

# New York NYSTP 2019 Grade 8 Math

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# 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
1 mile = 1.609 kilometers	1 ton = 2,000 pounds	1 gallon = 3.785 liters
		1 liter = 0.264 gallon
		1 liter = 1,000 cubic centimeters

## FORMULAS

**Triangle**

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

**Parallelogram**

$$A = bh$$

**Circle**

$$A = \pi r^2$$

**Circle**

$$C = \pi d \text{ or } C = 2\pi r$$

**General Prisms**

$$V = Bh$$

**Cylinder**

$$V = \pi r^2 h$$

**Sphere**

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

**Cone**

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

**Pythagorean Theorem**

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

Name: \_\_\_\_\_



# New York State *Testing Program*

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## 2019 Mathematics Test Session 1

# Grade 8

May 1–3, 2019

RELEASED QUESTIONS

# Session 1



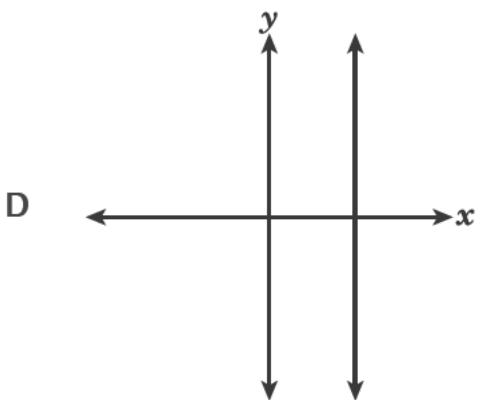
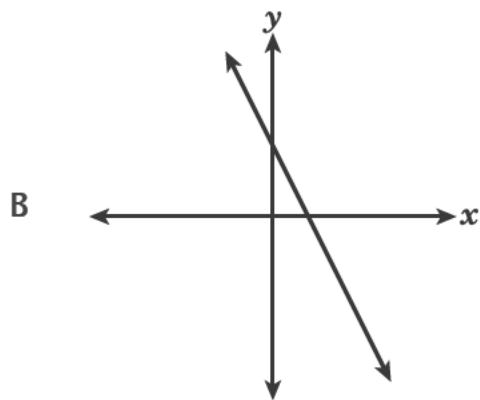
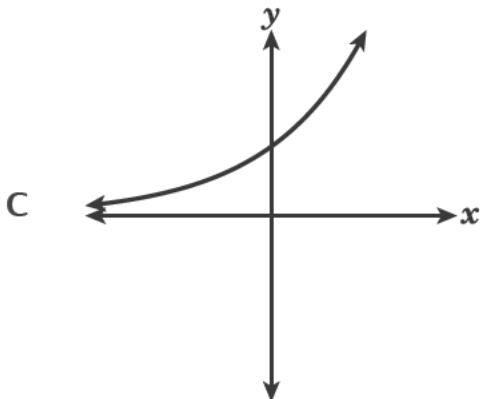
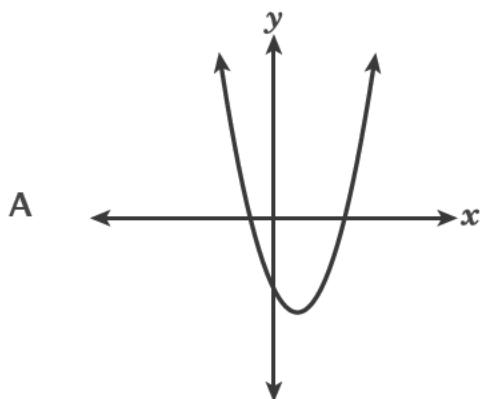
## TIPS FOR TAKING THE TEST

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  $x$ ?



2

What is the value of the expression shown below?

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

- A  $0.8 \times 10^3$
- B  $8 \times 10^3$
- C  $0.8 \times 10^7$
- D  $8 \times 10^7$

**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

**GO ON**

**7**

Which equation represents a function of  $x$  that is **not** linear?

A  $y = 4(x + 3)$

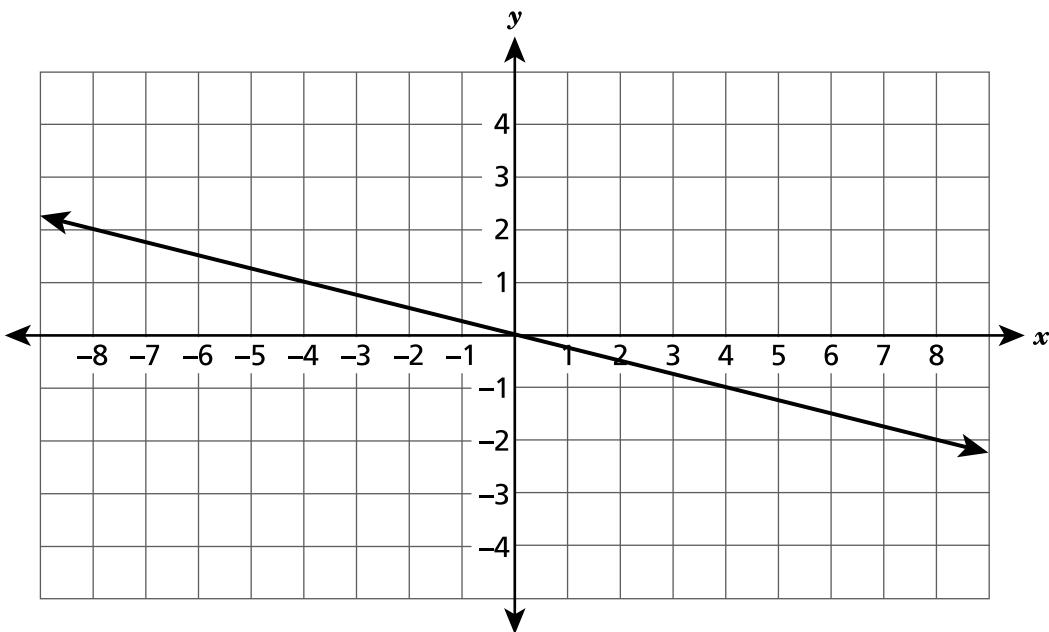
B  $y = 4^2 + 3x$

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

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

**8**

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



A  $y = 4x$

B  $y = -4x$

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

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

**GO ON**

**9**

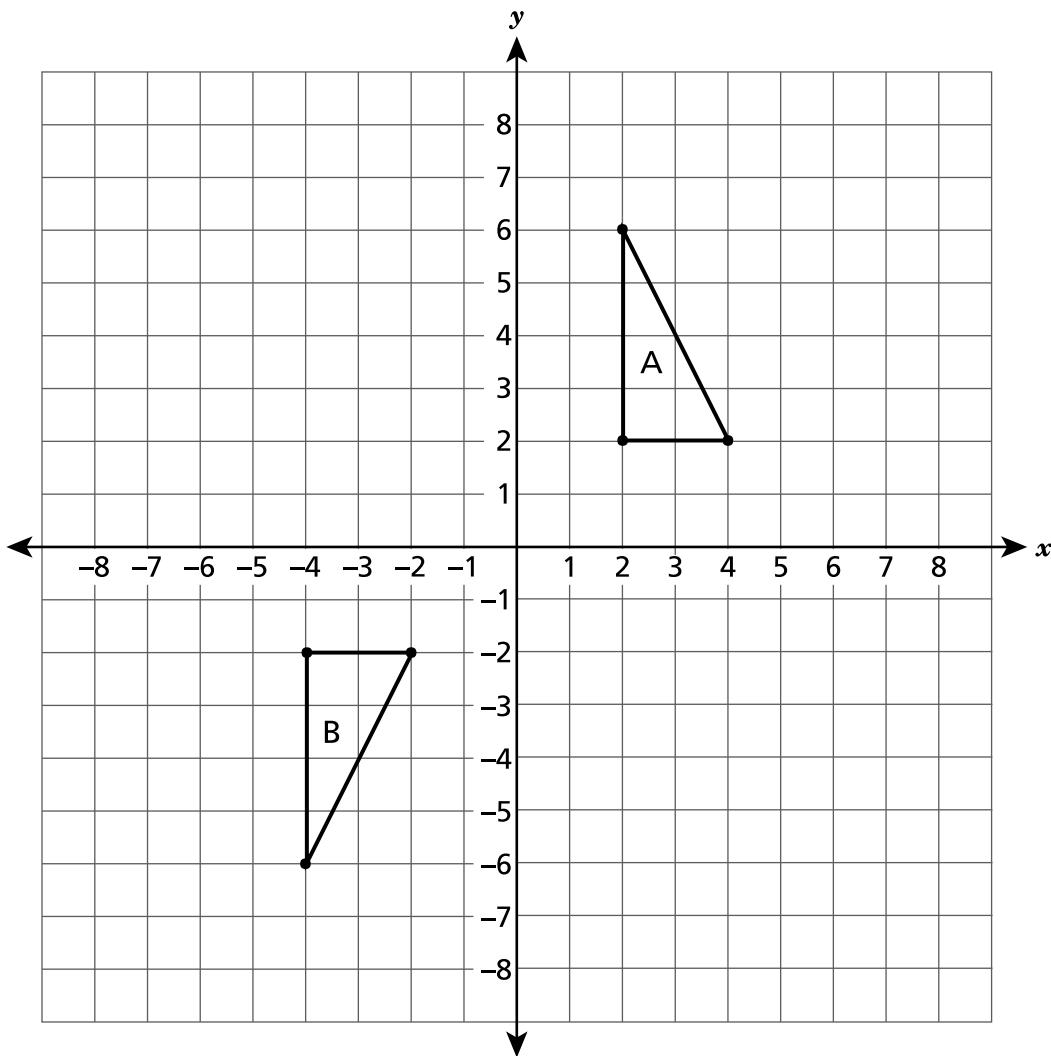
The closest distance between Earth and Mars is approximately  $3.39 \times 10^7$  miles. The fastest rocket leaving Earth travels at an average speed of approximately  $3.6 \times 10^4$  miles per hour. At that rate, which expression could be used to determine the approximate number of hours it would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

- A  $(3.39 \times 10^7) - (3.6 \times 10^4)$
- B  $(3.6 \times 10^4) - (3.39 \times 10^7)$
- C  $(3.39 \times 10^7) \div (3.6 \times 10^4)$
- D  $(3.6 \times 10^4) \div (3.39 \times 10^7)$

**GO ON**

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  $90^\circ$  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 
$$\begin{cases} 7x - 2y = 9 \\ 7x - 2y = 13 \end{cases}$$

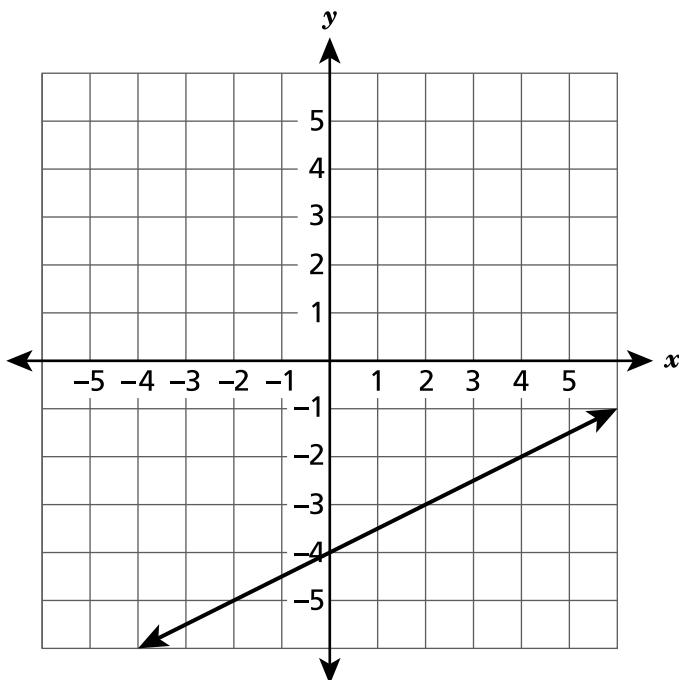
C 
$$\begin{cases} 2x - y = -11 \\ -2x + y = 11 \end{cases}$$

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

**GO ON**

**13**

A line is graphed on the coordinate plane below.



