

Name: _____



New York State *Testing Program*

2017 Common Core Mathematics Test Book 1

Grade **8**

May 2–4, 2017

Released Questions

Book 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 choosing your response.
- You have been provided with mathematics tools (a ruler and a protractor) 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.

Grade 8 Mathematics Reference Sheet

CONVERSIONS

1 inch = 2.54 centimeters

1 meter = 39.37 inches

1 mile = 5,280 feet

1 mile = 1,760 yards

1 mile = 1.609 kilometers

1 kilometer = 0.62 mile

1 pound = 16 ounces

1 pound = 0.454 kilogram

1 kilogram = 2.2 pounds

1 ton = 2,000 pounds

1 cup = 8 fluid ounces

1 pint = 2 cups

1 quart = 2 pints

1 gallon = 4 quarts

1 gallon = 3.785 liters

1 liter = 0.264 gallon

1 liter = 1,000 cubic centimeters

FORMULAS

Triangle

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

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

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

1

A certain human red blood cell has a diameter of 0.000007 meters. Which expression represents this diameter, in meters, in scientific notation?

A 7×10^{-6}

B 7×10^{-5}

C 7×10^6

D 7×10^5

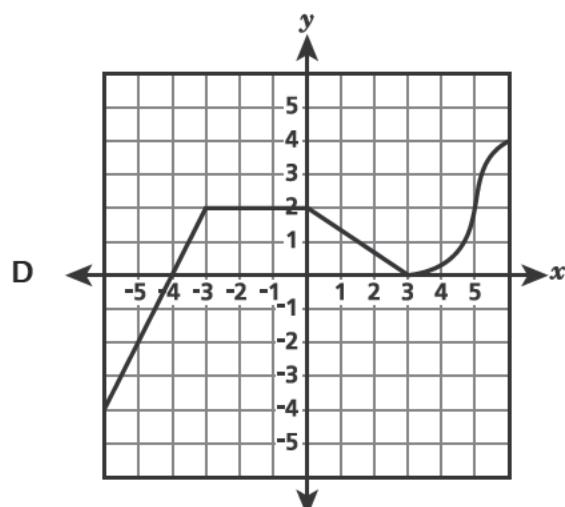
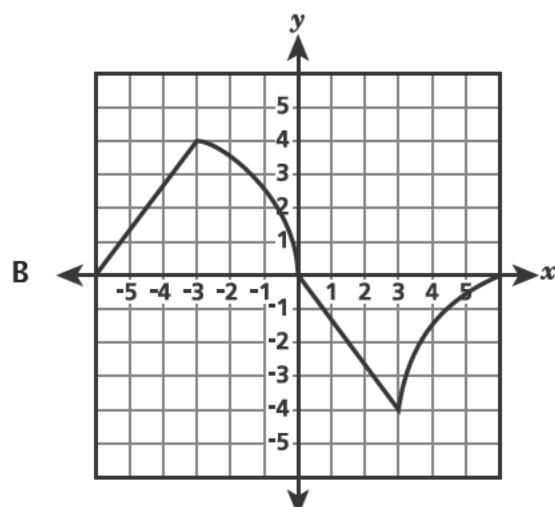
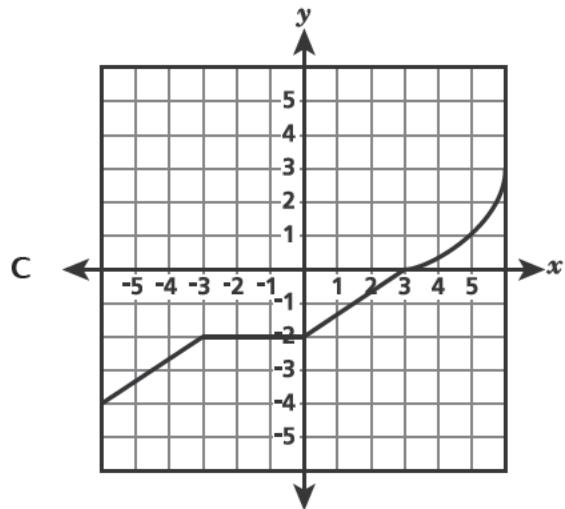
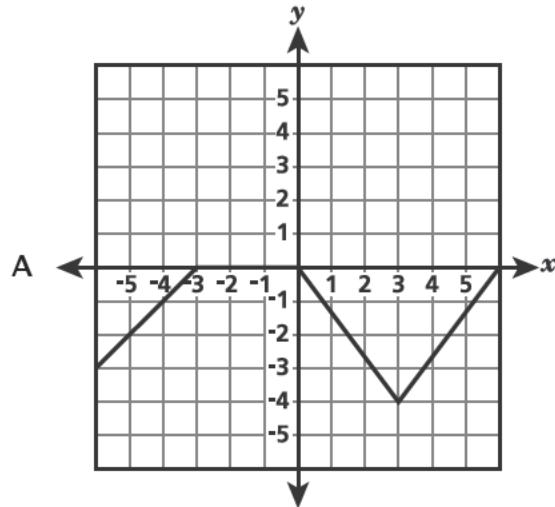
GO ON

2

A function has the following properties:

- It is increasing and linear when the value of x is between -5 and -3 .
- It remains constant when the value of x is between -3 and 0 .
- It is decreasing and linear when the value of x is between 0 and 3 .
- It is increasing and nonlinear when the value of x is between 3 and 5 .

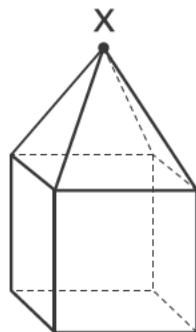
Which graph **best** represents this function?



GO ON

3

The figure shown below consists of a square pyramid on top of a cube. A vertical plane passes through point X and is perpendicular to the bases of both shapes, slicing the figure into equal halves.



What shape is created by the intersection of the vertical plane and these three-dimensional shapes?

- A square
- B triangle
- C hexagon
- D pentagon

GO ON

4

Ms. Gibson made an initial deposit of \$500 when opening a bank account. After the initial deposit, she deposited the same amount of money each month. The table below shows the total amount of money, a , she deposited into the account after a certain number of months, t , since opening it.

	Total Amount Depo i
4	\$1,500
8	\$2,500
10	\$3,000
13	\$3,750

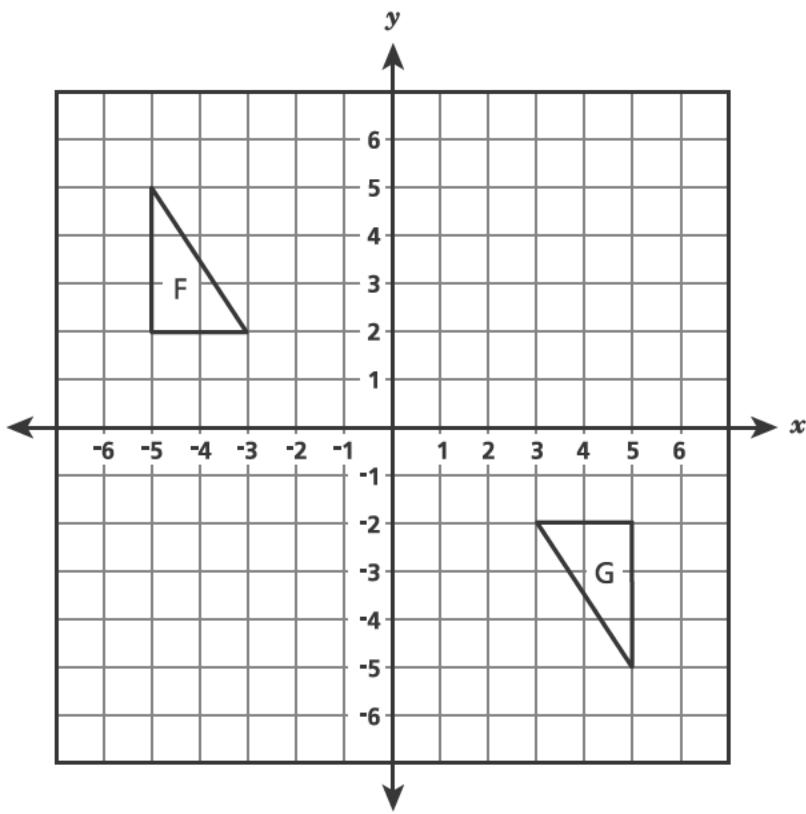
Which equation models the relationship between a and t ?

- A $a = 250t$
- B $a = 500t$
- C $a = 250t + 500$
- D $a = 500t + 250$

GO ON

5

Triangle F and triangle G are shown below.



Which sequence does **not** transform triangle F to triangle G?

- A a 180° clockwise rotation about the origin
- B a 180° counterclockwise rotation about the origin
- C a reflection over the x -axis and then a reflection over the y -axis
- D a reflection over the y -axis and then a 90° clockwise rotation about the origin

GO ON

6

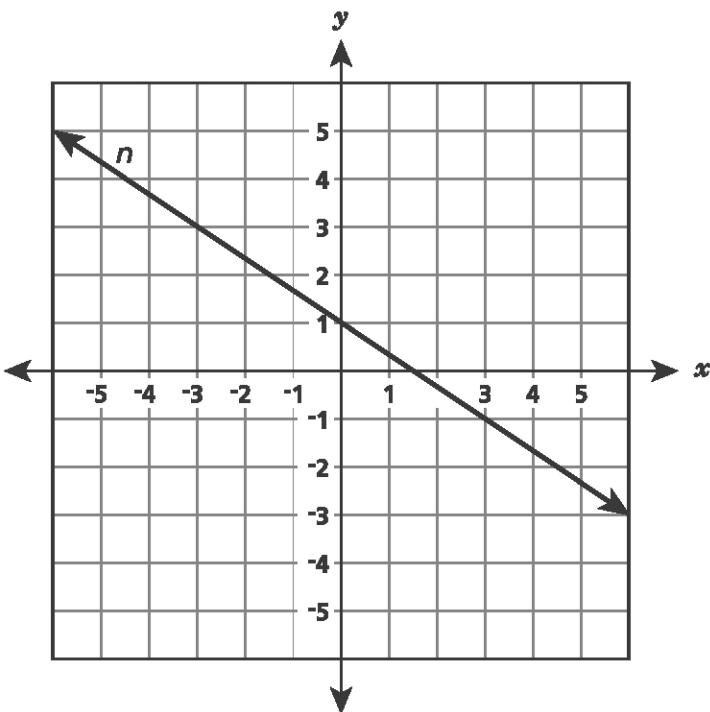
Which statement explains the type of function that is represented by the equation $y = x^2 + 9$?

- A The function is linear because it contains more than one term.
- B The function is linear because the variable x is raised to the second power.
- C The function is nonlinear because it contains more than one term.
- D The function is nonlinear because the variable x is raised to the second power.

GO ON

7

Line n is shown on the grid below.



Line q will be graphed on the same grid. The only solution to the system of linear equations formed by lines n and q occurs when $x = \frac{3}{2}$ and $y = 0$. Which equation could represent line q ?

- A $y = \frac{3}{2}x$
- B $y = \frac{4}{3}x - 2$
- C $y = -\frac{5}{2}x + 1$
- D $y = -\frac{2}{3}x + \frac{3}{2}$

GO ON

8

The table represents linear Function F.

<i>x</i>	<i>y</i>
4	18
6	24
10	36

The equation $y = 4x + 2$ represents Function G.

Which statement is true?

- A The rate of change of Function G is less than the rate of change of Function F because $2 < 3$.
- B The rate of change of Function G is less than the rate of change of Function F because $4 < 9$.
- C The rate of change of Function G is greater than the rate of change of Function F because $2 > \frac{9}{7}$.
- D The rate of change of Function G is greater than the rate of change of Function F because $4 > 3$.

GO ON

9

What is the solution to the equation shown below?

