Math.Content.8.EE.C.8b	Expressions and Equations		0.69	0.34
44	Constructed Response		2	CCSS.Math.Content.8.F.B.4	Functions		0.81	0.41
45	Constructed Response		2	CCSS.Math.Content.8.EE.B.5	Expressions and Equations		0.88	0.44
46	Constructed Response		2	CCSS.Math.Content.8.G.A.3	Geometry		0.53	0.26
47	Constructed Response		2	CCSS.Math.Content.8.G.C.9	Geometry		1.07	0.54
48	Constructed Response		3	CCSS.Math.Content.8.F.A.3	Functions		1.31	0.44

*This item map is intended to identify the primary analytic skills necessary to successfully answer each question. However, some questions measure proficiencies described in multiple standards, including a balanced combination of procedural and conceptual understanding.