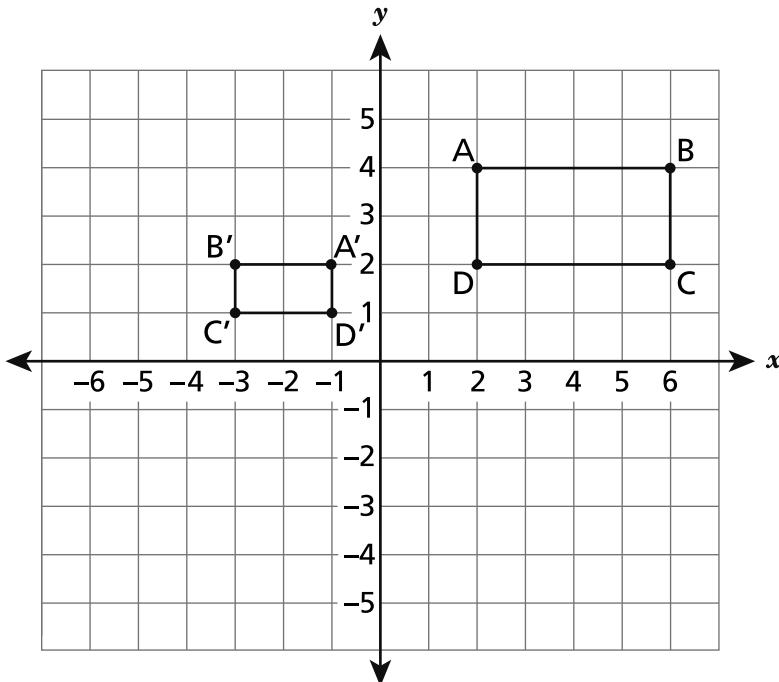
Line  $y = -x + 2$  will be graphed on the same coordinate plane to create a system of equations. What is the solution to that system of equations?

- A**  $(-2, 4)$
- B**  $(0, -4)$
- C**  $(2, -4)$
- D**  $(4, -2)$

**GO ON**

**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  $\frac{1}{2}$  with a center of dilation at the origin
- B** a reflection over the  $y$ -axis, then a dilation by a scale factor of  $\frac{1}{2}$  with a center of dilation at the origin
- C** a dilation by a scale factor of  $\frac{1}{2}$  with a center of dilation at the origin, then a  $90^\circ$  counterclockwise rotation about the origin
- D** a  $90^\circ$  counterclockwise rotation about the origin, then a dilation by a scale factor of  $\frac{1}{2}$  with a center of dilation at the origin

**GO ON**

**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

**GO ON**

**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?

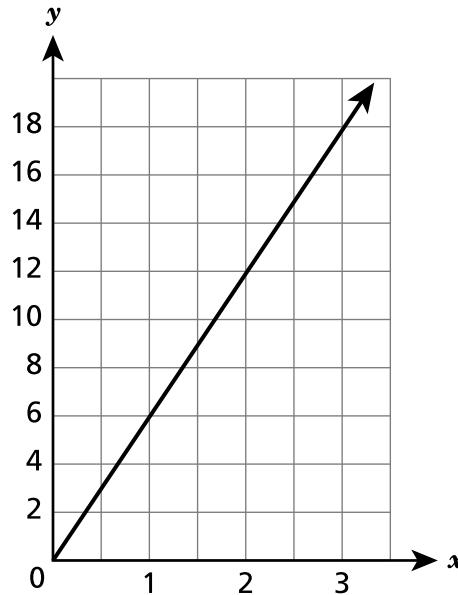
A  $y = 7x$

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  $(5^{-2})^5 \times 5^4$ ?

- A  $5^{12}$
- B  $5^7$
- C  $\frac{1}{5^6}$
- D  $\frac{1}{5^{40}}$

- 30** Linear functions M and P are shown below.

**FUNCTION M**

$x$	$y$
-2	-9
0	1
2	11
4	21

**FUNCTION P**

$$y = 7x + 9$$

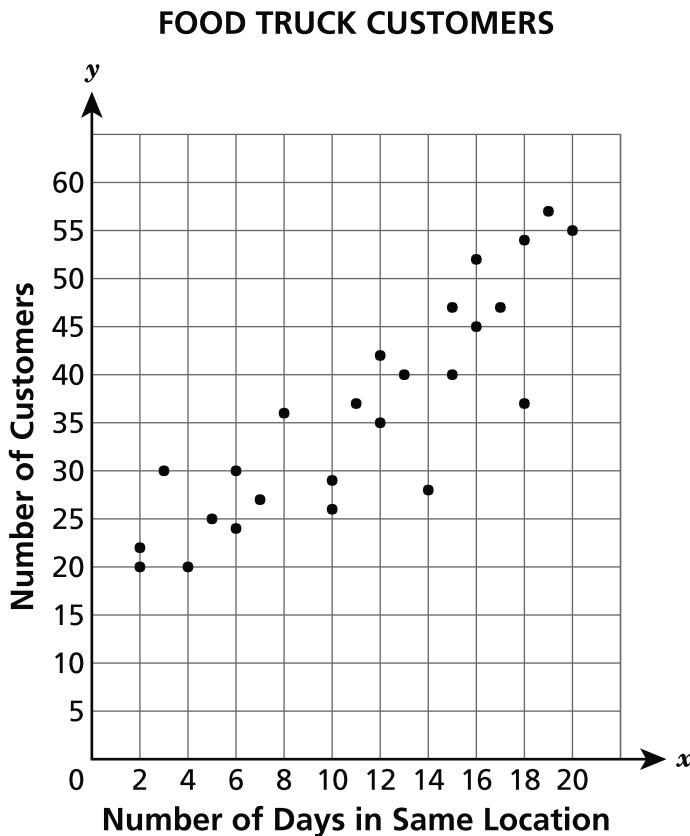
In comparing the rates of change, which statement about Function M and Function P is true?

- 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.

**GO ON**

**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.



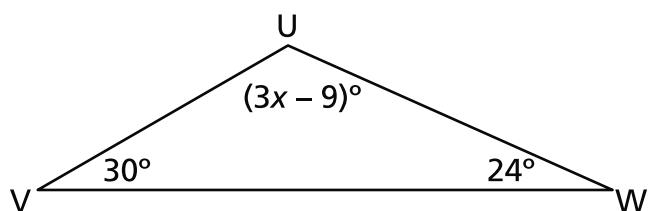
Which statement **best** describes the association between the number of days the food truck is in the same location and the number of customers who visit the food truck per day?

- 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.



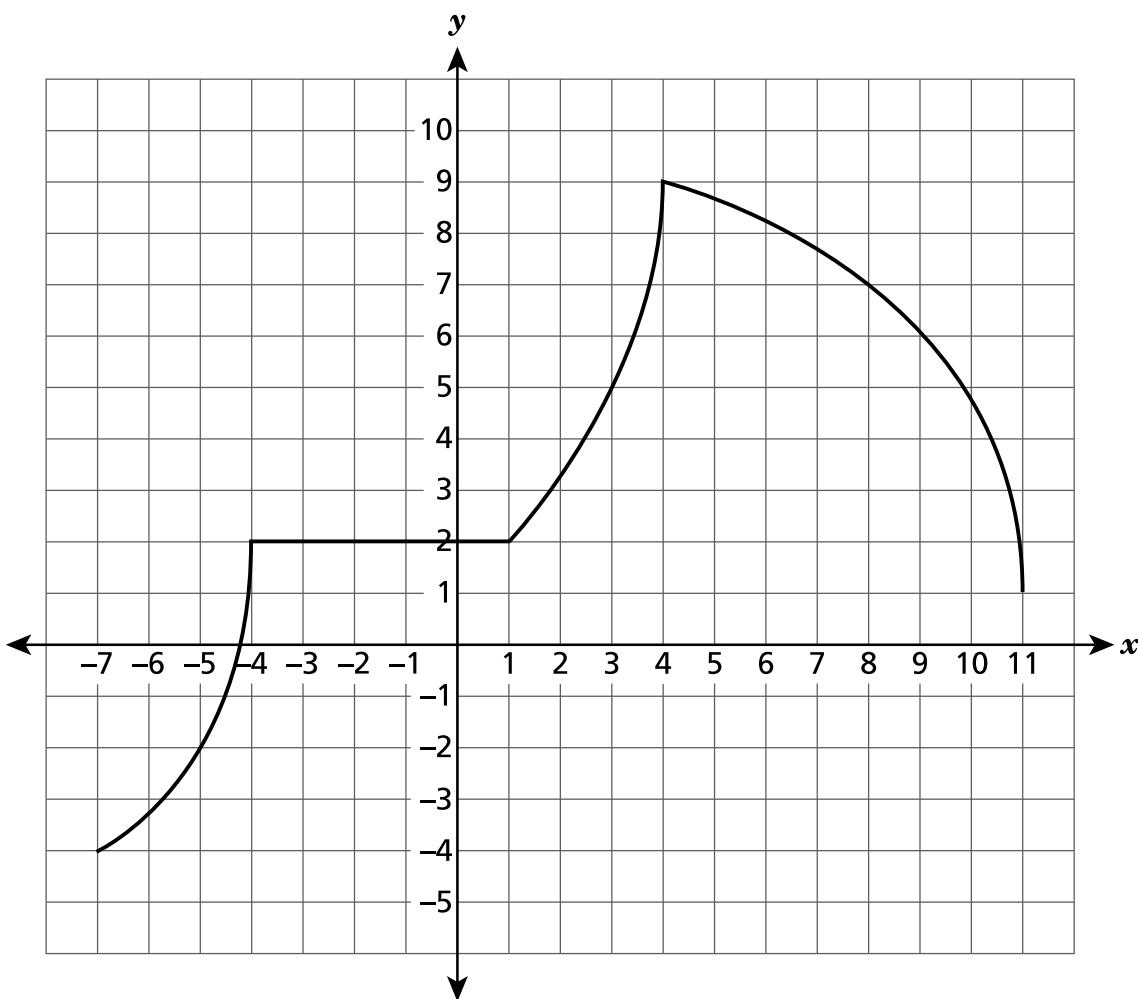
What is the value of  $x$ ?

- A** 21
- B** 39
- C** 45
- D** 126

**GO ON**

**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**

# 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.

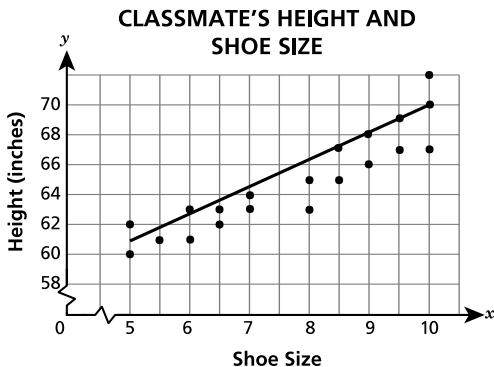
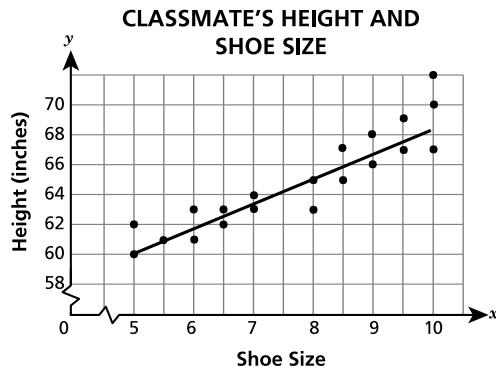
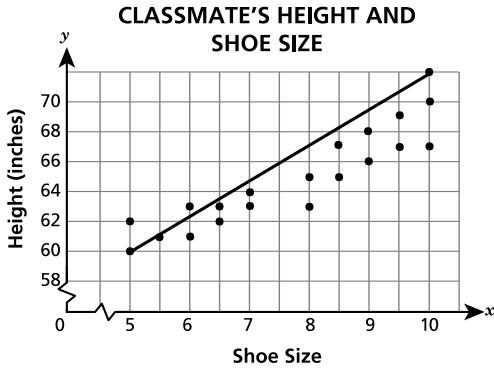
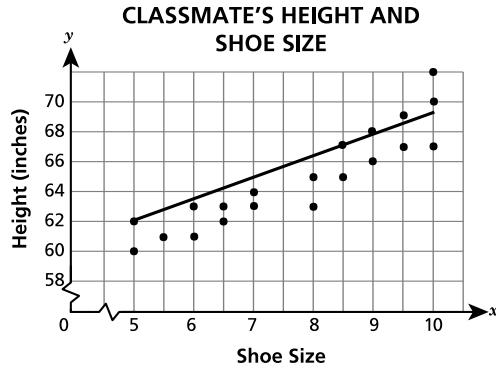
What is the difference between the volumes, in cubic inches, of the solids in terms of  $\pi$ ?