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

- A $x = -6$
- B $x = 4$
- C $x = -4.5$
- D $x = 9$

10

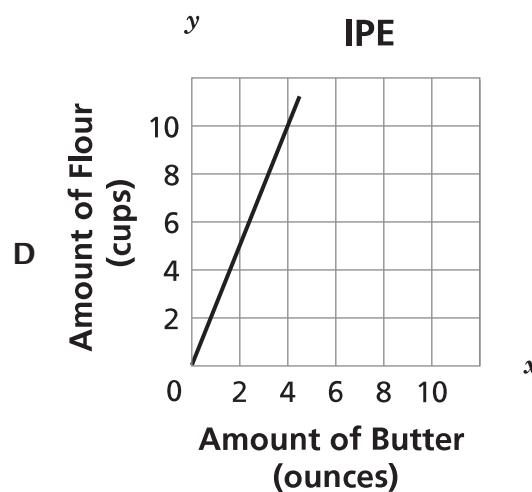
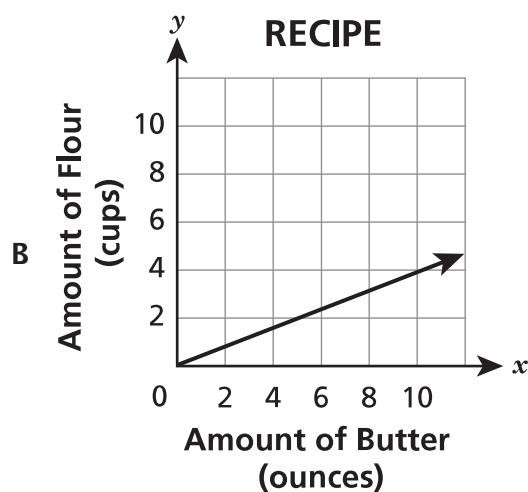
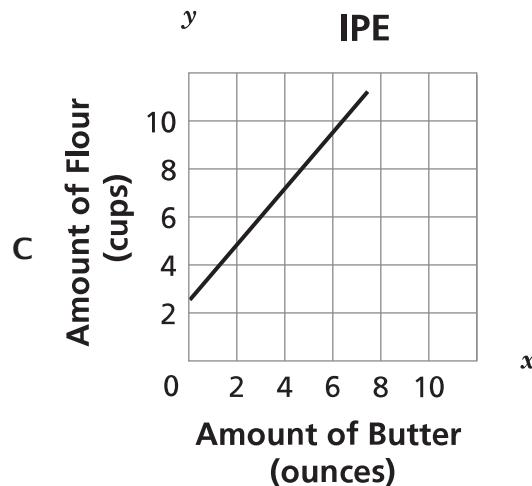
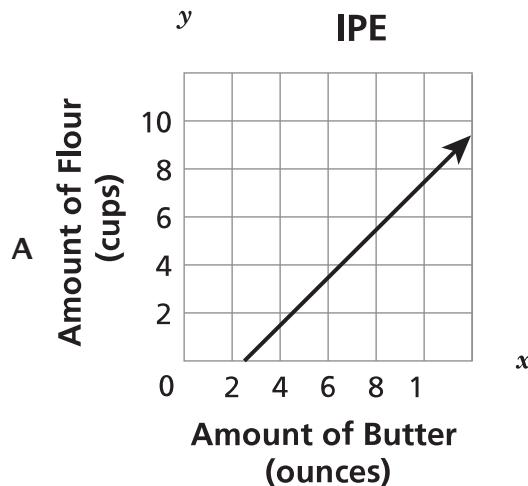
A company performed power tests on a set of batteries of the same type. The company determined that the equation $y = 100 - 8.9x$, where x is the number of hours of use and y is the percent of battery power remaining, models the battery life. Based on the equation, what is the **best** prediction of the percent of remaining power for a battery after 11 hours of use?

- A 1.2%
- B 2.1%
- C 10%
- D 97.9%

GO ON

15

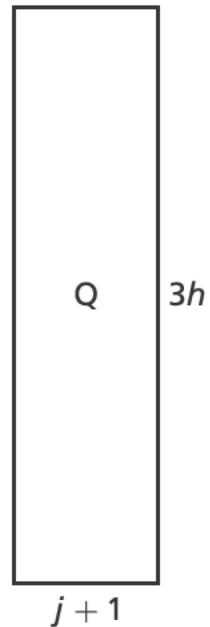
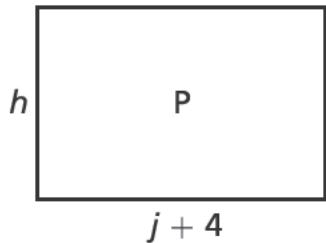
A cook uses 2.5 cups of flour for each ounce of butter in a recipe. Which graph represents the relationship between the amount of flour and the amount of butter in the recipe?



GO ON

18

Two rectangles are shown below. Rectangle P has a perimeter of 20 inches. Rectangle Q has a perimeter of 30 inches.



What are the values of j and h ?

- A $j = 3$ and $h = 3$
- B $j = 10$ and $h = 4$
- C $j = 2$ and $h = 4$
- D $j = 9.5$ and $h = 6.5$

GO ON

19

A school club had a T-shirt sale to raise money. After the sale, an inventory showed that 108 blue T-shirts and 96 green T-shirts had been sold. The sizes of these T-shirts included 60 small, 86 medium, and 58 large. Which table correctly represents these data?

NUMBER OF T-SHIRTS SOLD

A

Color	Small	Medium	Large
Blue	60	86	58
Green	60	86	58

B

NUMBER OF T-SHIRTS SOLD

Color	Small	Medium	Large
Blue	34	46	28
Green	26	40	30

C

NUMBER OF T-SHIRTS SOLD

Color	Small	Medium	Large
Blue	30	43	29
Green	30	43	29

D

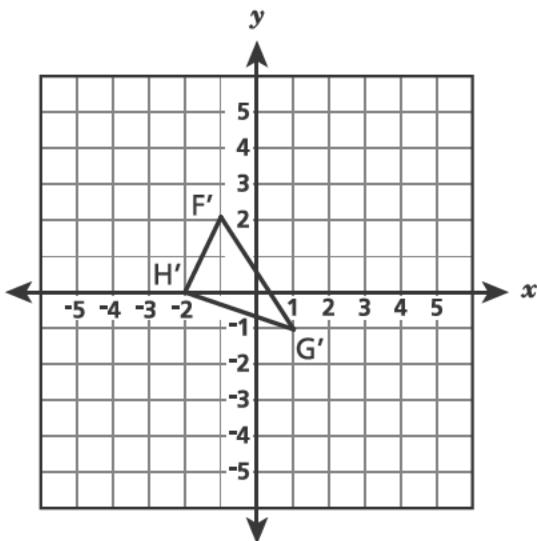
NUMBER OF T-SHIRTS SOLD

Color	Small	Medium	Large
Blue	26	40	30
Green	34	46	28

GO ON

20

The vertices of a triangle are located at $F(-4, -2)$, $G(2, 2)$, and $H(0, -4)$. A sequence of transformations to triangle FGH results in triangle $F'G'H'$, as shown below.



Which sequence of transformations to triangle FGH results in triangle $F'G'H'$?

- A a 90° clockwise rotation about the origin, then a dilation by a scale factor of 2 with a center of dilation at the origin
- B a 90° counterclockwise rotation about the origin, then a dilation by a scale factor of 2 with a center of dilation at the origin
- C a 90° counterclockwise rotation about the origin, then a dilation by a scale factor of $\frac{1}{2}$ with a center of dilation at the origin
- D a 90° clockwise 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

24 What is the value of n in the equation shown below?

$$2^2 \times 2^n = (2^4)^3$$

- A 5
- B 6
- C 10
- D 12

25 Which set of ordered pairs represents a function?

- A $\{(2, 7), (2, 8), (3, 8)\}$
- B $\{(3, 2), (3, 3), (3, 4)\}$
- C $\{(4, 1), (5, 1), (4, 4)\}$
- D $\{(5, 6), (8, 6), (9, 6)\}$

26 A parallelogram with vertices at $(0, 3)$, $(2, 0)$, $(4, 2)$, and $(2, 5)$ is reflected over the y -axis. Which vertex of the parallelogram will have the same x -coordinate before and after the reflection?

- A $(0, 3)$
- B $(2, 0)$
- C $(4, 2)$
- D $(2, 5)$

STOP

Book 2



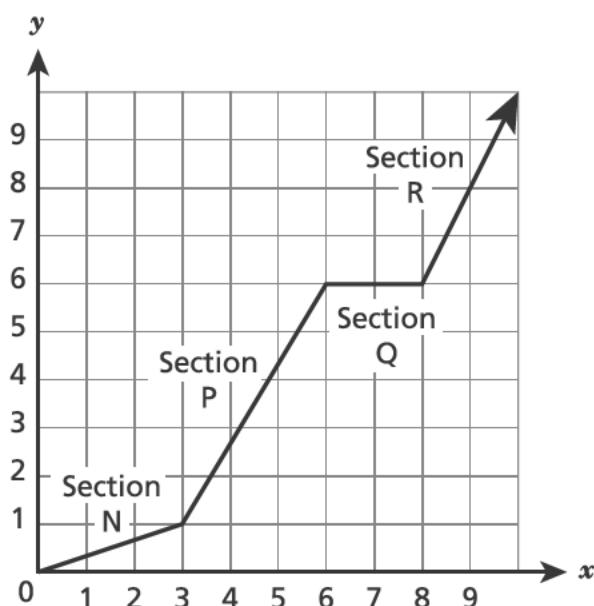
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27

The graph of a function is shown below.



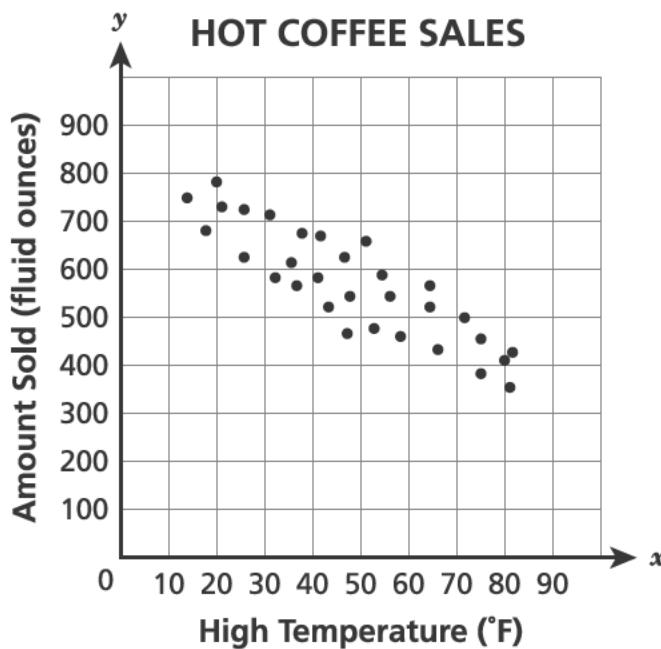
Which statement is **true** about a section of the graph?

- A In Section N, the function is linear and decreasing.
- B In Section P, the function is linear and increasing.
- C In Section Q, the function is nonlinear and decreasing.
- D In Section R, the function is nonlinear and increasing.

GO ON

28

The owner of a coffee shop compared the amount of hot coffee per day, in fluid ounces, sold and the daily high temperature, in degrees Fahrenheit, per day. Her data are shown in the scatter plot below.



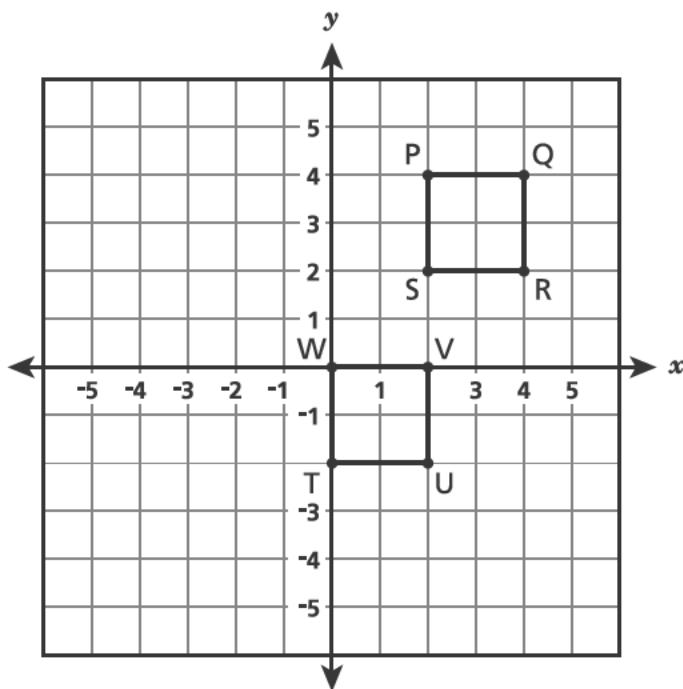
If these data are modeled by the line $y = -5.9x + 850$, which statement **best** describes a valid prediction the owner could make?

- A For each temperature increase of 10°F , the shop can expect to sell about 60 fluid ounces more hot coffee.
- B For each temperature decrease of 10°F , the shop can expect to sell about 6 fluid ounces more hot coffee.
- C On a day with a high temperature of 0°F , the shop can expect to sell about 145 fluid ounces of hot coffee.
- D On a day with a high temperature of 0°F , the shop can expect to sell about 850 fluid ounces of hot coffee.

GO ON

29

Squares PQRS and TUVW are shown below.



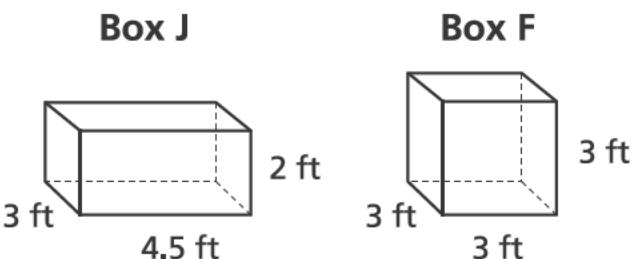
Which sequence of transformations of square PQRS shows that square PQRS is congruent to square TUVW?

- A a translation 2 units up and 2 units to the right, then a reflection over the x -axis
- B a translation 2 units up and 2 units to the right, then a reflection over the y -axis
- C a translation 2 units down and 2 units to the left, then a reflection over the x -axis
- D a translation 2 units down and 2 units to the left, then a reflection over the y -axis

GO ON

30

Two types of shipping boxes are shown below.



What is the difference in the surface areas, in square feet, of the two boxes?

- A 2
- B 3
- C 21
- D 30

31

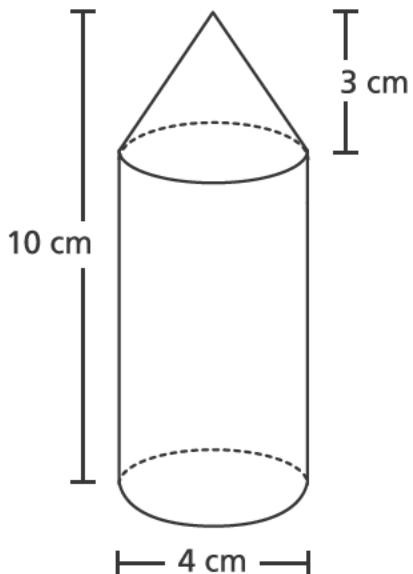
Which expression is equivalent to $2^2 \cdot \frac{2}{2^4}$?

- A 2^{-2}
- B 2^{-1}
- C 2^6
- D 2^7

GO ON

32

The object below was made by placing a cone on top of a cylinder. The base of the cone is congruent to the base of the cylinder.



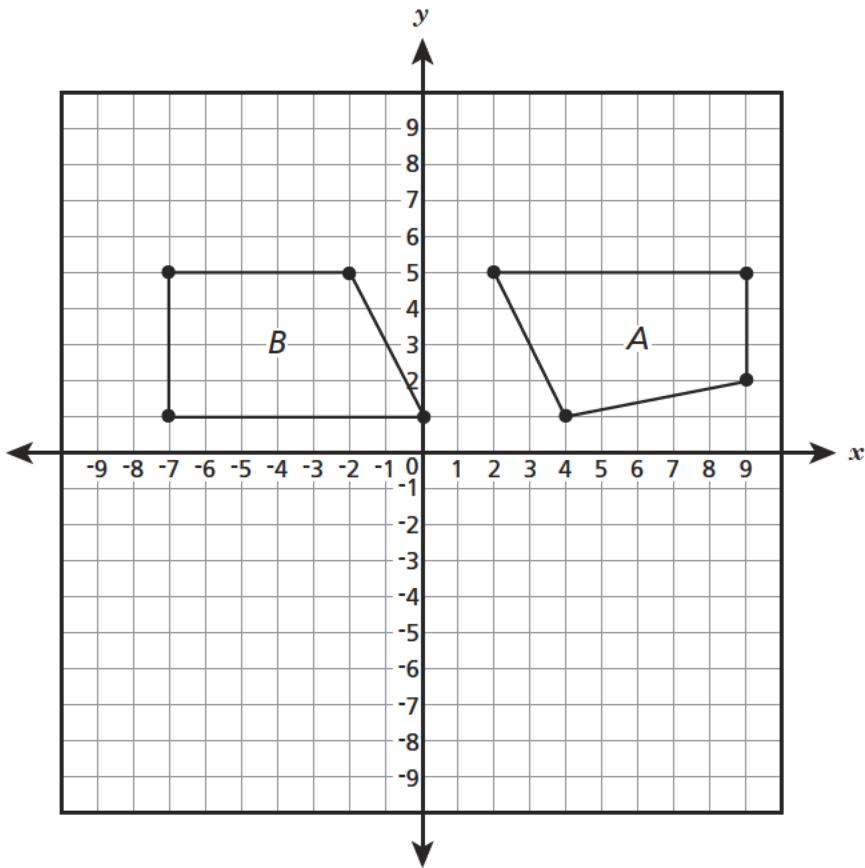
What is the volume, in cubic centimeters, of the object?

- A 32π
- B 40π
- C 44π
- D 128π

GO ON

34

Lily wants to define a transformation (or series of transformations) using only rotations, reflections, or translations that takes Figure A to Figure B.



Which statement about the transformation that Lily wants to define is true?

- A It can be defined with two reflections.
- B It can be defined with one rotation and one translation.
- C It cannot be defined because Figure A and Figure B are not congruent.
- D It cannot be defined because the longest side of Figure B is on the bottom.

GO ON

35

What is the solution to the system of equations below?

$$2x + 3y = 6$$

$$x - 3y = 9$$

A $\left(-1, \frac{8}{3}\right)$

B $(-3, -4)$

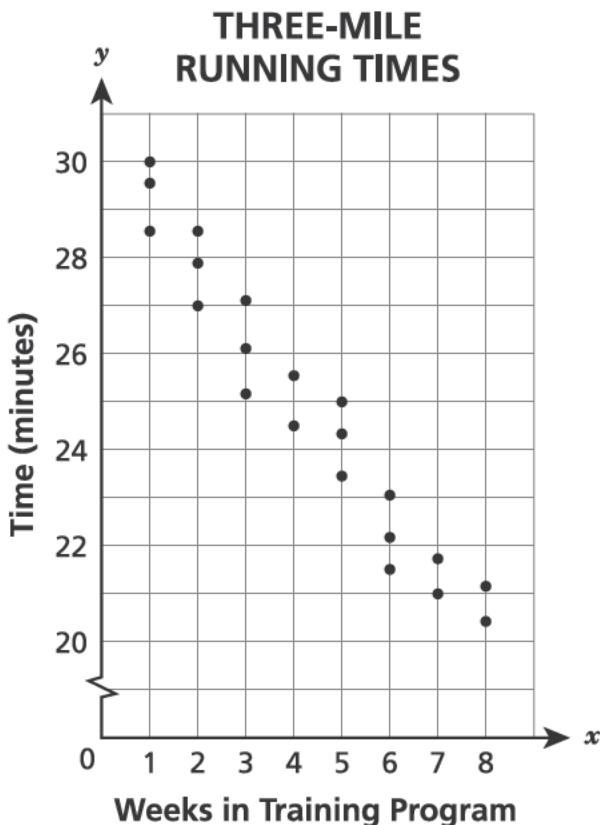
C $\left(5, -\frac{4}{3}\right)$

D $\left(8, -\frac{1}{3}\right)$

GO ON

36

As part of a training program for a triathlon, Marcie completes a three-mile run a few times each week. The scatter plot below shows the times in which Marcie completes this run for each week that she has been in the training program.



Based on these data, which statement **best** describes the relationship between the number of weeks Marcie has been in the training program and her running times?

- A There is a negative linear association with no outliers.
- B There is a negative linear association with one outlier.
- C There is a positive linear association with no outliers.
- D There is a positive linear association with one outlier.

GO ON

- 37** What is the solution to the equation below?

$$5c + 4 = 2(c - 5)$$

A $c = -4\frac{2}{3}$

B $c = -3$

C $c = -2$

D $c = -\frac{1}{3}$

- 38** Which statement **best** explains whether these ordered pairs represent a function?

$(-4, 2), (6, 7), (-8, 3), (9, 10), (12, 14), (6, 9)$

- A The ordered pairs represent a function because no output values are repeated.
- B The ordered pairs represent a function because each output value is greater than each input value.
- C The ordered pairs do not represent a function because one input value has two different output values.
- D The ordered pairs do not represent a function because the difference between the input and output of each ordered pair is not the same.

GO ON

39

The amount of revenue in dollars, y , that Jason receives from selling x posters is given by the equation $y = 4x$. The cost of producing x posters is given by the equation $y = \frac{1}{2}x + 280$. How many posters does Jason need to sell so that the cost and revenue are equal?

A 40

B 80

C 140

D 320

40

A car traveled 36 miles in 45 minutes. The car traveled at a constant speed. If the car continues to travel at this rate, which equation can be used to determine y , the total number of miles the car will travel, in x hours?

A $y = 48x$

B $y = x + 48$

C $48y = x$

D $48 + y = x$

GO ON

42

The mass of a dust particle is approximately 7.5×10^{-10} kilograms and the mass of an electron is 9.1×10^{-31} kilograms. Approximately how many electrons have the same mass as one dust particle?

A 1.21×10^{20}

B 1.21×10^{21}

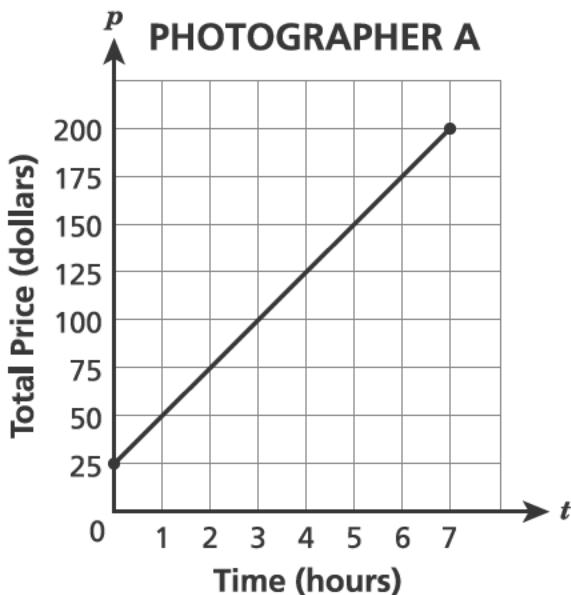
C 8.24×10^{20}

D 8.24×10^{21}

GO ON

43

Two photographers offer different pricing plans for their services. The graph below models the prices Photographer A charges. The table below shows the prices Photographer B charges. Each photographer charges a one-time equipment fee and an hourly rate.



PHOTOGRAPHER B

Time (hours)	2	4
Total Price	\$80	\$110

Which statement about the two pricing plans is true?

- A Photographer A charges \$15 per hour more than Photographer B.
- B Photographer B charges \$15 per hour more than Photographer A.
- C Photographer A's equipment fee is \$25 less than Photographer B's.
- D Photographer B's equipment fee is \$25 less than Photographer A's.

GO ON

44

Acute $\triangle ABC$ is rotated about a point and then dilated by a scale factor of $\frac{1}{2}$ to produce $\triangle A'B'C'$. Which statement correctly compares $\triangle A'B'C'$ to $\triangle ABC$?

- A The angle measures and side lengths of $\triangle A'B'C'$ are half the size of those of $\triangle ABC$.
- B The angle measures of $\triangle A'B'C'$ are the same as those of $\triangle ABC$, but the side lengths of $\triangle A'B'C'$ are half the size of those of $\triangle ABC$.
- C The angle measures of $\triangle A'B'C'$ are the same as those of $\triangle ABC$, but the side lengths of $\triangle A'B'C'$ are twice the size of those of $\triangle ABC$.
- D The angle measures of $\triangle A'B'C'$ depend on the angle of rotation, but the side lengths of $\triangle A'B'C'$ are half the size of those of $\triangle ABC$.

45

Which expression is equivalent to $(4.5 \times 10^2) + (6.0 \times 10^3)$ and written in scientific notation?

- A 1.05×10^6
- B 2.7×10^6
- C 6.45×10^3
- D 10.5×10^5

GO ON

46

The points $(2, -2)$ and $(-4, 13)$ lie on the graph of a linear function of x . Which point also lies on the graph of this function?

- A $(-6, 18)$
- B $(-1, 5)$
- C $(7, 14.5)$
- D $(13, -4)$

47

What value for the constant, h , in the equation shown below will result in an infinite number of solutions?

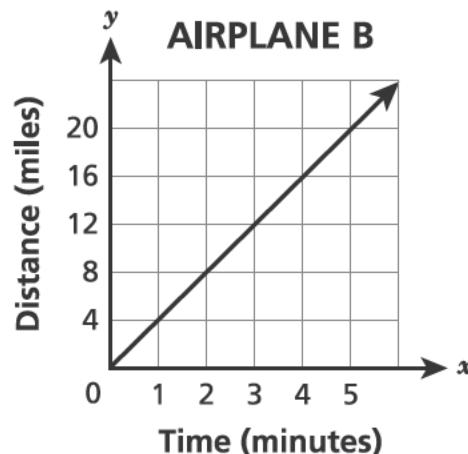
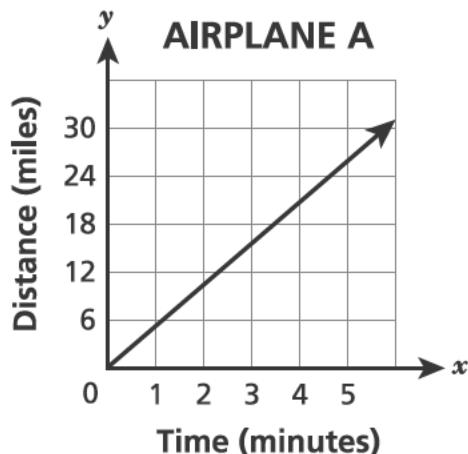
$$6x + 18 = h(3x + 9)$$

- A -2
- B -3
- C 2
- D 3

GO ON

50

The graphs below show the relationship between elapsed time and distance traveled by airplane A and airplane B after each airplane reaches its cruising speed.



Airplane C is traveling at a different cruising speed. The equation $y = \frac{27}{6}x$ can be used to determine y , the number of miles traveled by airplane C in x minutes. Which statement accurately compares the cruising speed of airplane C to airplanes A and B?

- A The cruising speed of airplane C is less than the cruising speeds of both airplanes A and B.
- B The cruising speed of airplane C is greater than the cruising speeds of both airplanes A and B.
- C The cruising speed of airplane C is greater than the cruising speed of airplane A and less than the cruising speed of airplane B.
- D The cruising speed of airplane C is less than the cruising speed of airplane A and greater than the cruising speed of airplane B.