- A  $72\pi$
- B  $144\pi$
- C  $216\pi$
- D  $288\pi$

**GO ON**

**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****C****B****D****37**

Which expression is equivalent to  $(7^{-8})(7^3)$ ?

A  $49^{-5}$

B  $49^{-11}$

C  $7^{-5}$

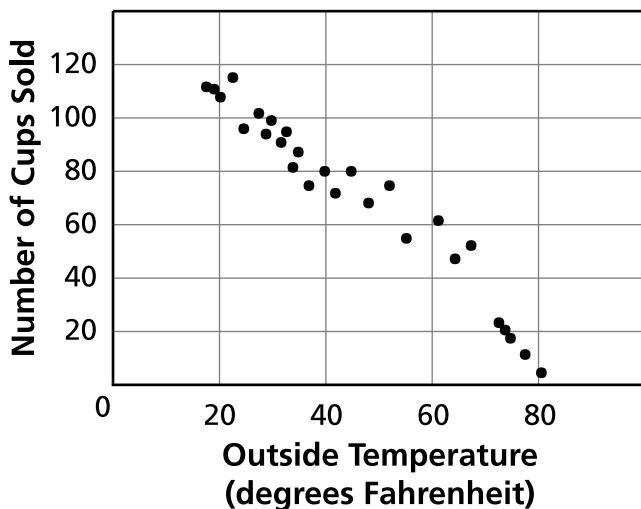
D  $7^{-11}$

**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**



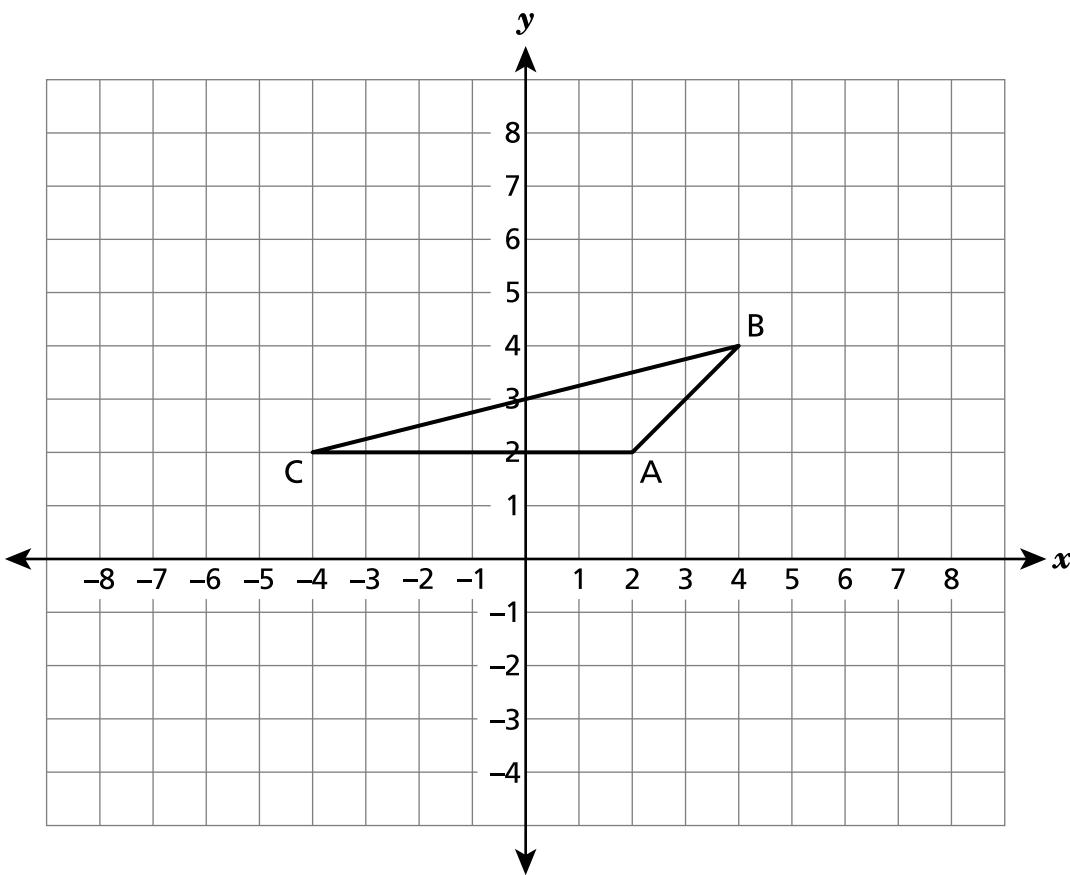
Which statement describes the data?

- 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.

**GO ON**

**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  $\triangle A'B'C'$ . What are the coordinates of the vertices of  $\triangle A'B'C'$ ?

- 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)

**GO ON**

**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)

**GO ON**

**41**

The approximate areas of two states are listed below.

- Texas:  $2.69 \times 10^5$  square miles
- Rhode Island:  $1.21 \times 10^3$  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

**GO ON**

**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**  $x = \underline{\hspace{2cm}}$

$y = \underline{\hspace{2cm}}$

**GO ON**

**43**

Solve the system of equations shown below.

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

$$x + 2y = 14$$

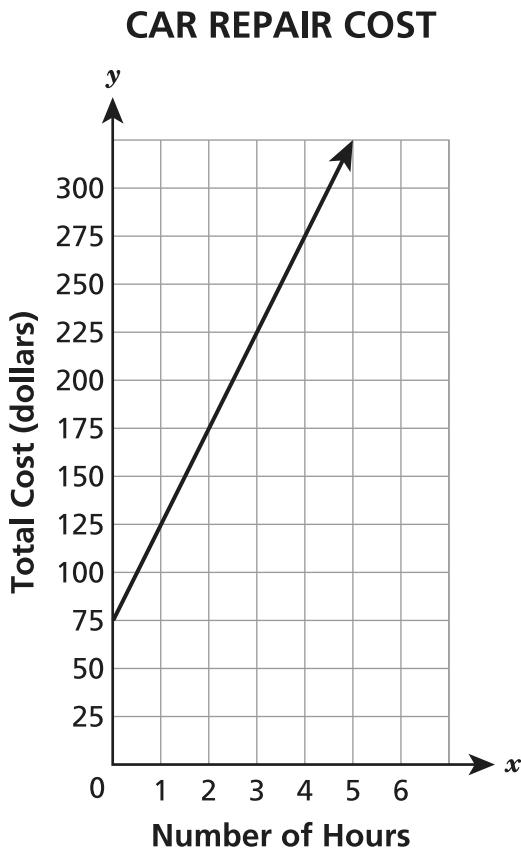
*Show your work.*

*Answer* \_\_\_\_\_

**GO ON**

**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.



What equation represents this linear function?

*Show your work.*

*Equation* \_\_\_\_\_

**GO ON**

**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

**GO ON**

**46**

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

- a rotation  $180^\circ$  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.*

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**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**

$$\text{Step 1: } V = \frac{4}{3}\pi r^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(15)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi(3375)$$

$$\text{Step 4: } V = 4500\pi$$

**BILLY'S WORK**

$$\text{Step 1: } V = \frac{4}{3}\pi r^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(7.5)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi\left(\frac{3375}{8}\right)$$

$$\text{Step 4: } V = \frac{1125}{2}\pi$$

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

*Explain your answer.*

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**GO ON**

**48**

The two equations shown below represent different functions.

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

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

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

*Function P* \_\_\_\_\_

*State your reason.*

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*Function Q* \_\_\_\_\_

*State your reason.*

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**STOP**

**THE STATE EDUCATION DEPARTMENT**  
**THE UNIVERSITY OF THE STATE OF NEW YORK / ALBANY, NY 12234**  
**2019 Mathematics Tests Map to the Standards**  
**Grade 8 Released Questions on EngageNY**

Question	Type	Key	Points	Standard	Cluster	Multiple Choice Questions:	Constructed Response Questions:	
						Percentage of Students Who Answered Correctly (P-Value)	Average Points Earned	P-Value (Average Points Earned ÷ Total Possible Points)
<b>Session 1</b>								
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		
<b>Session 2</b>								
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.

## 2-Point Holistic Rubric

<b>2 Point</b>	A two-point response includes the correct solution to the question and demonstrates a thorough understanding of the mathematical concepts and/or procedures in the task.  This response <ul style="list-style-type: none"><li>• indicates that the student has completed the task correctly, using mathematically sound procedures</li><li>• contains sufficient work to demonstrate a thorough understanding of the mathematical concepts and/or procedures</li><li>• may contain inconsequential errors that do not detract from the correct solution and the demonstration of a thorough understanding</li></ul>
<b>1 Point</b>	A one-point response demonstrates only a partial understanding of the mathematical concepts and/or procedures in the task.  This response <ul style="list-style-type: none"><li>• correctly addresses only some elements of the task</li><li>• may contain an incorrect solution but applies a mathematically appropriate process</li><li>• may contain the correct solution but required work is incomplete</li></ul>
<b>0 Point*</b>	A zero-point response is incorrect, irrelevant, incoherent, or contains a correct solution obtained using an obviously incorrect procedure. Although some elements may contain correct mathematical procedures, holistically they are not sufficient to demonstrate even a limited understanding of the mathematical concepts embodied in the task.

\* Condition Code A is applied whenever a student who is present for a test session leaves an entire constructed-response question in that session completely blank (no response attempted).

### 3-Point Holistic Rubric

<b>3 Point</b>	<p>A three-point response includes the correct solution(s) to the question and demonstrates a thorough understanding of the mathematical concepts and/or procedures in the task.</p> <p>This response</p> <ul style="list-style-type: none"> <li>• indicates that the student has completed the task correctly, using mathematically sound procedures</li> <li>• contains sufficient work to demonstrate a thorough understanding of the mathematical concepts and/or procedures</li> <li>• may contain inconsequential errors that do not detract from the correct solution(s) and the demonstration of a thorough understanding</li> </ul>
<b>2 Point</b>	<p>A two-point response demonstrates a partial understanding of the mathematical concepts and/or procedures in the task.</p> <p>This response</p> <ul style="list-style-type: none"> <li>• appropriately addresses most but not all aspects of the task using mathematically sound procedures</li> <li>• may contain an incorrect solution but provides sound procedures, reasoning, and/or explanations</li> <li>• may reflect some minor misunderstanding of the underlying mathematical concepts and/or procedures</li> </ul>
<b>1 Point</b>	<p>A one-point response demonstrates only a limited understanding of the mathematical concepts and/or procedures in the task.</p> <p>This response</p> <ul style="list-style-type: none"> <li>• may address some elements of the task correctly but reaches an inadequate solution and/or provides reasoning that is faulty or incomplete</li> <li>• exhibits multiple flaws related to misunderstanding of important aspects of the task, misuse of mathematical procedures, or faulty mathematical reasoning</li> <li>• reflects a lack of essential understanding of the underlying mathematical concepts</li> <li>• may contain the correct solution(s) but required work is limited</li> </ul>
<b>0 Point*</b>	<p>A zero-point response is incorrect, irrelevant, incoherent, or contains a correct solution obtained using an obviously incorrect procedure. Although some elements may contain correct mathematical procedures, holistically they are not sufficient to demonstrate even a limited understanding of the mathematical concepts embodied in the task.</p>

\* Condition Code A is applied whenever a student who is present for a test session leaves an entire constructed-response question in that session completely blank (no response attempted).