GO ON

51

Two transformations are performed on a figure on a coordinate plane. The first transformation is a translation 8 units to the left. Which second transformation will result in an image that is similar to, but not congruent to, the original figure?

- A a clockwise rotation of 90° about the center
- B a clockwise rotation of 180° about the center
- C a dilation by a scale factor of 1 with the origin as the center of dilation
- D a dilation by a scale factor of $\frac{1}{2}$ with the origin as the center of dilation

STOP

Book 3



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- Be sure to show your work when asked.

52

Determine the solution to the equation below.

$$-3.1x + 7 - 7.4x = 1.5x - 6\left(x - \frac{3}{2}\right)$$

Show your work.

Answer _____

GO ON

53

A cylinder and a cone have the same volume. The cylinder has a radius of 2 inches and a height of 3 inches. The cone has a radius of 3 inches. What is the height of the cone?

Show your work.

Answer _____ inches

GO ON

54

Determine the solution, if any, to the system of equations below.

$$\begin{aligned}8x - 2y &= 1 \\-4x + y &= 3\end{aligned}$$

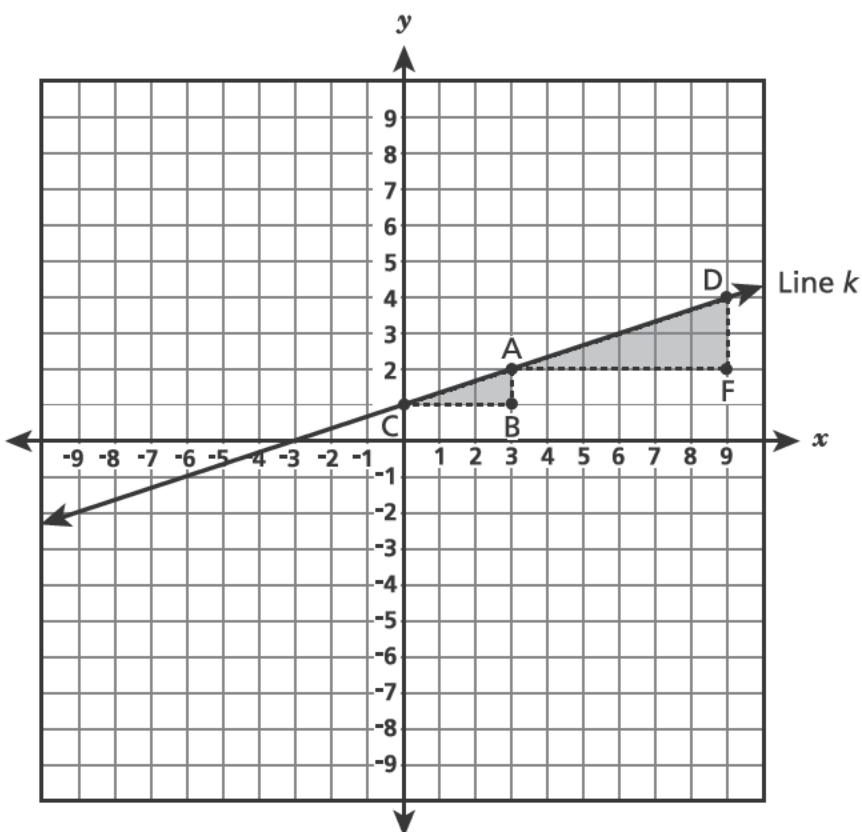
Show your work.

Answer _____

GO ON

55

The hypotenuses of similar triangles ABC and DFA both lie on line k , as shown below.



Demonstrate whether the slope of line k is constant between points C and D. Use the leg lengths of triangles ABC and DFA in your answer.

GO ON

56

The values in the table below represent Function B, which is a linear function.

<i>x</i>	<i>y</i>
-3	-7
-1	-1
1	5
3	11

Function L is represented by the equation $y = 6x + 4$. Compare Functions B and L by determining which one has the greater rate of change and which one has the greater *y*-intercept. Explain why your answers are correct.

Show your work.

GO ON

57

The values given in the table below lie on the graph of a linear function.

x	y
0.25	1.00
0.50	1.75
0.75	2.50

What equation represents this linear function?

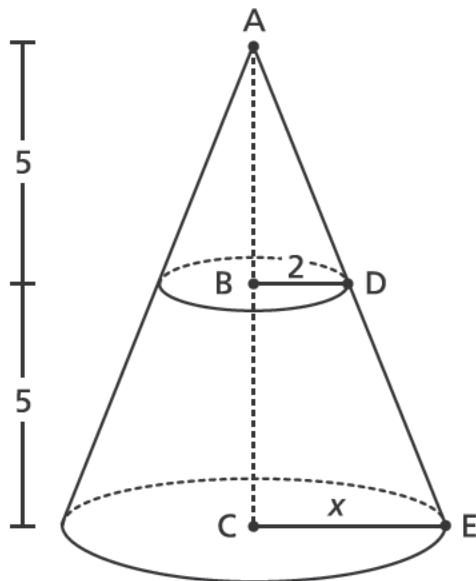
Show your work.

Answer _____

GO ON

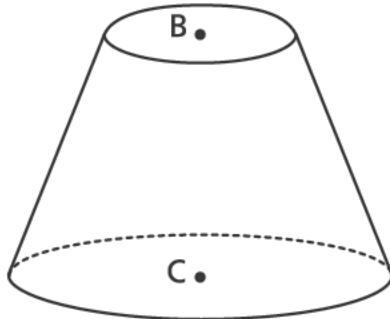
58

The circular base of the cone below has center C. Another circle, with center B, is parallel to the base. This circle is the base of a smaller cone with height AB. The measurements in the diagram are given in inches.



Triangle ABD is similar to triangle ACE.

The smaller cone is removed to create a new object, as shown below.



What is the volume of this new object? Round your answer to the nearest tenth.

Show your work.

Answer _____ cubic inches

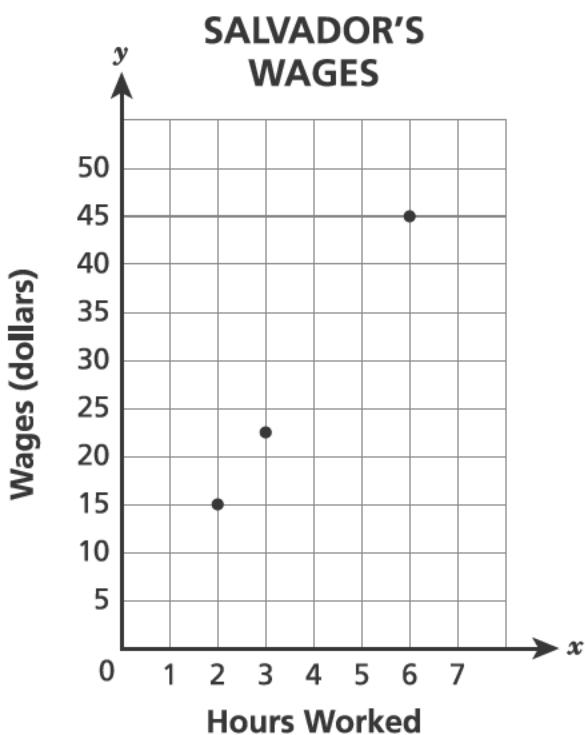
GO ON

59

The table and the graph below show Josie's and Salvador's wages, respectively, based on the number of hours worked.

JOSIE'S WAGES

Hours Worked	Wages (dollars)
3	26.25
5	43.75
7	61.25



In 2010, Josie and Salvador each worked an eight-hour day for five days each week. How many weeks did it take Josie to earn \$1,000 more than Salvador?

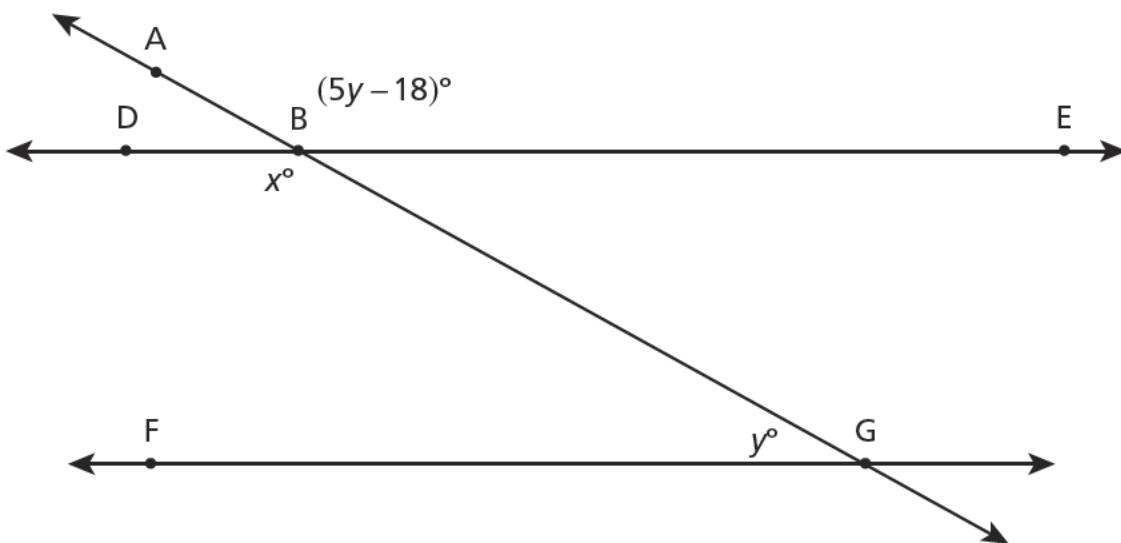
Show your work.

Answer _____ weeks

GO ON

60

In the figure below, line DE is parallel to line FG, with transversal AG.



Write and solve a system of linear equations to determine the values of x and y .

Show your work.

Answer $x = \underline{\hspace{2cm}}$ and $y = \underline{\hspace{2cm}}$

GO ON

61

Four equations are shown below.

Equation 1: $y = 2^x$

Equation 2: $y = 2x - 5$

Equation 3: $y = x^2 + 6$

Equation 4: $y = \frac{x}{2}$

Identify one linear equation and one nonlinear equation from the list. State a reason why each equation you identified is linear or nonlinear.

Linear equation _____

Nonlinear equation _____

STOP

**THE STATE EDUCATION DEPARTMENT
THE UNIVERSITY OF THE STATE OF NEW YORK / ALBANY, NY 12234
2017 Mathematics Tests Map to the Standards
Released Questions on EngageNY**

Grade 8	Question	Type	Key	Points	Standard	Cluster	Secondary Standard(s)	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)	
Book 1											
1	Multiple Choice	A	1	CCSS.Math.Content.8.EE.A.3	Expressions and Equations			0.62			
2	Multiple Choice	D	1	CCSS.Math.Content.8.F.B.5	Functions			0.46			
3	Multiple Choice	D	1	CCSS.Math.Content.7.G.A.3	Geometry			0.41			
4	Multiple Choice	C	1	CCSS.Math.Content.8.F.B.4	Functions			0.57			
5	Multiple Choice	D	1	CCSS.Math.Content.8.G.A.2	Geometry			0.53			
6	Multiple Choice	D	1	CCSS.Math.Content.8.F.A.3	Functions			0.66			
7	Multiple Choice	B	1	CCSS.Math.Content.8.EE.C.8a	Expressions and Equations			0.22			
8	Multiple Choice	D	1	CCSS.Math.Content.8.F.A.2	Functions			0.48			
9	Multiple Choice	A	1	CCSS.Math.Content.8.EE.C.7b	Expressions and Equations			0.54			
10	Multiple Choice	B	1	CCSS.Math.Content.8.SP.A.3	Statistics and Probability			0.49			
15	Multiple Choice	D	1	CCSS.Math.Content.8.EE.B.5	Expressions and Equations			0.46			
18	Multiple Choice	C	1	CCSS.Math.Content.8.EE.C.8c	Expressions and Equations			0.49			
19	Multiple Choice	B	1	CCSS.Math.Content.8.SP.A.4	Statistics and Probability			0.67			
20	Multiple Choice	D	1	CCSS.Math.Content.8.G.A.4	Geometry			0.36			
24	Multiple Choice	C	1	CCSS.Math.Content.8.EE.A.1	Expressions and Equations			0.36			
25	Multiple Choice	D	1	CCSS.Math.Content.8.F.A.1	Functions			0.56			