## **2019 2- and 3-Point Mathematics Scoring Policies**

Below are the policies to be followed while scoring the mathematics tests for all grades:

1. If a student shows the work in other than a designated “Show your work” or “Explain” area, that work should still be scored.
2. If the question requires students to show their work, and the student shows appropriate work and clearly identifies a correct answer but fails to write that answer in the answer space, the student should still receive full credit.
3. If students are directed to show work or provide an explanation, a correct answer with **no** work shown or **no** explanation provided, receives **no** credit.
4. If students are **not** directed to show work, any work shown will **not** be scored. This applies to items that do **not** ask for any work and items that ask for work for one part and do **not** ask for work in another part.
5. If the student provides one legible response (and one response only), the rater should score the response, even if it has been crossed out.
6. If the student has written more than one response but has crossed some out, the rater should score only the response that has **not** been crossed out.
7. If the student provides more than one response, but does not indicate which response is to be considered the correct response and none has been crossed out, the student shall not receive full credit.
8. If the student makes a conceptual error (that is an error in understanding rather than an arithmetic or computational error), that student shall not receive more than 50% credit.
9. Trial-and-error responses are **not** subject to Scoring Policy #6 above, since crossing out is part of the trial-and-error process.
10. If a response shows repeated occurrences of the same conceptual error within a question, the conceptual error should **not** be considered more than once in gauging the demonstrated level of understanding.
11. In questions requiring number sentences, the number sentences must be written horizontally.
12. When measuring angles with a protractor, there is a +/- 5 degrees deviation allowed of the true measure.
13. Condition Code A is applied whenever a student who is present for a test session leaves an entire constructed-response question in that session completely blank (no response attempted). This is not to be confused with a score of zero wherein the student does respond to part or all of the question but that work results in a score of zero.

## EXEMPLARY RESPONSE

41

The approximate areas of two states are listed below.

- Texas:  $2.69 \times 10^5$  square miles
- Rhode Island:  $1.21 \times 10^3$  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.*

$$2.69 \times 10^5 - 1.21 \times 10^3$$

$$269 \times 10^3 - 1.21 \times 10^3 = 267.79 \times 10^3$$

*or*

$$2.69 \times 10^5 - 0.0121 \times 10^5 = 2.6779 \times 10^5$$

*or*

$$269,000 - 1,210 = 267,790$$

*or other valid process*

*Answer*  $2.6779 \times 10^5$  square miles

# GUIDE PAPER 1

Additional

41

The approximate areas of two states are listed below.

- Texas:  $2.69 \times 10^5$  square miles
- Rhode Island:  $1.21 \times 10^3$  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.*

$$\begin{aligned}(2.69 \times 10^5) - (1.21 \times 10^3) \\ (2.69 \times 10^5) - (0.0121 \times 10^5) \\ 2.6779 \times 10^5\end{aligned}$$

*Answer*

$$2.6779 \times 10^5$$

square miles

## Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The difference is correctly calculated and written in scientific notation.

## GUIDE PAPER 2

41

The approximate areas of two states are listed below.

- Texas:  $2.69 \times 10^5$  square miles
- Rhode Island:  $1.21 \times 10^3$  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.

$$2.69 \times 10^5 = 269000$$

$$1.21 \times 10^3 = 1210$$

$$\begin{array}{r} 269000 \\ - 1210 \\ \hline 267790 \end{array}$$

$$2.6779 \times 10^5$$

Answer  $2.6779 \times 10^5$  square miles

### Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The difference is correctly calculated and written in scientific notation.

## GUIDE PAPER 3

41

The approximate areas of two states are listed below.

- Texas:  $2.69 \times 10^5$  square miles
- Rhode Island:  $1.21 \times 10^3$  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.*

$$2.69 \times 10^5 = 269000$$

$$1.21 \times 10^3 = 1210$$

$$269000 - 1210 = 267790$$

**Answer**

$$2.6779 \times 10^5$$

square miles

### Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The difference is correctly calculated and written in scientific notation.

## GUIDE PAPER 4

41

The approximate areas of two states are listed below.

- Texas:  $2.69 \times 10^5$  square miles
- Rhode Island:  $1.21 \times 10^3$  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.*

$$\begin{aligned}2.69 \times 10^5 &= 269000 \\1.21 \times 10^3 &= 1210 \\269000 - 1210 &= 267790 \text{ square miles}\end{aligned}$$

*Answer*

267790

square miles

### Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The difference is correctly calculated, but it is not written in scientific notation. The response addresses only some elements of the task.

# GUIDE PAPER 5

41

The approximate areas of two states are listed below.

- Texas:  $2.69 \times 10^5$  square miles
- Rhode Island:  $1.21 \times 10^3$  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.

$$\begin{array}{r} 2.69 \times 10^5 \\ - 1.21 \times 10^3 \\ \hline \end{array}$$

$$\begin{array}{r} 1.48 \times 10^2 \\ - 264800 \\ \hline 1210 \end{array}$$

$$\begin{array}{r} 2.69000 \\ - 2.64800 \\ \hline 45200 \\ 1210 \\ \hline 268790 \end{array}$$

$$\begin{array}{r} 2.68790 \\ - 1210 \\ \hline 2.7 \times 10^5 \end{array}$$

$$\begin{array}{r} 1210 \\ \hline 1310 \end{array}$$

Answer  $2.7 \times 10^5$  square miles

## Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. After an initial incorrect attempt, the difference is correctly calculated and written in scientific notation; however, the answer should not be rounded or truncated.

# GUIDE PAPER 6

41

The approximate areas of two states are listed below.

- Texas:  $2.69 \times 10^5$  square miles
- Rhode Island:  $1.21 \times 10^3$  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.*

$$2.69 \times 10 \text{ exponent } 5 + 1.21 \times 10 \text{ exponent } 3$$

$$269000 + 1210 = 270210$$

$$2.70210 \times 10 \text{ exponent } 5$$

$$2.70210 \times 10 \text{ exponent } 5$$

*Answer*

square miles

## Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. Although the areas are inappropriately added rather than subtracted, they are correctly converted both from, and the answer back to, scientific notation. The response correctly addresses only some elements of the task.

## GUIDE PAPER 7

41

The approximate areas of two states are listed below.

- Texas:  $2.69 \times 10^5$  square miles
- Rhode Island:  $1.21 \times 10^3$  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.*

$$\text{Texas} = 2.69 \times 10^5 = 269,000$$

$$\text{Rhode island} = 1.21 \times 10^3 = 1,210$$

*Answer*

The square mile of Texas is  
269,000 and the square mile of  
Rhode island is 1,210

square miles

### Score Point 0 (out of 2 points)

Although the areas are correctly converted to standard notation, no other manipulations are performed on the numbers. Holistically, this procedure alone is not sufficient to demonstrate even a limited understanding of the concepts in the task.

# GUIDE PAPER 8

Additional

41

The approximate areas of two states are listed below.

- Texas:  $2.69 \times 10^5$  square miles
- Rhode Island:  $1.21 \times 10^3$  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.*

$$2.96 \times 10^5 - 1.21 \times 10^3$$

$$1.75 \times 10^2$$

*Answer*

$$1.75 \times 10^2$$

square miles

## Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the concepts in the task. One of the areas is transcribed incorrectly, and the answer indicates no understanding of the correct method to subtract numbers with different powers of ten.

## EXEMPLARY RESPONSE

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.*

**When  $x$  increases by 2,  $y$  increases by 1. Continuing that pattern of  $(x + 2, y + 1)$ , the next pair will be  $(4, 0)$ .**

***The pattern may also be continued to more negative values to  $(-4, -4)$ .***

**OR**

**The rate of change of the linear function is  $\frac{-2 - (-3)}{0 - (-2)} = \frac{1}{2}$ .**

**The point  $(0, -2)$  represents the  $y$ -intercept of  $-2$ , so the equation of the function is  $y = \frac{1}{2}x - 2$ .**

$$\frac{1}{2}(4) - 2 = 0$$

***Any point shown to be on this line (with work), and that is not one of the original coordinate pairs, is an acceptable answer.***

***or other valid process***

**Answer  $x = \underline{\hspace{2cm}}\text{4}\underline{\hspace{2cm}}$**

**$y = \underline{\hspace{2cm}}\text{0}\underline{\hspace{2cm}}$  or other valid coordinates**

# GUIDE PAPER 1

Additional

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.

$$\frac{-2+3}{0+2} = \frac{1}{2}$$
$$y = \frac{1}{2}x - 2 \quad -2 = \frac{1}{2}(-4) - 2$$

$$-3.5 = \frac{1}{2}(-3) - 2$$
$$-3.5 = -3.5 \checkmark$$

Answer       $x = \underline{\hspace{2cm}} \underline{-3}$

$y = \underline{\hspace{2cm}} \underline{-3.5}$

## Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. A correct coordinate pair is determined by creating an algebraic equation of the linear function.

## GUIDE PAPER 2

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.

$$(4, 0)$$

$$0 - (-2) = 2$$

$$(-2) - (-3) = 1$$

$$(x, y) - (2, -1) = (2, 1)$$

$$\begin{cases} x - 2 = 2 \\ y + 1 = 1 \end{cases}$$

$$\begin{cases} y = 0 \\ x = 4 \end{cases}$$

$$(4, 0)$$

Answer

$$x = 4$$

$$y = 0$$

### Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. A correct coordinate pair is determined by extending the pattern in the set.

# GUIDE PAPER 3

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.*

The x values always increase by 2, therefore the next value should be 4  
The y values always increase by 1, therefore the next value should be 0

$$\begin{array}{ccc} -2 & -3 \\ 0 & -2 & b = -2 \\ 2 & -1 \\ x & y & m = \frac{1}{2} \end{array}$$

Answer: (4,0)

Check:  $y = \frac{1}{2} x - 2$

$$0 = \frac{1}{2} (4) - 2 \quad \frac{1}{2} \times 4 = 2$$

$$0 = 2 - 2 \quad \text{Check}$$

Answer  $x =$

$y =$

## Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. A correct coordinate pair is determined by extending the pattern in the set as well as checking the coordinates using the equation of the function.

## GUIDE PAPER 4

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.*

-2+2 = 0 thus thus the rate of change is +2 or plus two.

*Answer*  $x =$

(4) is the  
missing x  
half ordered  
pair to the  
set.

$y =$   
(1) is the  
missing y  
half of the  
ordered pair  
to the set.

### Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The pattern of the  $x$ -coordinates is correctly identified and applied, but it is incorrectly referred to as the rate of change and the same pattern is incorrectly applied to the  $y$ -coordinate. The response correctly addresses only some elements of the task.

# GUIDE PAPER 5

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.*

-2, 0, 2, 4, 6- goes up by 2  
-3, -2, -1, 0- goes down by 1

*Answer*

## Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The pattern of the  $x$ -coordinates is correctly identified and applied, but the pattern and solution for the  $y$ -coordinate are incorrect. The response correctly addresses only some elements of the task.

## GUIDE PAPER 6

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.*

$$\frac{-2 - -3}{0 - -2} = 1/2$$

*Answer*  $x =$

$y =$

### Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. A correct coordinate pair is determined; however, while the work correctly calculates the slope of the function, it is not clear how the slope was used to obtain the answer. The response contains the correct solution but the required work is incomplete.

# GUIDE PAPER 7

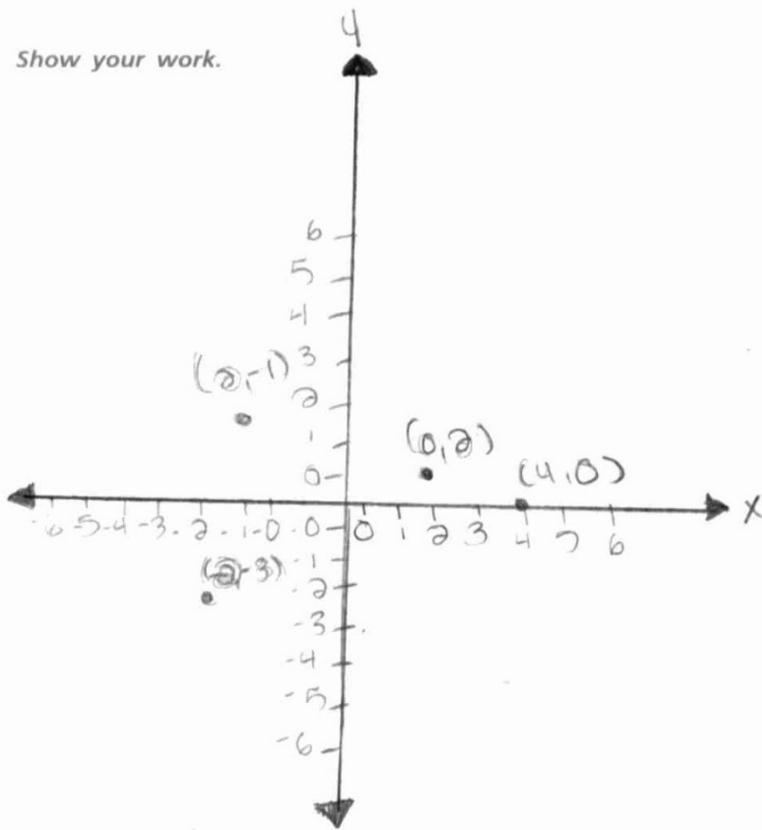
42

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

$$x = \underline{\hspace{2cm}} 4 \underline{\hspace{2cm}}$$

$$y = \underline{\hspace{2cm}} 0 \underline{\hspace{2cm}}$$

## Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the concepts in the task. The correct answer is not supported by the work: the given ordered pairs are plotted incorrectly and the axes are labeled inaccurately (four separate tic marks are labeled 0, none of which are the origin/point of intersection).

# GUIDE PAPER 8

Additional

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.*

$$(-2, -3), (0, -2)$$

*Answer*  $x =$

$$(4, 0)$$

$y =$

## Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the concepts in the task. The correct answer is given with no original student work: the ordered pairs in the work are already provided by the prompt. Per Scoring Policy #3, the response receives no credit.

## EXEMPLARY RESPONSE

43

Solve the system of equations shown below.

$$\begin{aligned}2x - 6y &= -12 \\x + 2y &= 14\end{aligned}$$

*Show your work.*

*Using the substitution method:*

$$\begin{aligned}x + 2y &= 14 \\x &= 14 - 2y\end{aligned}$$

$$\begin{aligned}2x - 6y &= -12 \\2(14 - 2y) - 6y &= -12 \\28 - 4y - 6y &= -12 \\-10y &= -40 \\y &= 4\end{aligned}$$

$$\begin{aligned}x + 2(4) &= 14 \\x &= 14 - 8 \\x &= 6\end{aligned}$$

*or other valid process*

*Answer* (6, 4)      or       $x = 6$  and  $y = 4$

# GUIDE PAPER 1

Additional

43

Solve the system of equations shown below.

$$\begin{aligned}2x - 6y &= -12 \\x + 2y &= 14\end{aligned}$$

Show your work.

$$\begin{aligned}-\frac{1}{2}(2x - 6y = -12) &= -1x + 3y = 6 \\x + 2y = 14 &= x + 2y = 14 \\&= 5y = 20 \\&= y = 4 \\x + 2(4) &= 14 \\x + 8 &= 14 \\x &= 6\end{aligned}$$

Answer

(6,4)

## Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The system of equations is solved correctly using the elimination method.

## GUIDE PAPER 2

43

Solve the system of equations shown below.

$$\begin{aligned}2x - 6y &= -12 \\x + 2y &= 14\end{aligned}$$

Show your work.

$$\begin{array}{lll}2x-6y=-12 & 2x-6y=-12 & 6+2y=14 \\x+2y=14 & 2x-6(7-\frac{1}{2}x)=-12 & 2y=8 \\-x & 2x-42+3x=-12 & y=4 \\2y=14-x & 5x-42=-12 & \\2 & 5x=30 & \\y=7-\frac{1}{2}x & x=6 & \end{array}$$

Answer

Solution: (6,4)

### Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The system of equations is solved correctly using the substitution method.

# GUIDE PAPER 3

43

Solve the system of equations shown below.

$$\begin{aligned}2x - 6y &= -12 \\x + 2y &= 14\end{aligned}$$

Show your work.

$$\begin{aligned}2x - 6y &= -12 \\x + 2y &= \frac{14 - 4}{2} \\&\quad y = 2 + \frac{1}{3}x \\y &= 7 - \frac{1}{2}x\end{aligned}$$

$$\begin{aligned}7 - \frac{1}{2}x &= 2 + \frac{1}{3}x \\-\frac{1}{2}x &= \frac{1}{3}x \\+\frac{1}{2}x &= \frac{1}{2} \\0 &= \frac{5}{6}x \\0 &= \frac{5}{6}x \\0 &= x \\y &= mx + b \\y &= 6\end{aligned}$$

Answer (6, 4)

## Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The system of equations is solved correctly by writing both equations in slope-intercept form and setting them equal to each other.

# **GUIDE PAPER 4**

43

Solve the system of equations shown below.

$$\begin{aligned}2x - 6y &= -12 \\x + 2y &= 14\end{aligned}$$

*Show your work.*

$$\begin{aligned}
 2x - 6y &= -12 \\
 x + 2y &= 14 \\
 \\ 
 2x - 6y &= -12 & 2x - 6y &= -12 \\
 -2(x + 2y = 14) && -2x + -4y &= -28 \\
 && -10y &= -40 \\
 && \underline{-} & \underline{-} \\
 && -10 & -10 \\
 && y &= 4
 \end{aligned}$$

### **Answer**

$$y=4$$

### **Score Point 1 (out of 2 points)**

This response demonstrates only a partial understanding of the concepts in the task. The elimination method is used to solve the system of equations; however, only the  $y$ -coordinate of the solution is calculated. The response correctly addresses only some elements of the task.

# GUIDE PAPER 5

43

Solve the system of equations shown below.

$$\begin{aligned}2x - 6y &= -12 \\x + 2y &= 14\end{aligned}$$

Show your work.

$$\begin{array}{rcl}2(x + 2y = 14) & = & \begin{array}{r}2x + 4y = 28 \\ - 2x - 6y = -12 \\ \hline 10y = 16\end{array} & x + 2(1.6) & = & 14 \\ & & & - x + 3.2 & = & 14 \\ & & & 3.2 & & 3.2 \\ & & & \hline x & = & 10.8\end{array}$$
$$\begin{array}{l}16 \div 10 = 1.6 \\ y = 1.6\end{array}$$

Answer

$$x = 10.8 \quad y = 1.6$$

## Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The elimination method is used to solve the system of equations; however, an arithmetic error [ $28 - (-12) \neq 16$ ] leads to an incorrect value of  $y$ . The value of  $x$  is correct based on the incorrect value of  $y$ . The response contains an incorrect solution but applies an appropriate process.

## GUIDE PAPER 6

43

Solve the system of equations shown below.

$$\begin{aligned}2x - 6y &= -12 \\x + 2y &= 14\end{aligned}$$

Show your work.

$$\begin{array}{l}(1) 2x - 6y = -12 \\(2) x + 2y = 14\end{array}$$

$$\begin{array}{r}\cancel{2x - 6y = -12} \\ \underline{-2x - 4y = -28} \\ \cancel{-10y = -40} \\ -10 \\ y = -30\end{array}$$

Answer  $y = -30$

### Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The elimination method is used to solve the system of equations; however, only the  $y$ -coordinate of the solution is calculated, and it is incorrect due to an arithmetic error. The response contains an incorrect solution but applies an appropriate process.

# **GUIDE PAPER 7**

43

Solve the system of equations shown below.

$$\begin{aligned}2x - 6y &= -12 \\x + 2y &= 14\end{aligned}$$

*Show your work.*

$$-\frac{2x}{3} - 6y = \frac{-12 - 2x}{-6}$$

$$y = 2 - 0.3x$$

$x$	$y$
-2	2.6
-1	2.3
0	2
1	1.2
2	1.4
3	1.1
4	0.8
5	0.5
6	0.2
7	-0.1
8	-0.4

$$\begin{array}{r}
 x \mid 1 \\
 -2 \mid 26 \\
 \hline
 -1 \mid 23 \\
 \hline
 0 \mid 2 \\
 \hline
 1 \mid 2.3 \\
 \hline
 2 \mid 2.6 \\
 \hline
 3 \mid 2.9 \\
 \hline
 4 \mid 0.8 \\
 \hline
 5 \mid 3.5 \\
 \hline
 6 \mid 3.8 \\
 \hline
 7 \mid 4.1
 \end{array}
 \quad
 \begin{array}{l}
 x + 2y = 14 - x \\
 \hline
 2
 \end{array}
 \quad
 y = 7 - x$$

x	v
-2	9
-1	8
0	7
1	6
2	5
3	4
4	0
5	2
6	1
7	0
8	-1

### *Answer*

$$(7, 0)$$

**Score Point 0 (out of 2 points)**

Although there may be some recognition that the solution is a common coordinate pair between both equations, holistically this response is not sufficient to demonstrate even a limited understanding of the concepts in the task. Both equations are written in slope-intercept form incorrectly, and the solution of  $(7, 0)$  is not supported by the tables in the work since the left-most table contains  $(7, -0.1)$  and is not an exact match.

# GUIDE PAPER 8

Additional

43

Solve the system of equations shown below.

$$\begin{aligned}2x - 6y &= -12 \\x + 2y &= 14\end{aligned}$$

Show your work.

$$\begin{aligned}2x - 6y &= -12 \\x + 2y &= 14\end{aligned}$$

$$\begin{aligned}3x - 8y &= 2 \\-8 &\quad -8 \\3x &= 6 \\-3 &\quad -3 \\x &= 3\end{aligned}$$

1x = 2

Answer

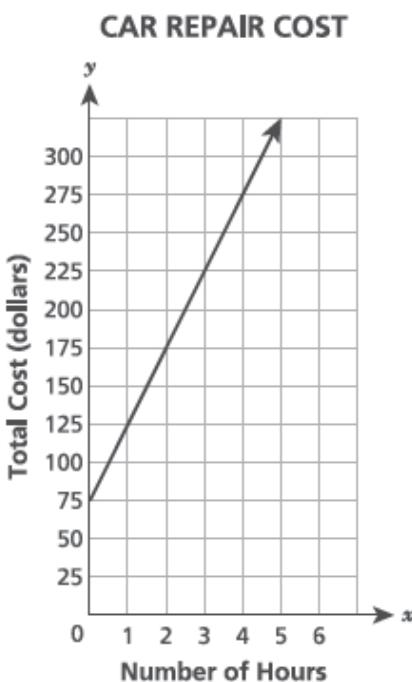
## Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the concepts in the task. The work drops the variable  $y$  and displays no understanding of how to correctly isolate each variable.

## EXEMPLARY RESPONSE

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.



What equation represents this linear function?