Released Questions on EngageNY

Grade 8	Question	Type	Key	Points	Standard	Cluster	Secondary Standard(s)	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)	
	26	Multiple Choice	A	1	CCSS.Math.Content.8.G.A.3	Geometry		0.58			
Book 2											
	27	Multiple Choice	B	1	CCSS.Math.Content.8.F.B.5	Functions		0.83			
	28	Multiple Choice	D	1	CCSS.Math.Content.8.SP.A.3	Statistics and Probability		0.44			
	29	Multiple Choice	C	1	CCSS.Math.Content.8.G.A.2	Geometry		0.70			
	30	Multiple Choice	B	1	CCSS.Math.Content.7.G.B.6	Geometry		0.48			
	31	Multiple Choice	B	1	CCSS.Math.Content.8.EE.A.1	Expressions and Equations		0.36			
	32	Multiple Choice	A	1	CCSS.Math.Content.8.G.C.9	Geometry		0.36			
	34	Multiple Choice	C	1	CCSS.Math.Content.8.G.A.1	Geometry		0.58			
	35	Multiple Choice	C	1	CCSS.Math.Content.8.EE.C.8b	Expressions and Equations		0.54			
	36	Multiple Choice	A	1	CCSS.Math.Content.8.SP.A.1	Statistics and Probability		0.63			
	37	Multiple Choice	A	1	CCSS.Math.Content.8.EE.C.7b	Expressions and Equations		0.54			
	38	Multiple Choice	C	1	CCSS.Math.Content.8.F.A.1	Functions		0.47			
	39	Multiple Choice	B	1	CCSS.Math.Content.8.EE.C.8c	Expressions and Equations		0.58			
	40	Multiple Choice	A	1	CCSS.Math.Content.8.F.B.4	Functions		0.59			
	42	Multiple Choice	C	1	CCSS.Math.Content.8.EE.A.4	Expressions and Equations		0.23			
	43	Multiple Choice	C	1	CCSS.Math.Content.8.F.A.2	Functions		0.38			
	44	Multiple Choice	B	1	CCSS.Math.Content.8.G.A.4	Geometry		0.39			

Released Questions on EngageNY

Grade 8 Question	Type	Key	Points	Standard	Cluster	Secondary Standard(s)	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)
45	Multiple Choice	C	1	CCSS.Math.Content.8.EE.A.4	Expressions and Equations		0.47		
46	Multiple Choice	A	1	CCSS.Math.Content.8.F.A.3	Functions		0.48		
47	Multiple Choice	C	1	CCSS.Math.Content.8.EE.C.7a	Expressions and Equations		0.57		
50	Multiple Choice	D	1	CCSS.Math.Content.8.EE.B.5	Expressions and Equations		0.45		
51	Multiple Choice	D	1	CCSS.Math.Content.8.G.A.4	Geometry		0.50		
Book 3									
52	Constructed Response		2	CCSS.Math.Content.8.EE.C.7b	Expressions and Equations			0.64	0.32
53	Constructed Response		2	CCSS.Math.Content.8.G.C.9	Geometry			0.81	0.40
54	Constructed Response		2	CCSS.Math.Content.8.EE.C.8b	Expressions and Equations			0.62	0.31
55	Constructed Response		2	CCSS.Math.Content.8.EE.B.6	Expressions and Equations			0.46	0.23
56	Constructed Response		2	CCSS.Math.Content.8.F.A.2	Functions			0.61	0.30
57	Constructed Response		2	CCSS.Math.Content.8.F.B.4	Functions			0.67	0.33
58	Constructed Response		3	CCSS.Math.Content.8.G.C.9	Geometry			0.46	0.15
59	Constructed Response		3	CCSS.Math.Content.8.EE.B.5	Expressions and Equations			0.83	0.28
60	Constructed Response		3	CCSS.Math.Content.8.EE.C.8c	Expressions and Equations			0.51	0.17
61	Constructed Response		3	CCSS.Math.Content.8.F.A.3	Functions			1.60	0.53

*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

2 Point	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">• indicates that the student has completed the task correctly, using mathematically sound procedures• contains sufficient work to demonstrate a thorough understanding of the mathematical concepts and/or procedures• may contain inconsequential errors that do not detract from the correct solution and the demonstration of a thorough understanding
1 Point	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">• correctly addresses only some elements of the task• may contain an incorrect solution but applies a mathematically appropriate process• may contain the correct solution but required work is incomplete
0 Point*	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

Score Points:

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

2017 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 blank, the student should still receive full credit.
3. If students are directed to show work, a correct answer with **no** work shown 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. Trial-and-error responses are **not** subject to Scoring Policy #6 above, since crossing out is part of the trial-and-error process.
8. 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.
9. In questions requiring number sentences, the number sentences must be written horizontally.
10. 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

52

Determine the solution to the equation below.

$$-3.1x + 7 - 7.4x = 1.5x - 6\left(x - \frac{3}{2}\right)$$

Show your work.

$$-3.1x + 7 - 7.4x = 1.5x - 6x + 9$$

$$-10.5x + 7 = -4.5x + 9$$

$$-10.5x + 4.5x = 9 - 7$$

$$-6x = 2$$

$$x = \frac{2}{-6} = -\frac{1}{3}$$

or other valid process

$$x = -\frac{1}{3}$$

Answer _____

GUIDE PAPER 1

Additional

52

Determine the solution to the equation below.

$$-3.1x + 7 - 7.4x = 1.5x - 6\left(x - \frac{3}{2}\right)$$

Show your work.

$$\begin{aligned} -3.1x + 7 - 7.4x &= 1.5x - 6x + \frac{18}{2} \\ +6x & \\ \hline -3.1x + 7 - 1.4x &= 1.5x + \frac{18}{2} \\ +3.1x & \\ \hline -7 - 1.4x &= 4.6x + 9 \\ -7 & \\ \hline -1.4x &= 4.6x + 2 \\ -4.6x & \\ \hline -6.0x &= 2 \\ -6 & \\ \hline x &= -\frac{1}{3} \end{aligned}$$

Answer $x = -\frac{1}{3}$

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The equation is solved correctly using appropriate procedures.

GUIDE PAPER 2

52

Determine the solution to the equation below.

$$-3.1x + 7 - 7.4x = 1.5x - 6\left(x - \frac{3}{2}\right)$$

Show your work.

$$-3.1x + 7 - 7.4x = 1.5x - 6\left(x - \frac{3}{2}\right)$$

$$-10.5x + 7 = 1.5x - 6x + 9$$

$$-10.5x + 7 = -4.5x + 9$$

$$\underline{-10.5x} \quad \underline{+10.5x}$$

$$7 = 6x + 9$$

$$-2 = 6x$$

$$-\frac{1}{3} = x$$

$$-10.5\left(-\frac{1}{3}\right) + 7 = 1.5x - 6x + 9$$

$$3.5 + 7 = -4.5\left(\frac{1}{3}\right) + 9$$

$$3.5 + 7 = 1.5 + 9$$

$$10.5 = 10.5$$

Answer $\boxed{x = -\frac{1}{3}}$

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The equation is solved correctly using appropriate procedures.

GUIDE PAPER 3

52

Determine the solution to the equation below.

$$-3.1x + 7 - 7.4x = 1.5x - 6\left(x - \frac{3}{2}\right)$$

Show your work.

$$-3.1x + 7 - 7.4x = 1.5x - 6\left(x - \frac{3}{2}\right)$$

$$-3.1x + 7 - 7.4x = 1.5x - 6x + 9$$

$$\begin{array}{r} -10.5x + 7 = -4.5x + 9 \\ +4.5 \qquad \qquad +4.5 \end{array}$$

$$\begin{array}{r} -6x = 2 \\ \hline -6 \qquad -6 \\ x = -0.\overline{3} \end{array}$$

Answer $-0.\overline{3}$

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The equation is solved correctly using appropriate procedures. Providing the solution as a repeating decimal is acceptable and correct.

GUIDE PAPER 4

52

Determine the solution to the equation below.

$$-3.1x + 7 - 7.4x = 1.5x - 6\left(x - \frac{3}{2}\right)$$

Show your work.

$$\begin{aligned} -3.1x + 7 - 7.4x &= 1.5x - 6x + 9 \\ -10.5x + 7 &= -4.5x + 9 \\ -10.5x &\stackrel{+4.5x}{=} -4.5x + 2 \\ +4.5x &\stackrel{-6x}{=} +4.5x \\ 3.15 &\stackrel{-6x}{=} \frac{2}{-6} \\ &x = -0.3 \end{aligned}$$

Answer $-0.\overline{3}$

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The equation is solved correctly; however, the solution is truncated by not providing the overline (vinculum) to indicate that the decimal repeats. The response contains an incorrect solution but applies an appropriate process.

GUIDE PAPER 5

52

Determine the solution to the equation below.

$$-3.1x + 7 - 7.4x = 1.5x - 6\left(x - \frac{3}{2}\right)$$

Show your work.

$$\begin{aligned} -3.1x + 7 - 7.4x &= 1.5x - 6\left(x - \frac{3}{2}\right) \\ (-3.1x + 7) - 7.4x &= 1.5x - 6x + 9 \\ -10.5x + 7 &= -4.5x + 9 \\ +4.5x &\quad +4.5x \\ -6x + 7 &= 9 \\ -7 &\quad -7 \\ -6 &= 2 \\ -6 &\quad -6 \\ x &= -3 \end{aligned}$$

Answer : $x = -3$

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The equation is solved using appropriate procedures; however, the final step of the work incorrectly evaluates $2 \div -6 = -3$. The response contains an incorrect solution but applies an appropriate process.

GUIDE PAPER 6

52

Determine the solution to the equation below.

$$-3.1x + 7 - 7.4x = 1.5x - 6\left(x - \frac{3}{2}\right)$$

Show your work.

$$-3.1x + 7 - 7.4x = 1.5x - 6\left(x - \frac{3}{2}\right)$$

$$\cancel{-3.1x} + 7 - \cancel{7.4x} = \cancel{1.5x} - \cancel{6x} + \cancel{9}$$

$$\cancel{-10.5x} + 7 = \cancel{-4.5x} + \cancel{9}$$

$$\frac{-15x}{-15} = \frac{16}{-15}$$

$$x = -1.06$$

Answer $x = -1.1$

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. Like terms are correctly combined on each side of the equation; however, sign errors occur when combining like terms across the equals sign resulting in the incorrect equation $-15x = 16$. The response correctly addresses only some elements of the task.

GUIDE PAPER 7

52

Determine the solution to the equation below.

$$-3.1x - 7 - 7.4x = 1.5x - 6\left(x - \frac{3}{2}\right)$$

Show your work.

$$\begin{array}{r} -3.1x \\ -7.4x \\ \hline +10.5x \end{array}$$

$$\begin{array}{r} 7 \\ + -6 \\ \hline \end{array}$$

Answer

13

Score Point 0 (out of 2 points)

Holistically, this response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. Although an attempt is made to combine like terms, the work is incomplete and incorrect.

GUIDE PAPER 8

Additional

52

Determine the solution to the equation below.

$$-3.1x + 7 - 7.4x = 1.5x - 6\left(x - \frac{3}{2}\right)$$

Show your work.

$$-3.1(4) + 7 - 7.4(4)$$

$$= 1.5x - 6\left(x - \frac{3}{2}\right)$$

Answer

4

Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The value 4 is inappropriately substituted for x only in the left side of the equation and is incorrectly chosen as the solution.

EXEMPLARY RESPONSE

53

A cylinder and a cone have the same volume. The cylinder has a radius of 2 inches and a height of 3 inches. The cone has a radius of 3 inches. What is the height of the cone?

Show your work.

$$V_{\text{cyl}} = V_{\text{cone}}$$

$$\pi r_{\text{cyl}}^2 h_{\text{cyl}} = \frac{1}{3} \pi r_{\text{cone}}^2 h_{\text{cone}}$$

$$\pi(2)^2(3) = \frac{1}{3} \pi(3)^2 h_{\text{cone}}$$

$$12\pi = 3\pi h_{\text{cone}}$$

$$h_{\text{cone}} = 4$$

or other valid process

Answer: 4 inches

GUIDE PAPER 1

Additional

53

A cylinder and a cone have the same volume. The cylinder has a radius of 2 inches and a height of 3 inches. The cone has a radius of 3 inches. What is the height of the cone?

Show your work.

$$\begin{aligned}\pi r^2 h &= \frac{1}{3} \pi r^2 h \\ \frac{\pi r^2 h}{\pi} &= \frac{1}{3} \pi r^2 h \\ 2^2 h &= \frac{1}{3} 3^2 h \\ 4 \cdot 3 &= 3h \\ \frac{12}{3} &= \frac{3h}{3} \\ 4 &= h\end{aligned}$$

Answer: 4 inches

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The height of the cone is calculated correctly by equating the two volumes.

GUIDE PAPER 2

53

A cylinder and a cone have the same volume. The cylinder has a radius of 2 inches and a height of 3 inches. The cone has a radius of 3 inches. What is the height of the cone?

Show your work.

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

$$r = 2$$

$$h = 3$$

$$\pi r^2 h$$

$$\pi 2^2 3$$

$$\pi 4 3$$

$$12\pi$$

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

$$h = ?$$

$$\downarrow$$

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

$$\frac{1}{3} \pi 3^2 h$$

$$\frac{1}{3} \pi 9 h$$

$$3\pi h = 12\pi$$

$$3\pi(4) = 12\pi$$

Answer: 4 inches

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The height of the cone is calculated correctly by equating the two volumes.

GUIDE PAPER 3

53

A cylinder and a cone have the same volume. The cylinder has a radius of 2 inches and a height of 3 inches. The cone has a radius of 3 inches. What is the height of the cone?