*Show your work.*

$$y = mx + b$$

$$m = \frac{175 - 75}{2 - 0} = 50$$

$$b = 75 \text{ from the point } (0, 75)$$

*or other valid process*

*Equation*

---

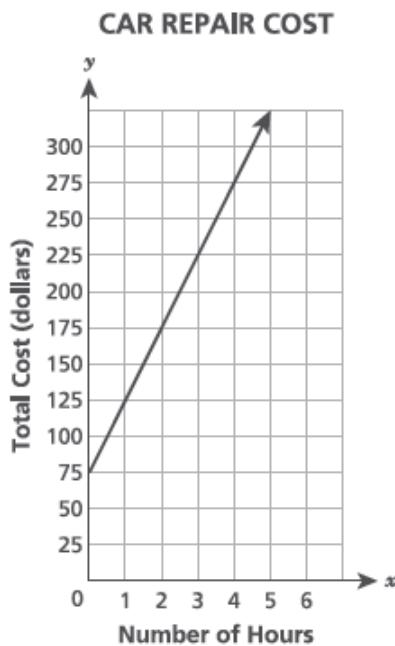
$$y = 50x + 75$$

# GUIDE PAPER 1

Additional

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.



What equation represents this linear function?

*Show your work.*

$$\begin{aligned}y &= mx + b \\b &= 75 \\m &= \frac{\Delta y}{\Delta x} \\&= \frac{125 - 75}{1 - 2} = \frac{-50}{-1} = \frac{50}{1} = 50 \\y &= 50x + 75\end{aligned}$$

*Equation*

$$y = 50x + 75$$

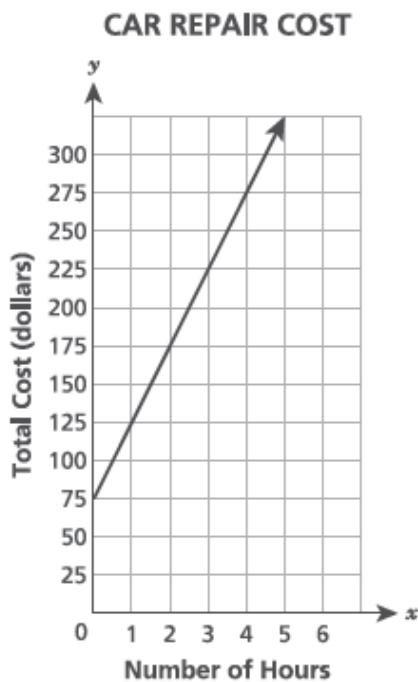
**Score Point 2 (out of 2 points)**

This response demonstrates a thorough understanding of the concepts in the task. The equation of the function is correct with sufficient supporting work.

## GUIDE PAPER 2

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.



What equation represents this linear function?

*Show your work.*

$$y = mx + b$$

Line starts at 75; 75 is the Y- intercept or "b"  
From 0 to 1, it goes to 125, then from 1 to 2 it goes up to 175; so the slope of the line is 50

*Equation*

$$y = 50x + 75$$

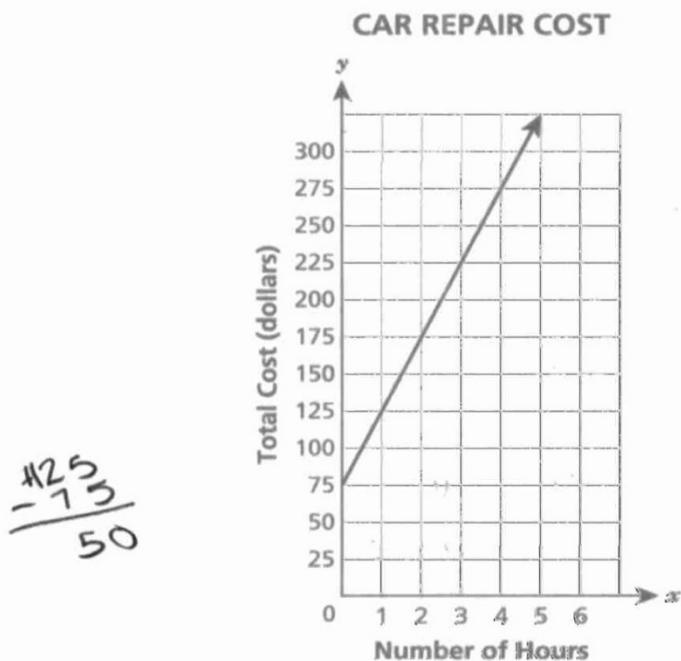
### Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The equation of the function is correct with sufficient supporting work.

# GUIDE PAPER 3

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.



What equation represents this linear function?

Show your work.

$$y = 75 + 50x$$

CK:  
 $y = 75 + 50(3)$   
 $y = 75 + 150$   
 $y = 225$

Equation  $y = 75 + 50x$

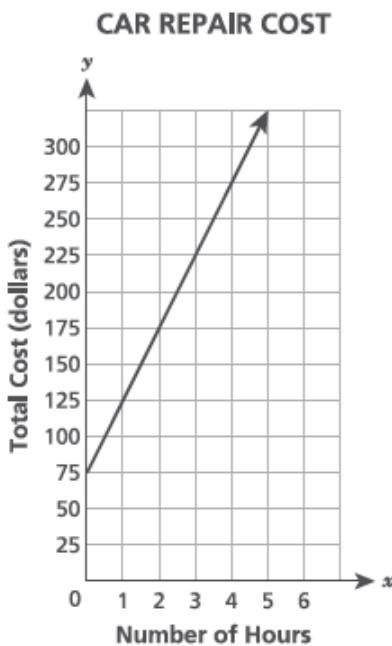
## Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The equation of the function is correct with sufficient supporting work. The single difference  $+125 - 75 = 50$  is enough to establish slope because the  $x$ -values are consecutive integer inputs.

# GUIDE PAPER 4

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.



What equation represents this linear function?

*Show your work.*

$$\begin{array}{r} (1, 125) \quad (2, 175) \\ 175 - 125 \\ \hline 2 - 1 \end{array}$$

$$\frac{50}{1}$$

Slope = 50

$$\begin{aligned} Y &= Mx + B \\ 125 &= 50 \times 1 + B \\ 125 &= 50 + b \\ -125 & \quad -50 \\ \hline 75 & \\ 75 &= b \end{aligned}$$

*Equation*

$$Y = 50x + 75$$

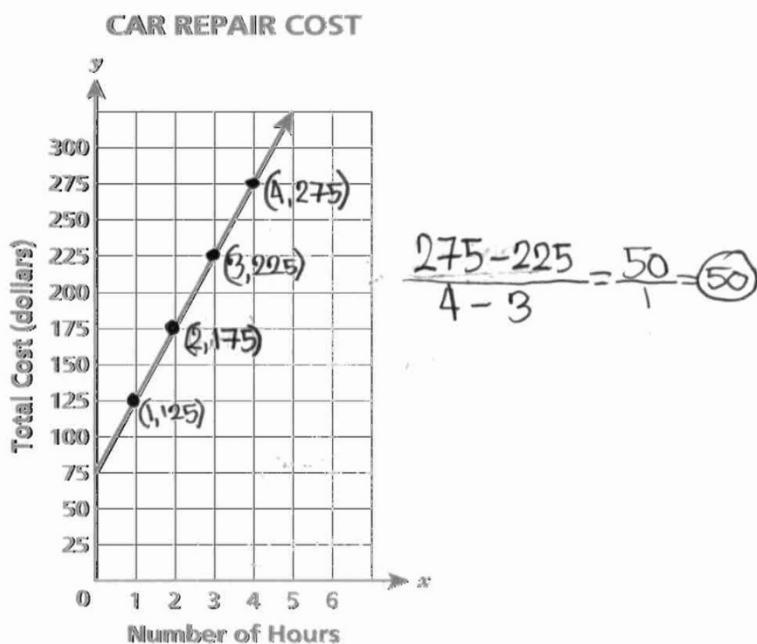
## Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The slope and  $y$ -intercept of the function are calculated correctly, but the equation is missing the variable  $x$ . The response contains an incorrect solution but applies an appropriate process.

# GUIDE PAPER 5

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.



What equation represents this linear function?

Show your work.

Equation  $y = 75x + 50$

GO ON

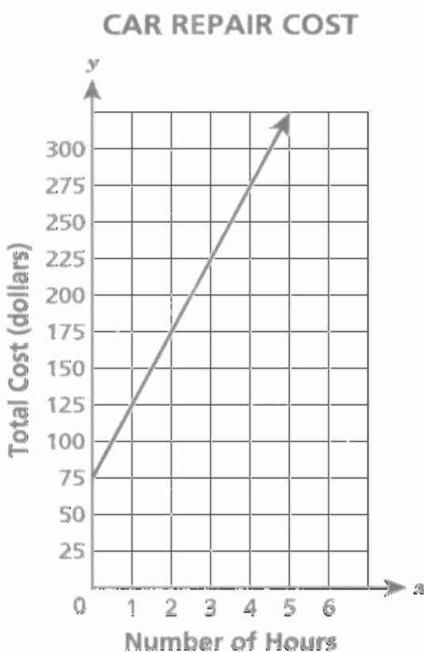
## Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The slope of the function is calculated correctly and there is a recognition that the value 75 is needed, but the equation is written incorrectly with the values for the slope and  $y$ -intercept transposed. The response correctly addresses only some elements of the task.

# GUIDE PAPER 6

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.



What equation represents this linear function?

*Show your work.*

*Equation  $y = mx + b = y = 2x + 75$*

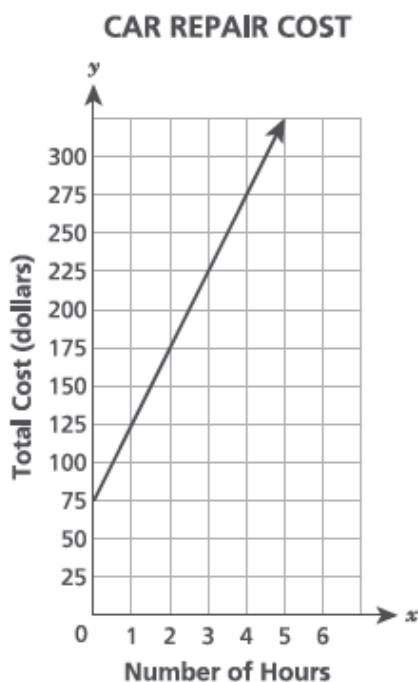
## Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The  $y$ -intercept of the function is correct, with the statement of  $y = mx + b$  considered as enough work to support it; however, the slope is incorrect and indicates a misunderstanding of the scale of the  $y$ -axis. The response correctly addresses only some elements of the task.

# GUIDE PAPER 7

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.



What equation represents this linear function?

*Show your work.*

for every hour the repair shop charges \$25.  
It has an pattern

*Equation*

1 hour=\$125  
2 hours=\$175  
3 hours=\$225

**Score Point 0 (out of 2 points)**

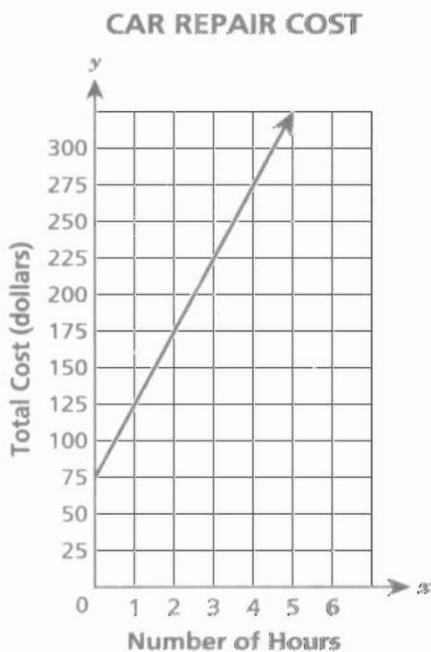
This response is not sufficient to demonstrate even a limited understanding of the concepts in the task. The slope is determined incorrectly, the  $y$ -intercept is not addressed, and there is no equation included.

# GUIDE PAPER 8

Additional

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.



What equation represents this linear function?

Show your work.

Equation  $y = 25x + 75$

**Score Point 0 (out of 2 points)**

This response is not sufficient to demonstrate even a limited understanding of the concepts in the task. Although the  $y$ -intercept of the equation is correct, there is nothing else written on the page that could be considered supporting work. Per Scoring Policy #3, the response must receive no credit.

## EXEMPLARY RESPONSE

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.*

$$\frac{8.3}{2.5} = \frac{16.6}{5} = 3.32$$

$$3.32 - 2.8 = 0.52$$

*or other valid process*

*Answer* \$ 0.52 per gallon

# GUIDE PAPER 1

Additional

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.*

$$\begin{array}{r} 8.30 \\ - 2.5 \\ \hline 3.32 \\ - 2.80 \\ \hline .52 \end{array}$$

*Answer* \$  per gallon

## Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The difference in the unit rates between the two gas stations is calculated correctly using sound procedures.

## GUIDE PAPER 2

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.*

$$c = 2.80g \quad (2.5, 8.30) \quad (5, 16.60)$$

$$\frac{16.60 - 8.30}{5 - 2.5} = \frac{8.3}{2.5} = 3.32 \quad c = 3.32g$$

$$3.32 - 2.80 = 0.52$$

*Answer* \$ 0.52 per gallon

### Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The difference in the unit rates between the two gas stations is calculated correctly using sound procedures.

# GUIDE PAPER 3

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.

$$\text{gas station } 2 \quad \frac{\$8.30}{2.5} = \$3.32$$

$$2 = \$3.32 \text{ per gallon}$$
$$1 = \$2.80 \text{ per gallon}$$

$$\begin{array}{r} 3.32 \\ - 2.80 \\ \hline \boxed{0.52} \end{array}$$

Answer \$ 0.52 per gallon

## Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The difference in the unit rates between the two gas stations is calculated correctly using sound procedures.

## GUIDE PAPER 4

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.

$$\begin{array}{c|c|c} \frac{1}{\times} & = & \frac{2.5}{8.30} \\ \hline 2.5x & = & \frac{8.30}{2.5} \\ \hline 2.5 & & \\ \hline x & = & 3.32 \end{array}$$

Answer \$ 2.80 per gallon

### Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The unit rate of the second gas station is calculated correctly, but the unit rate of the first gas station is written in the answer space rather than the difference between the rates of the two stations. The response correctly addresses only some elements of the task.

## GUIDE PAPER 5

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.*

$$8.30 \div 2.5 = 3.32$$

3.32

*Answer* \$ 3.32 per gallon

### Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The unit rate of the second gas station is calculated correctly, but the difference between the rates of the two stations is not determined. The response correctly addresses only some elements of the task.

## GUIDE PAPER 6

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.

$$\begin{aligned}C &= 2.80g \\C &= 3.32g\end{aligned}$$

$$\begin{array}{r} 2.13 \\ \times 3.22 \\ \hline -426 \\ 651 \\ \hline .52 \end{array}$$

Answer \$ 0.52 per gallon

### Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The difference in the unit rates between the two gas stations is calculated correctly, but it is not clear how the \$3.32 per gallon rate was determined. The response contains the correct solution but the required work is incomplete.

## GUIDE PAPER 7

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.*

$$\begin{aligned}2.80 \times 5 &= 14 \\16.60 - 14 &= 2.60 \\2.80 \times 2.5 &= 7 \\8.30 - 7 &= 1.30\end{aligned}$$

*Answer* \$ 1.30 per gallon

### Score Point 0 (out of 2 points)

Although prices are correctly calculated and compared for 2.5 gallons and 5 gallons of gasoline, no attempt is made to calculate a rate in dollars per gallon. Holistically, this response is not sufficient to demonstrate even a limited understanding of the concepts in the task.

# GUIDE PAPER 8

Additional

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.

$$\begin{array}{l} 4.15 = 1.25 g \\ \$8.30 = 2.5 g \qquad C = 2.80g \\ \$16.60 = 5 g \end{array}$$

$$24.9 = 10g$$

Answer \$ • 15 per gallon

8.3 ~ 2.5	12.2 ~ 3.8
8.6 ~ 2.6	12.5 ~ 4.0
8.9 ~ 2.7	12.8 ~ 4.1
9.2 ~ 2.8	13.1 ~ 4.2
9.5 ~ 2.9	13.4 ~ 4.3
9.8 ~ 3.0	13.7 ~ 4.4
10.1 ~ 3.1	14 ~ 4.5
10.4 ~ 3.2	14.3 ~ 4.6
10.7 ~ 3.3	14.6 ~ 4.7
11 ~ 3.4	14.9 ~ 4.8
11.3 ~ 3.5	15.2 ~ 4.9
11.6 ~ 3.6	15.5 ~ 5.0
11.9 ~ 3.7	

GO ON

## Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the concepts in the task. The answer does not follow from the work and the work is incorrect.

## EXEMPLARY RESPONSE

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.*

### ***Transformation 1***

A 180° rotation maps  $(x, y)$  to  $(-x, -y)$ ,  
so vertex A $(2, -3)$  moves to  $(-2, 3)$ .

### ***Transformation 2***

A reflection over the  $x$ -axis maps  $(x, y)$  to  $(x, -y)$ ,  
so point  $(-2, 3)$  moves to  $(-2, -3)$ .

### ***Transformation 3***

A reflection over the  $y$ -axis maps  $(x, y)$  to  $(-x, y)$ ,  
so point  $(-2, -3)$  moves to  $(2, -3)$ .

This means that vertex A' is at the same location as vertex A.

*or other valid explanation*

# GUIDE PAPER 1

Additional

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.*

The 180 degree rotation about the axis makes the point A  $(2, -3)$  into the point  $(-2, 3)$ . it is then reflected over the  $x$  axis which creates the point in  $(-2, -3)$ , the final reflection over the  $y$  axis moves the point back to where it originated at  $(2, -3)$

## Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The changes in coordinates resulting from each transformation are described correctly. The response is complete and correct.

## GUIDE PAPER 2

46

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

- a rotation  $180^\circ$  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'.

$(2, -3)$

Explain your answer.

The rotation is  $180^\circ$ , reflecting over the x-axis first then it is the same as doing an rotation of  $180^\circ$  again making  $A = A'$

$(2, -3)$

$(-2, 3)$  rotation

$(-2, -3)$  reflection of x

$(2, -3)$  reflection of y

### Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The changes in coordinates resulting from each transformation are described correctly. The response is complete and correct.

## GUIDE PAPER 3

46

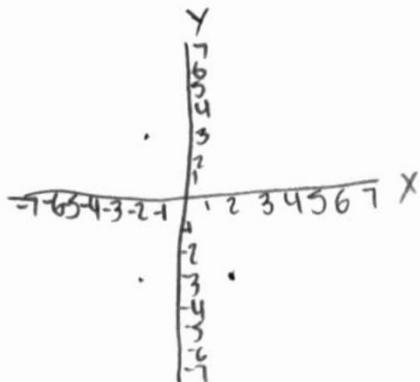
Triangle ABC goes through a series of three transformations, resulting in triangle A'B'C'. The three transformations are listed below.

- a rotation  $180^\circ$  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.*

If you do those transformations, point A will land on point A'. If you do a rotation of point A  $180^\circ$  clockwise, the point will be  $(-2, 3)$  then reflect it over the  $x$ -axis the point will be  $(-2, -3)$ , then reflect it over the  $y$ -axis the point will be  $(2, -3)$ .



### Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The changes in coordinates resulting from each transformation are described correctly. The response is complete and correct.

## GUIDE PAPER 4

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.*

First, the triangle rotates to coordinates  $(2,3)$ , then it reflects over the  $x$ -axis to  $(2,-3)$  then it reflects over the  $y$ -axis and the final coordinates are  $(-2,-3)$ .

### Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The rotation is performed incorrectly, but the changes in coordinates resulting from the reflections are treated correctly. The response correctly addresses only some elements of the task.

# GUIDE PAPER 5

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.

The three transformations map vertex A into vertex A' which will be from  $(2, -3) \rightarrow (2, -3)$ , which is no change because you'll first start off with using the formula of  $180^\circ$  clockwise  $180^\circ \rightarrow (-x, -y) \rightarrow (-2, 3)$ . Then, since you are reflecting across the x-axis, you will change the value of x, to the absolute value of x.  $(-2, 3) \rightarrow (2, 3)$ . Lastly, since you are reflecting across the y-axis, you will change the value of y to the absolute value of y.  $(2, 3) \rightarrow (2, -3)$ . Therefore, vertex A is preserved.

$$\begin{array}{ccc} (2, -3) & & (2, -3) \\ \downarrow & & \downarrow \\ 180^\circ \rightarrow (-x, -y) & \rightarrow & (-2, 3) \\ \downarrow & & \downarrow \\ \text{Reflection over } x\text{-axis} & & \\ \downarrow & & \downarrow \\ (-2, 3) & \rightarrow & (2, 3) \\ \downarrow & & \downarrow \\ \text{Reflection over } y\text{-axis} & & \\ \downarrow & & \downarrow \\ (2, 3) & \rightarrow & (2, -3) \end{array}$$

vertex A = **GO ON**

## Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The rotation is performed correctly; however, the description of the reflections is incorrect, changing the wrong coordinate of each pair and misusing “absolute value” to mean the opposite of a number. The response correctly addresses only some elements of the task.

## GUIDE PAPER 6

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.*

Rotation 180 degrees clockwise about the origin =  $2, -3 \times -x, -y = -2, 3$   
I rotated point A by 180 degrees by multiplying the coordinates to  $-x, -y$  so it would equal  $-2, 3$

$A' = -2, 3$

### Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The rotation is performed correctly, but the reflections are not addressed. The response correctly addresses only some elements of the task.

## GUIDE PAPER 7

46

Triangle ABC goes through a series of three transformations, resulting in triangle A'B'C'.

The three transformations are listed below.

- a rotation  $180^\circ$  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.*

The first transformation mapped the triangle on to its side. The second flipped it upside down and the third flipped it to the right to get to the final form.

### Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the concepts in the task. The explanation does not indicate any knowledge of how transformations affect the coordinates of points.

# GUIDE PAPER 8

Additional

46

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

- a rotation  $180^\circ$  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.*

*The rotation will turn it and the reflection cancels each other out.*

## Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the concepts in the task. The explanation does not indicate any knowledge of how transformations affect the coordinates of points and does not seem to recognize that the reflections occur over different lines.

## EXEMPLARY RESPONSE

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

$$\text{Step 1: } V = \frac{4}{3}\pi r^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(15)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi(3375)$$

$$\text{Step 4: } V = 4500\pi$$

### BILLY'S WORK

$$\text{Step 1: } V = \frac{4}{3}\pi r^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(7.5)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi\left(\frac{3375}{8}\right)$$

$$\text{Step 4: } V = \frac{1125}{2}\pi$$

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

*Explain your answer.*

Matt made an error in Step 2 because he used the diameter for  $r$  instead of using the radius, which is half the diameter.

*or other valid explanation*

# GUIDE PAPER 1

Additional

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

$$\text{Step 1: } V = \frac{4}{3}\pi r^3 \quad \checkmark$$

$$\text{Step 2: } V = \frac{4}{3}\pi(15)^3 \quad \times$$

$$\text{Step 3: } V = \frac{4}{3}\pi(3375)$$

$$\text{Step 4: } V = 4500\pi$$

## BILLY'S WORK

$$\text{Step 1: } V = \frac{4}{3}\pi r^3 \quad \checkmark$$

$$\text{Step 2: } V = \frac{4}{3}\pi(7.5)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi\left(\frac{3375}{8}\right)$$

$$\text{Step 4: } V = \frac{1125}{2}\pi \quad \checkmark$$

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

*Explain your answer.*

*Matt was the student that made the error because he used the 15 as a radius when it was the diameter.*

## Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The error that Matt made is correctly described.