Show your work.

$$\begin{aligned}\text{Cylinder} \\ V &= \pi r^2 h \\ V &= \pi (2)^2 (3) \\ V &= \pi 4 \cdot 3 \\ V &= 12\pi\end{aligned}$$

$$\begin{aligned}\text{cone} \\ V &= \frac{1}{3} \pi r^2 h \\ V &= \frac{1}{3} \pi (3^2) h \\ V &= \frac{1}{3} (9) \pi h \\ V &= 3\pi h\end{aligned}$$

$$\frac{12\pi}{3} = \cancel{\frac{3\pi h}{3}}$$

$$\frac{4\pi}{1} = \cancel{\frac{h}{1}}$$

$$h = 4$$

Answer: 4 inches

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The height of the cone is calculated correctly by equating the two volumes.

GUIDE PAPER 4

53

A cylinder and a cone have the same volume. The cylinder has a radius of 2 inches and a height of 3 inches. The cone has a radius of 3 inches. What is the height of the cone?

Show your work.

$$\begin{aligned} \text{cylinder} \\ V &= \frac{4}{3}\pi r^2 h \\ V &= \frac{4}{3} \times 3.14 \times 2^2 \times 3 \\ &\underline{4 \times 3.14 \times 2^2 \times 3} \\ &= \frac{150.72}{3} \\ &= 50.24 \text{ in}^3 \end{aligned}$$

Cone

$$\begin{aligned} V &= \frac{1}{3}\pi r^2 h \\ 50.24 \text{ in}^3 &= \frac{1}{3} \times 3.14 \times 3^2 \times h \\ &\underline{= 1 \times 3.14 \times 3^2 \times h} \\ 50.24 &= 9.42 \times h \\ \underline{9.42} & \qquad \qquad \qquad h = 5.3 \end{aligned}$$

Answer: 5.3 inches

Score Point 1 (out of 2 points)

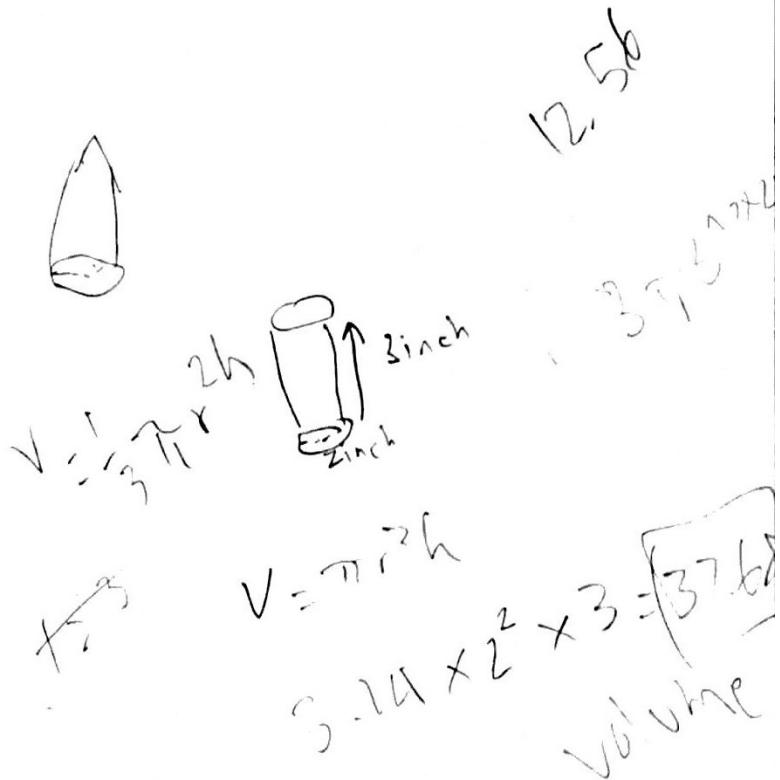
This response demonstrates only a partial understanding of the mathematical concepts in the task. The two volumes are properly equated to determine the height of the cone; however, the volume of the cylinder is calculated incorrectly with an extraneous factor of $\frac{4}{3}$ and the value of π is inappropriately approximated as 3.14. The response correctly addresses only some elements of the task.

GUIDE PAPER 5

53

A cylinder and a cone have the same volume. The cylinder has a radius of 2 inches and a height of 3 inches. The cone has a radius of 3 inches. What is the height of the cone?

Show your work.



Answer: 4 inches

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The volume of the cylinder is calculated correctly and the solution for the height of the cone is correct; however, the work for the volume of the cone only includes the general formula and the value of π is inappropriately approximated as 3.14. The response contains the correct solution but the required work is incomplete.

GUIDE PAPER 6

53

A cylinder and a cone have the same volume. The cylinder has a radius of 2 inches and a height of 3 inches. The cone has a radius of 3 inches. What is the height of the cone?

Show your work.

$$\text{cylinder } (2^2 \cdot 3\pi)$$
$$\frac{1}{3}\pi 3^2 h$$
$$\frac{1}{3} 9$$
$$= 3(4)$$

Answer: 4 inches

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The volume of the cylinder is calculated correctly; however, the work for the volume of the cone drops the values π and h from the expression when simplifying. The response contains the correct solution but the required work is faulty or incomplete.

GUIDE PAPER 7

53

A cylinder and a cone have the same volume. The cylinder has a radius of 2 inches and a height of 3 inches. The cone has a radius of 3 inches. What is the height of the cone?

Show your work.

Cylinder:

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

$$V = 3.14(2)^2 h$$

$$V = 37.68$$

$$\text{cone} = \frac{1}{3}(\pi)(3^2)(h)$$

$$V = \frac{1}{3} 28.26 h$$

$$V = \frac{28.26}{3}$$

$$V = 9.42 \text{ in}^3$$

Evidence:

$$V = \frac{1}{3}(3.14)3^2(9.42)$$

$$V = 82.62092$$

$$V = \frac{1}{3}(3.14)3^2(28.26)$$

$$V = 82.62092$$

Answer, 28.26 inches

Score Point 0 (out of 2 points)

Holistically, this response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. Although the volume of the cylinder is calculated correctly, the variable h is dropped when calculating the volume of the cone. In addition, the values 28.26 and 9.42 are both misinterpreted as the height of the cone in the work labeled "Evidence", indicating a lack of understanding that the height has a unique value. The two calculations in the "Evidence" are incorrectly evaluated to the same result despite using different values for the height and the resulting volume is contradictory to the previous work.

GUIDE PAPER 8

Additional

53

A cylinder and a cone have the same volume. The cylinder has a radius of 2 inches and a height of 3 inches. The cone has a radius of 3 inches. What is the height of the cone?

Show your work.

$$\text{Cylinder: } V = \pi r^2 h$$

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

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

Answer: 4 inches

Score Point 0 (out of 2 points)

Holistically, this response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The solution of 4 is correct; however, only a transcription of the formulas from the reference sheet is shown. No work is shown, therefore the response contains no support for the solution.

EXEMPLARY RESPONSE

54

Determine the solution, if any, to the system of equations below.

$$\begin{aligned}8x - 2y &= 1 \\-4x + y &= 3\end{aligned}$$

Show your work.

$$\begin{aligned}8x - 2y &= 1 \\2 \times (-4x + y) &= (3) \times 2\end{aligned}$$

$$\begin{array}{r}8x - 2y = 1 \\-8x + 2y = 6 \\ \hline 0x + 0y = 7\end{array} \rightarrow 0 \neq 7 \text{ No Solution}$$

OR

$$\begin{aligned}-2y &= -8x + 1 \\y &= 4x + 3 \\y &= 4x - \frac{1}{2} \\y &= 4x + 3\end{aligned}$$

The equations in slope-intercept form have the same slope but different y -intercepts, so they represent parallel lines and will never intersect: no solution.

or other valid process

Answer _____ No Solution

GUIDE PAPER 1

Additional

54

Determine the solution, if any, to the system of equations below.

$$\begin{aligned} 8x - 2y &= 1 \\ -4x + y &= 3 \end{aligned}$$

Doesn't have to have one

Show your work.

$$\begin{aligned} 8x - 2y &= 1 \\ 2(-4x + y - 3) &\rightarrow -8x + 2y = 6 \\ \hline 0 + 0 &\neq 7 \\ 0 &\neq 7 \end{aligned}$$

$$\begin{aligned} 8x - 2y &= 1 \\ -8x & \\ \hline -2y &= -8x + 1 \\ -2 & \\ y &= 4x - 1/2 \end{aligned}$$

$$\begin{aligned} -4x + (4x - 1/2) &= 3 \\ 0 - 1/2 &\neq 3 \\ -1/2 &\neq 3 \end{aligned}$$

check

Answer No solutions

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The response completes the task correctly using mathematically sound procedures.

GUIDE PAPER 2

54

Determine the solution, if any, to the system of equations below.

$$\begin{aligned} 8x - 2y &= 1 \\ -4x + y &= 3 \end{aligned}$$

+4x

Show your work.

$$\begin{array}{rcl} 8x - 2y = 1 + 2y & & 4 = 4x + 3 \\ +2y & - & \\ \hline 8x - 1 & = & 2y & 4x + 3 = 4x - 0.5 \\ 2 & 2 & 2 & \\ 4x - 0.5 & = & 4 \end{array}$$

Answer no solution

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The response completes the task correctly using mathematically sound procedures. Although no final statement of inequality is provided, the work is sufficiently developed and correct to establish full understanding.

GUIDE PAPER 3

54

Determine the solution, if any, to the system of equations below.

$$\begin{aligned} 8x - 2y &= 1 \\ -4x + y &= 3 \end{aligned}$$

Show your work.

$$\begin{array}{rcl} 8x - 2y & = 1 \\ + -4x + y & = 3 \\ \hline 4x - y & = -2 \\ \\ 8x - 2y & = 1 \\ + -8x + 2y & = 6 \\ \hline & & 7 \end{array}$$

Answer

no solution

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The response completes the task correctly using mathematically sound procedures. Although no final statement of inequality is provided, the work is sufficiently developed and correct to establish full understanding.

GUIDE PAPER 4

54

Determine the solution, if any, to the system of equations below.

$$\begin{aligned}8x - 2y &= 1 \\-4x + y &= 3\end{aligned}$$

Show your work.

$$\begin{aligned}2(8x - 2y = 1) \\-4x + y = 3 \\ \hline -8x + 2y &= 6\end{aligned}$$

8

$$\begin{aligned}\cancel{8}x - \cancel{2}y &= 1 \\-8x + 2y &= 6 \\ \hline 0 &= -5\end{aligned}$$

Answer no solution

1/2

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The response provides a correct answer using mathematically sound procedures; however, in the final step of the work the right side of the equations are subtracted rather than added. The response correctly addresses only some elements of the task.

GUIDE PAPER 5

54

Determine the solution, if any, to the system of equations below.

$$\begin{aligned}8x - 2y &= 1 \\-4x + y &= 3\end{aligned}$$

Show your work.

$$\begin{array}{r}8x - 2y = 1 \\-8x \quad -8x \\ \hline -2y = -8x + 1 \\-2 \quad -2 \\ \hline y = 4x - 1\end{array}$$

$$\begin{array}{r}-4x + y = 3 \\+4x \quad +4x \\ \hline y = 4x + 3\end{array}$$

$$y = 4x - 2$$

???

• Same slope = Parallel lines!

• No solution

Answer No solutions \emptyset

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The response provides a correct answer using mathematically sound procedures; however, the first equation is rearranged into slope-intercept form incorrectly. The response correctly addresses only some elements of the task.

GUIDE PAPER 6

54

Determine the solution, if any, to the system of equations below.

$$\begin{aligned}8x - 2y &= 1 \\-4x + y &= 3\end{aligned}$$

Show your work.

$$\begin{aligned}\cancel{4x} + \boxed{y} &= 3 \\+ 4x &\quad + 4x \\(y = 4x + 3) &\\y &= 4(1) + 3 \\y &= 28 + 3 \\y &= 31\end{aligned}$$

$$(7, 31)$$

$$\begin{aligned}8x - 2y &= 1 \\8x - 2(4x + 3) &= 1 \\8x - 8x - 6 &= 1 \\0x - 6 &= 1 \\+ 6 &\quad + 6 \\x &= 7\end{aligned}$$

Answer $(7, 31)$

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The substitution method is used appropriately to solve the system of equations; however, the system is incorrectly solved as $x = 7$ rather than $0 = 7$. This incorrect x -value is then used to appropriately solve for the value of y . The response contains an incorrect solution but applies an appropriate process.

GUIDE PAPER 7

54

Determine the solution, if any, to the system of equations below.

$$\begin{aligned}8x - 2y &= 1 \\-4x + y &= 3\end{aligned}$$

Show your work.

$$\begin{aligned}\cancel{8x - 2y = 1} \\-\cancel{8x} \\-2y &= 1 - 8x \\-2y &= \frac{-8x + 1}{-2} \\-2y &= 4x - 0.5 \\y &= 4x - 0.5\end{aligned}$$

$$\begin{aligned}\cancel{-4x + y = 3} \\+\cancel{4x} \\y &= 3 + 4x\end{aligned}$$

Answer

2, 3

Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. Although both equations are rearranged into slope-intercept form, the work is not developed any further and the answer provided is incorrect.