## GUIDE PAPER 2

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

$$\text{Step 1: } V = \frac{4}{3}\pi r^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(15)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi(3375)$$

$$\text{Step 4: } V = 4500\pi$$

### BILLY'S WORK

$$\text{Step 1: } V = \frac{4}{3}\pi r^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(7.5)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi\left(\frac{3375}{8}\right)$$

$$\text{Step 4: } V = \frac{1125}{2}\pi$$

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

*Explain your answer.*

Matt made the error. Instead of using the radius for the formula like he was supposed too, he used the diameter. This then makes the answer all wrong.

### Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The error that Matt made is correctly described.

## GUIDE PAPER 3

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

$$\text{Step 1: } V = \frac{4}{3}\pi r^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(15)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi(3375)$$

$$\text{Step 4: } V = 4500\pi$$

### BILLY'S WORK

$$\text{Step 1: } V = \frac{4}{3}\pi r^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(7.5)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi\left(\frac{3375}{8}\right)$$

$$\text{Step 4: } V = \frac{1125}{2}\pi$$

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

*Explain your answer.*

Matt made the mistake because he used the diameter of the ball instead of cutting it in half to use the radius.

### Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the concepts in the task. The error that Matt made is correctly described.

# GUIDE PAPER 4

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.

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

$$V = \frac{4}{3} \pi (5)^3$$

$$V = \frac{4}{3} \pi 125$$

## MATT'S WORK

$$\text{Step 1: } V = \frac{4}{3} \pi r^3$$

$$\text{Step 2: } V = \frac{4}{3} \pi (15)^3$$

$$\text{Step 3: } V = \frac{4}{3} \pi (3375)$$

$$\text{Step 4: } V = 4500\pi$$

## BILLY'S WORK

$$\text{Step 1: } V = \frac{4}{3} \pi r^3$$

$$\text{Step 2: } V = \frac{4}{3} \pi (7.5)^3$$

$$\text{Step 3: } V = \frac{4}{3} \pi \left(\frac{3375}{8}\right)$$

$$\text{Step 4: } V = \frac{1125}{2}\pi$$

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

Explain your answer.

I think that matt made a mistake because the spherical ball has a diameter of 15 Centimeters and you suppose to find half of the diameter which is the radius and not multiply 15 by 3.

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

$$V = \frac{4}{3} \pi (5)^3$$

$$V = \frac{4}{3} \pi 125$$

GO ON

## Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The error that Matt made is correctly described; however, an additional misstatement (*and not multiply 15 by 3*), as well as incorrect work using  $r = 5$ , detract from the explanation. The response correctly addresses only some elements of the task.

## GUIDE PAPER 5

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

$$\text{Step 1: } V = \frac{4}{3}\pi r^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(15)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi(3375)$$

$$\text{Step 4: } V = 4500\pi$$

### BILLY'S WORK

$$\text{Step 1: } V = \frac{4}{3}\pi r^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(7.5)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi\left(\frac{3375}{8}\right)$$

$$\text{Step 4: } V = \frac{1125}{2}\pi$$

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

*Explain your answer.*

Matt made an error when he substituted r for 15

### Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The explanation correctly identifies that Matt should not have used the value of 15, but it is vague about why it was an error. The response correctly addresses only some elements of the task.

# GUIDE PAPER 6

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

$$\text{Step 1: } V = \frac{4}{3}\pi r^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(15)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi(3375)$$

$$\text{Step 4: } V = 4500\pi$$

## BILLY'S WORK

$$\text{Step 1: } V = \frac{4}{3}\pi d^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(7.5)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi\left(\frac{3375}{8}\right)$$

$$\text{Step 4: } V = \frac{1125}{2}\pi$$

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

*Explain your answer.*

Matt. The radius is the whole line through the middle of a circle. The diameter is half. Matt used the radius instead of the diameter.

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

## Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the concepts in the task. The explanation correctly identifies that Matt should have used half the value of 15 in the formula, but the terms “radius” and “diameter” are used incorrectly. The response correctly addresses only some elements of the task.

## GUIDE PAPER 7

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

$$\text{Step 1: } V = \frac{4}{3}\pi r^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(15)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi(3375)$$

$$\text{Step 4: } V = 4500\pi$$

### BILLY'S WORK

$$\text{Step 1: } V = \frac{4}{3}\pi r^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(7.5)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi\left(\frac{3375}{8}\right)$$

$$\text{Step 4: } V = \frac{1125}{2}\pi$$

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

*Explain your answer.*

Billy made a mistake in his work because, when he plugged in the radius of his sphere in his equation, he made it into a fraction instead of a whole number.

### Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the task. The error is not correctly identified and the explanation is incorrect.

# GUIDE PAPER 8

Additional

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

$$\text{Step 1: } V = \frac{4}{3}\pi r^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(15)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi(3375)$$

$$\text{Step 4: } V = 4500\pi$$

## BILLY'S WORK

$$\text{Step 1: } V = \frac{4}{3}\pi r^3$$

$$\text{Step 2: } V = \frac{4}{3}\pi(7.5)^3$$

$$\text{Step 3: } V = \frac{4}{3}\pi\left(\frac{3375}{8}\right)$$

$$\text{Step 4: } V = \frac{1125}{2}\pi$$

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

*Explain your answer.*

*Billy made an error. He made an error by Put 7.5 instead of 15 which makes it a different answer. Billy Put 7.5 for the Diameter when it should've been 15.*

## Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the task. The error is not correctly identified and the explanation is incorrect.

## EXEMPLARY RESPONSE

48

The two equations shown below represent different functions.

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

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

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

*Function P* nonlinear

*State your reason.*

- The  $x$  is in the denominator of the fraction      or
- The  $x$  has an implied exponent of  $-1$       or
- The equation cannot be put into slope-intercept form

*or other valid explanation*

*Function Q* linear

*State your reason.*

- The  $x$  has an exponent of 1      or
- The equation is in slope-intercept form

*or other valid explanation*

# GUIDE PAPER 1

Additional

48

The two equations shown below represent different functions.

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

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

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

Function P nonlinear

*State your reason.*

function P isn't in  $y=mx+b$  format,  
and cannot be simplified to be so.

Function Q linear

*State your reason.*

function Q is in  $y=mx+b$  format,  
the universally linear format.

## Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the concepts in the task. The (non)linearity of both functions are correctly identified and supported with sound reasoning. The phrase “*and cannot be simplified to be so*” is essential to the explanation for function P, as equivalent forms exist—standard form  $Ax + By = C$ , point-slope form  $y - y_1 = m(x - x_1)$ , etc.—that still represent linear functions.

## GUIDE PAPER 2

48

The two equations shown below represent different functions.

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

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

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

*Function P*

nonlinear

*State your reason.*

Function P is nonlinear because the variable is the denominator in the equation which means it has a negative exponent so it has an exponent other than 1.

*Function Q*

linear

*State your reason.*

Function Q is linear because the variable has an exponent of 1.

### Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the concepts in the task. The (non)linearity of both functions are correctly identified and supported with sound reasoning.

# GUIDE PAPER 3

48

The two equations shown below represent different functions.

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

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

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

*Function P*

nonlinear

*State your reason.*

this is because the 3 is divided by x

*Function Q*

linear

*State your reason.*

because it follows  $y=mx+b$

## Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the concepts in the task. The (non)linearity of both functions are correctly identified and supported with sound reasoning.

## GUIDE PAPER 4

48

The two equations shown below represent different functions.

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

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

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

*Function P*

non-linear

*State your reason.*

the function is nonlinear because it has an exponent of negative 1, and a linear function can't have a negative exponent.

*Function Q*

Linear

*State your reason.*

because it has a constant rate of change, has an exponent of 1, and forms a straight line

### Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the concepts in the task. The (non)linearity of both functions are correctly identified; however, the explanations are unclear about the exponents being attached to a variable. An exponent on a constant term would not factor into the linearity of a function. The response reflects some minor misunderstanding of the underlying concepts.

# GUIDE PAPER 5

48

The two equations shown below represent different functions.

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

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

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

*Function P*

nonlinear

*State your reason.*

Function P is nonlinear because it is not in proper  $y=mx+b$  form.

*Function Q*

linear

*State your reason.*

Function Q is linear because it is in proper  $y=mx+b$  form.

## Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the concepts in the task. The (non)linearity of both functions are correctly identified; however, the explanation for function P is incomplete, cf. Guide Paper #1. The response appropriately addresses most but not all aspects of the task.

# GUIDE PAPER 6

48

The two equations shown below represent different functions.

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

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

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

Function P Nonlinear

*State your reason.*

It is nonlinear b/c it has a y-intercept,  
but not a slope.

Function Q Linear

*State your reason.*

It is linear b/c it has a y-intercept  
+ it has a slope.

## Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the concepts in the task. The (non)linearity of both functions are correctly identified; however, the explanation for function P is slightly inaccurate. Function P does not have a *y*-intercept: there is a vertical asymptote at the *y*-axis. While a slope does exist for function P, “*but not a slope*” provides some recognition that it is not constant and therefore nonlinear. The explanation for function Q is sufficient to indicate slope-intercept form. The response reflects some minor misunderstanding of the underlying concepts.

# GUIDE PAPER 7

48

The two equations shown below represent different functions.

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

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

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

*Function P*

Nonlinear

*State your reason.*

Function P is a Nonlinear function because there can not be a fracti

*Function Q*

Is linear

*State your reason.*

It is linear because it can be on a graph

## Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the concepts in the task. The (non)linearity of both functions are correctly identified. The existence of a fraction alone does not impact linearity, but there is some indication that a variable in the denominator plays a role in function P. The explanation for function Q is irrelevant. The response reflects a lack of essential understanding.

# GUIDE PAPER 8

Additional

48

The two equations shown below represent different functions.

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

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

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

Nonlinear

Function P

*State your reason.*

In order for a function to be linear, it needs to have a slope and in an equation, "x" should be multiplied to the average rate of change not divided. In function P, the "x" is being divided by 3, instead of multiplied.

Linear

Function Q

*State your reason.*

In function Q, "x" is being multiplied to  $\frac{1}{3}$  showing that it is a function.

## Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the concepts in the task. The (non)linearity of both functions are correctly identified, but the explanation for function P is inaccurate (division is described in the incorrect order), though there is some indication that a variable in the denominator plays a role in function P. The explanation for function Q is vague, confusing linearity with being a function at all. The response addresses only some elements of the task correctly.

# GUIDE PAPER 9

48

The two equations shown below represent different functions.

$$\text{Function P: } y = \frac{3}{x} + 2 \quad \begin{matrix} 3 \uparrow \\ \hline x \end{matrix} \rightarrow$$

$$\text{Function Q: } y = \frac{1}{3}x + 2 \quad \begin{matrix} 1 \uparrow \\ \hline 3 \end{matrix} \rightarrow$$

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

Function P linear

*State your reason.*

It's in  $y = mx + b$  format.

Function Q linear

*State your reason.*

It's in  $y = mx + b$  format.

## Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the concepts in the task. The linearity of function Q is correctly identified and supported, but function P is incorrectly identified as also being in slope-intercept form. The response reflects a lack of essential understanding.

# GUIDE PAPER 10

48

The two equations shown below represent different functions.

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

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

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

**linear**

**Function P**

*State your reason.*

**linear is straight and non linear is not straight**

**non linear**

**Function Q**

*State your reason.*

**not straight an straight**

## Score Point 0 (out of 3 points)

This response is not sufficient to demonstrate even a limited understanding of the concepts in the task. Although the explanations relate straightness of a graph to its linearity, the identifications are incorrect, showing no understanding of how to relate the graph of a function to its algebraic form.

# GUIDE PAPER 11

Additional

48

The two equations shown below represent different functions.

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

Function Q:  $y = \frac{1}{3}x + 2 > 2.\overline{3}$

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

Function P linear

$$y = \frac{3}{x} + 2 \quad \frac{3}{1} + 2 = 5$$

State your reason.

$$y = \frac{1}{3}x + 2 =$$

because it comes to an end and  
is a whole number

Function Q nonlinear

State your reason.

is a repeating decimal.  
that doesn't end.

## Score Point 0 (out of 3 points)

This response is not sufficient to demonstrate even a limited understanding of the concepts in the task. Neither function is identified correctly and the explanations are irrelevant.