GUIDE PAPER 8

Additional

54

Determine the solution, if any, to the system of equations below.

$$\begin{aligned}8x - 2y &= 1 \\-4x + y &= 3\end{aligned}$$

Show your work.

$$\begin{aligned}\begin{cases} 8x - 2y = 1 \\ -4x + y = 3 \end{cases} \\ \begin{array}{r} 8x - 2y = 1 \\ -4x + y = 3 \\ \hline -3x + y = 4 \\ 3x + y = 24 \\ \hline 4 = 24 \\ 4 \cancel{4} \\ x = 6 \end{array}\end{aligned}$$

Answer One Solution

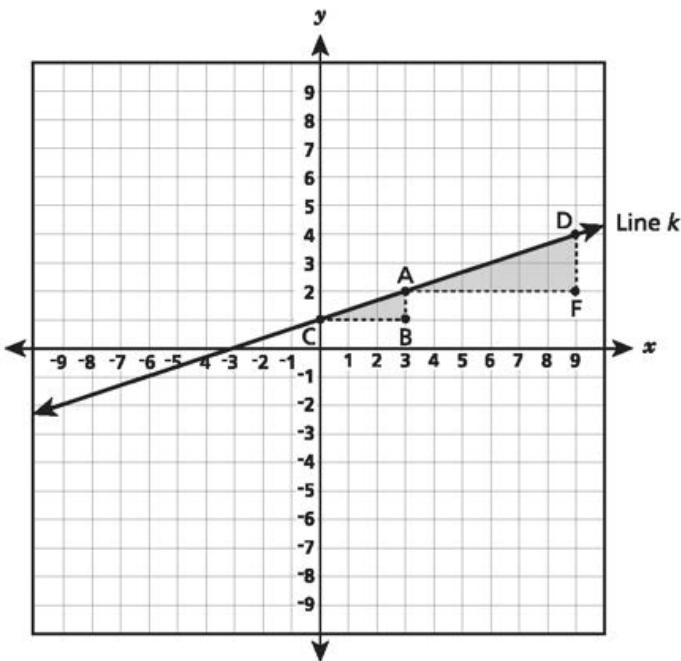
Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. An attempt is made to use the elimination method to solve the system of equations; however, numerous errors in the work demonstrate no overall understanding of using the procedure correctly and the answer provided is incorrect.

EXEMPLARY RESPONSE

55

The hypotenuses of similar triangles ABC and DFA both lie on line k , as shown below.



Demonstrate whether the slope of line k is constant between points C and D. Use the leg lengths of triangles ABC and DFA in your answer.

The slope of segment \overline{CA} is $BA \div CB = \frac{1}{3}$ and the slope of segment \overline{AD} is

$FD \div AF = \frac{2}{6} = \frac{1}{3}$. Both are $\frac{1}{3}$ so the slope of line k between points C and D is

constant.

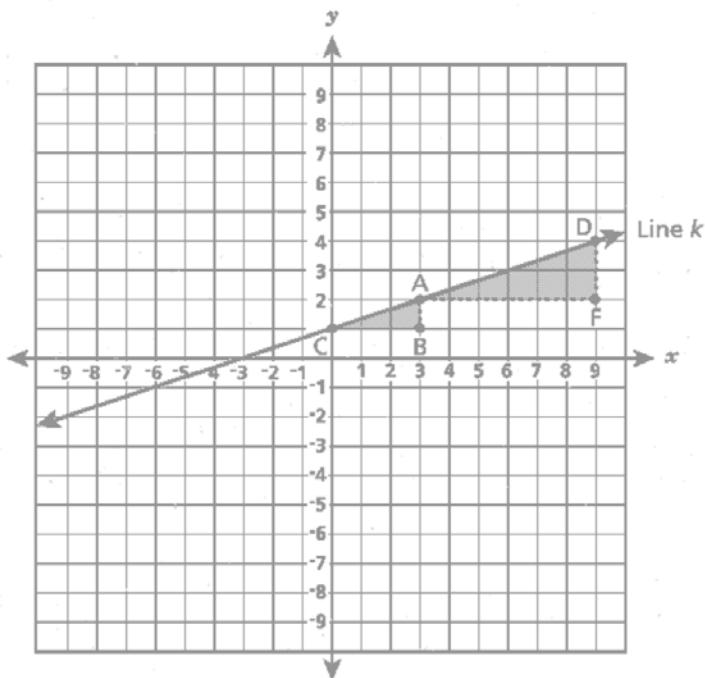
Or other valid response

GUIDE PAPER 1

Additional

55

The hypotenuses of similar triangles ABC and DFA both lie on line k , as shown below.



Demonstrate whether the slope of line k is constant between points C and D. Use the leg lengths of triangles ABC and DFA in your answer.

Yes, the slope of line k is constant between points C and D. The slope of \overline{CA} is $\frac{1}{3}$, and the slope of \overline{AD} is $\frac{2}{6}$, which simplifies to $\frac{1}{3}$.

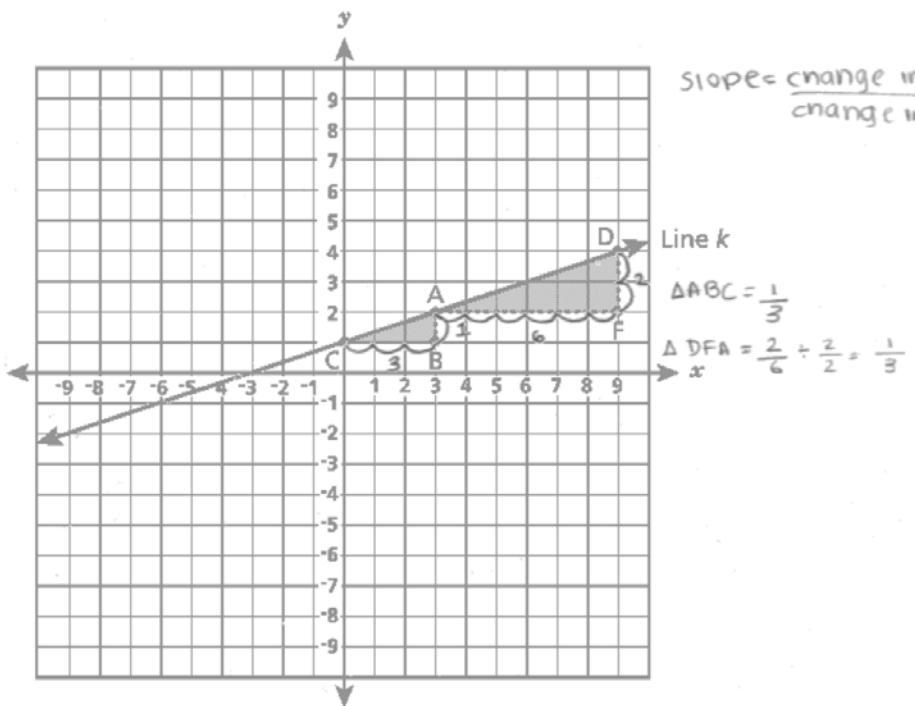
Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The slope of line k is correctly shown to be constant using the leg lengths of the triangles.

GUIDE PAPER 2

55

The hypotenuses of similar triangles ABC and DFA both lie on line k, as shown below.



Demonstrate whether the slope of line k is constant between points C and D. Use the leg lengths of triangles ABC and DFA in your answer.

The slope of line k is constant between points C and D. This is because when you find the slope, change in y over change in x of triangle ABC, the slope is $\frac{1}{3}$. and the slope of triangle DFA is $\frac{2}{6}$ which can also simplify to $\frac{1}{3}$ meaning the slope is the same / constant.

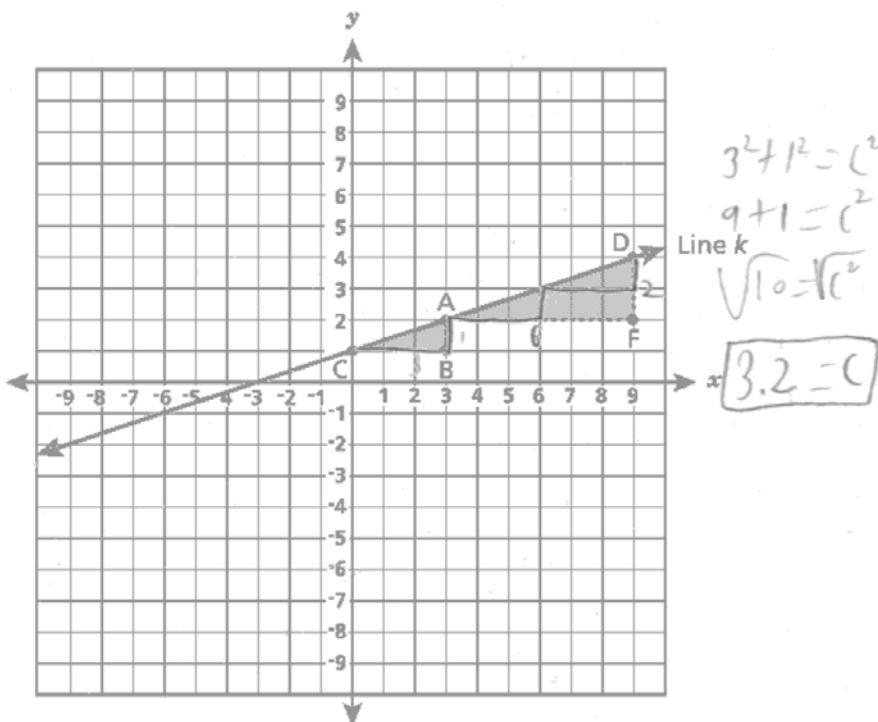
Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The slope of line k is correctly shown to be constant using the leg lengths of the triangles.

GUIDE PAPER 3

55

The hypotenuses of similar triangles ABC and DFA both lie on line k , as shown below.



Demonstrate whether the slope of line k is constant between points C and D. Use the leg lengths of triangles ABC and DFA in your answer.

The slope between C and D are constant because

1 over 3 (ABC) and 2 over 6 (DFA) are the same lengths

one is just multiplied by 2.

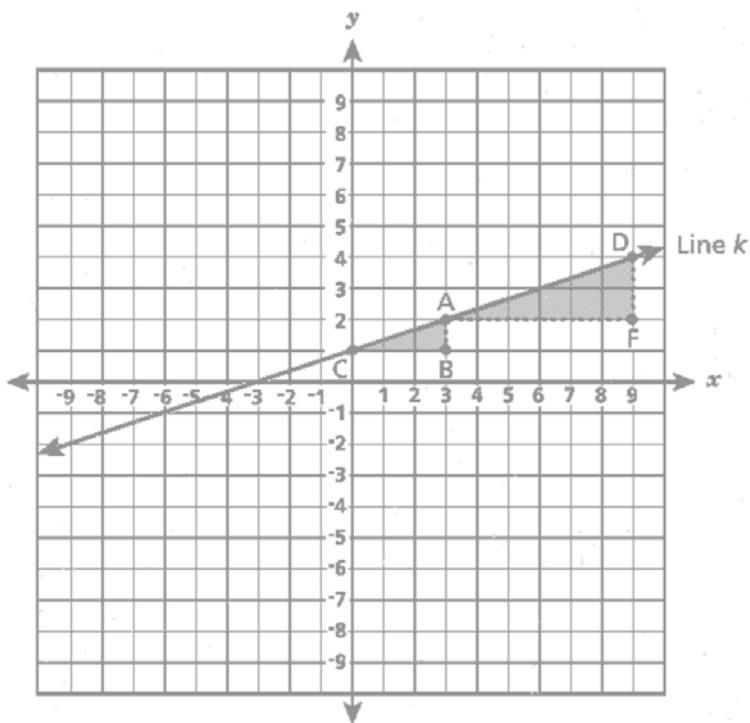
Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The slope of line k is correctly shown to be constant using the leg lengths of the triangles.

GUIDE PAPER 4

55

The hypotenuses of similar triangles ABC and DFA both lie on line k , as shown below.



Demonstrate whether the slope of line k is constant between points C and D. Use the leg lengths of triangles ABC and DFA in your answer.

Yes because $\frac{1}{3}$ and $\frac{2}{6}$ are the same thing.

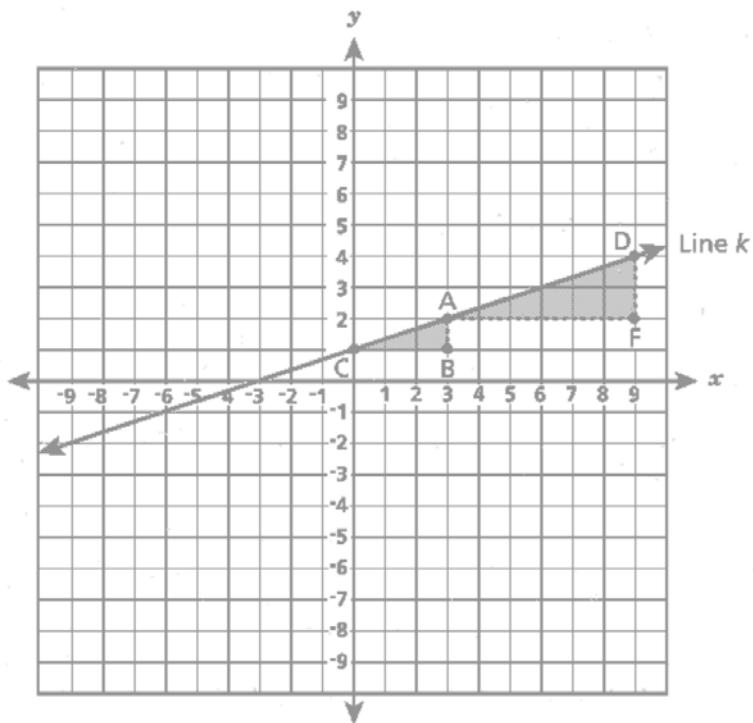
Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The slope of line k is correctly identified as constant; however, the explanation does not sufficiently demonstrate how the values $\frac{1}{3}$ and $\frac{2}{6}$ are related to the slope or the leg lengths of the triangles. The response addresses only some elements of the task.

GUIDE PAPER 5

55

The hypotenuses of similar triangles ABC and DFA both lie on line k , as shown below.



Demonstrate whether the slope of line k is constant between points C and D. Use the leg lengths of triangles ABC and DFA in your answer.

The graph is constantly increasing by $\frac{1}{3}$ through ABC and DFA.

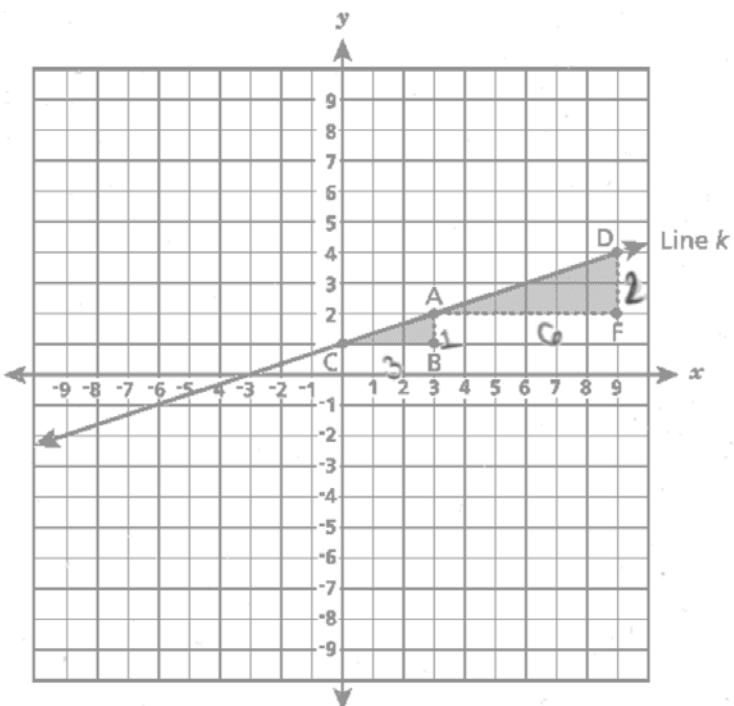
Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The slope of line k is correctly shown to be constant; however, the explanation does not sufficiently demonstrate how the value $\frac{1}{3}$ relates to the leg lengths of the triangles. The response addresses only some elements of the task.

GUIDE PAPER 6

55

The hypotenuses of similar triangles ABC and DFA both lie on line k , as shown below.



Demonstrate whether the slope of line k is constant between points C and D. Use the leg lengths of triangles ABC and DFA in your answer.

The slope of line k is constant because
the leg lengths of triangle ABC is 3 and 1 and
the leg lengths of triangle DFA is 6 and 2.

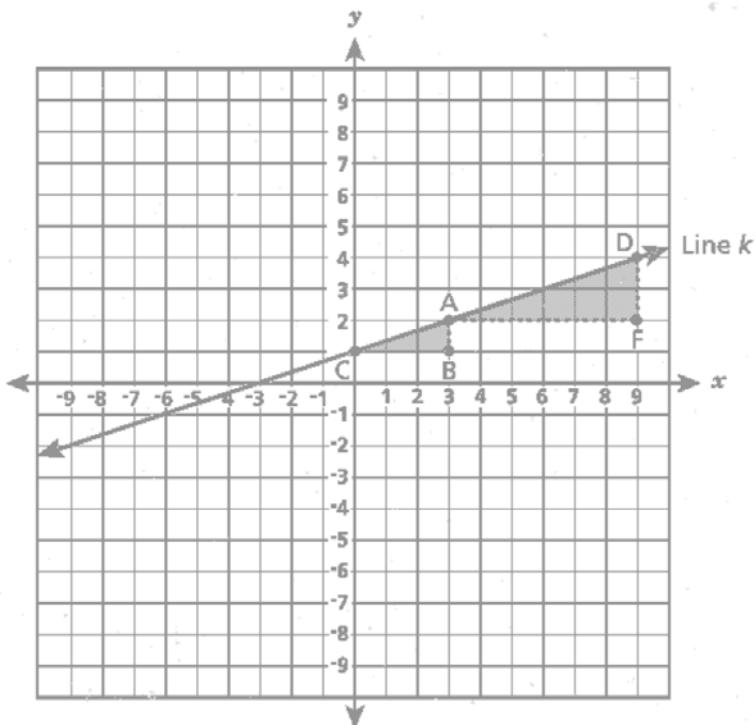
Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The slope of line k is identified as constant; however, the explanation does not sufficiently link the slope to the leg lengths of the triangles using division. The response addresses only some elements of the task.

GUIDE PAPER 7

55

The hypotenuses of similar triangles ABC and DFA both lie on line k , as shown below.



Demonstrate whether the slope of line k is constant between points C and D. Use the leg lengths of triangles ABC and DFA in your answer.

The slope is constant rise 3 over 1.

Score Point 0 (out of 2 points)

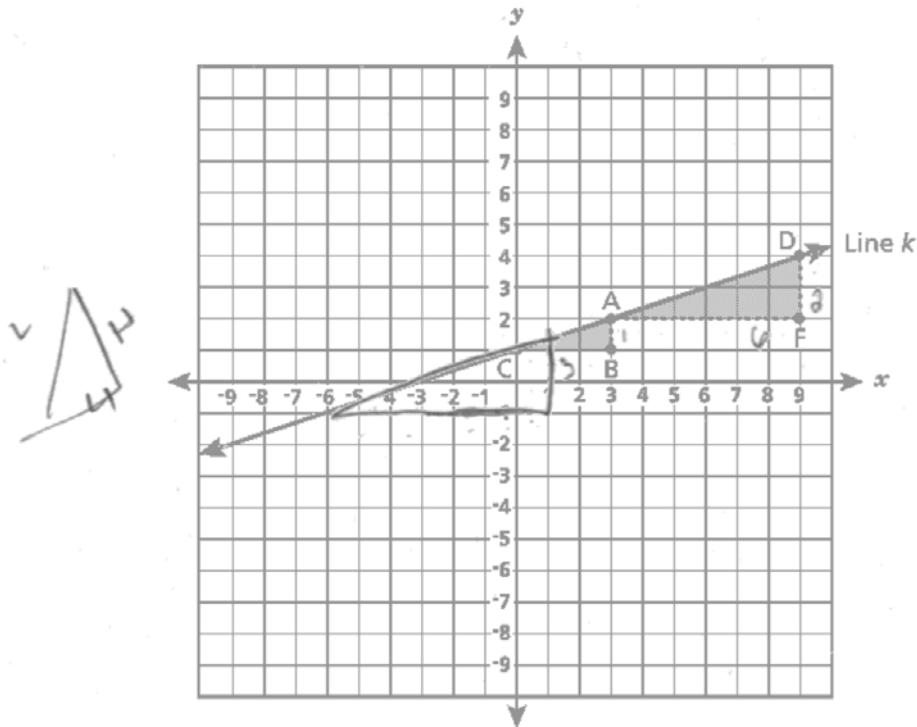
This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The slope of line k is incorrectly stated reciprocally and it is not explained in relation to the leg lengths of the triangles.

GUIDE PAPER 8

Additional

55

The hypotenuses of similar triangles ABC and DFA both lie on line k , as shown below.



Demonstrate whether the slope of line k is constant between points C and D. Use the leg lengths of triangles ABC and DFA in your answer.

The slope of line K is not constant because the slopes are different.

Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The response incorrectly states that the slope of line k is not constant.

EXEMPLARY RESPONSE

56

The values in the table below represent Function B, which is a linear function.

x	y
-3	-7
-1	-1
1	5
3	11

Function L is represented by the equation $y = 6x + 4$. Compare Functions B and L by determining which one has the greater rate of change and which one has the greater y -intercept. Explain why your answers are correct.

Show your work.

Function B:

$$y = mx + b$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - (-7)}{-1 - (-3)} = \frac{6}{2} = 3$$
$$y = 3x + b$$
$$-7 = 3(-3) + b$$
$$-7 = -9 + b$$
$$b = 2$$

Function B: $y = 3x + 2$

Function L: $y = 6x + 4$

The slope, m , represents the rate of change. The slope of Function L is 6, which

is greater than 3, the slope of Function B. The y -intercept is b . The y -intercept of

Function L is 4, which is greater than 2, the y -intercept of Function B.

or other valid response

GUIDE PAPER 1

Additional

56

The values in the table below represent Function B, which is a linear function.

x	y
-3	-7
-1	-1
1	5
3	11

$$\begin{aligned}y &= mx + b \\y &= \frac{8}{2}x + b \\y &= 3x + b\end{aligned}$$

Function L is represented by the equation $y = 6x + 4$. Compare Functions B and L by determining which one has the greater rate of change and which one has the greater y -intercept. Explain why your answers are correct.

Show your work.

$$11 = y = 6x + 4$$

$$y = 6x + 4$$

$$y = 3x + b$$

$$11 = 3(3) + b$$

$$11 = 9 + b$$

$$-9 \quad -9$$

$$2 = b$$

$$y = 3x + 2$$

Function L has a greater rate of change and a greater y -intercept than Function B because $6 > 3$ and $4 > 2$.

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The rate of change and y -intercept of Function B are correctly calculated and compared to Function L.

GUIDE PAPER 2

56

The values in the table below represent Function B, which is a linear function.

x	y
-3	-7
-1	-1
1	5
3	11

Function L is represented by the equation $y = 6x + 4$. Compare Functions B and L by determining which one has the greater rate of change and which one has the greater y-intercept. Explain why your answers are correct.

Show your work.

$$\begin{array}{|c|} \hline y = -3x + 2 \\ \hline \end{array}$$
$$(1, 5) \quad (3, 11)$$
$$x_1 \quad x_2 \quad y_1 \quad y_2$$
$$\frac{11 - 5}{3 - 1} = \frac{6}{2} = 3$$
$$5 = 3(1) + b$$
$$-5 = 3 + b$$
$$-3 = b$$
$$2 = b$$

Function L has a greater y intercept
and the greater rate of change. Function
B's rate of change is while Function L's
rate of change is 6. Function B's y intercept
is 2 while Function L's is 4.

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The rate of change and y-intercept of Function B are correctly calculated and compared to Function L. The value of the rate of change of Function B is missing from the explanation; however, it is clearly identified in the work. The omission is inconsequential, and does not detract from the demonstration of understanding.

GUIDE PAPER 3

56

The values in the table below represent Function B, which is a linear function.

$$y =$$

x	y
-3	-7
-1	-1
1	5
3	11

$$\frac{6}{2} \quad 3x$$

$$\begin{aligned} -1 &= 3(-1) + b \\ -1 &= -3 + b \\ 1 &= b \end{aligned}$$

Function L is represented by the equation $y = 6x + 4$. Compare Functions B and L by determining which one has the greater rate of change and which one has the greater y -intercept. Explain why your answers are correct.

Show your work.

$$\begin{aligned} y &= mx + b \\ -1 &= 3(-1) + b \\ -1 &= -3 + b \\ +3 &+3 \\ 2 &= b \end{aligned}$$

Function B
$$\boxed{y = 3x + 2}$$

Function L
$$\boxed{y = 6x + 4}$$

Function L has a greater rate of change because compared to function B where you get 3 for every 1 in function L you get 6 for every one. Also function L has a greater y intercept because 4 is greater than 2.

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The rate of change and y -intercept of Function B are correctly calculated and compared to Function L.

GUIDE PAPER 4

56

The values in the table below represent Function B, which is a linear function.

x	y
-3	-7
-1	-1
1	5
3	11

Function L is represented by the equation $y = 6x + 4$. Compare Functions B and L by determining which one has the greater rate of change and which one has the greater y-intercept. Explain why your answers are correct.

Show your work.

$$\text{Function L: } y = 6x + 4$$

$$\text{Function B: } \frac{y^2 - y^1}{x^2 - x^1} \rightarrow \frac{11 - 5}{3 - 1} = \frac{6}{2}$$

$$\text{Function B: } y = \frac{6}{2}x + 1.5$$

x	y
-3	-7
-1	-1
1	5
3	11

The rate of change of function L is greater than the rate of change of function B because 6 is greater than $\frac{6}{2}$. The y-intercept of function L is also greater than the y-intercept of function B because 4 is greater than 1.5.

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The rate of change of Function B is calculated correctly and the explanation correctly compares the functions; however, the y-intercept of Function B is calculated incorrectly. The response correctly addresses only some elements of the task.

GUIDE PAPER 5

56

The values in the table below represent Function B, which is a linear function.

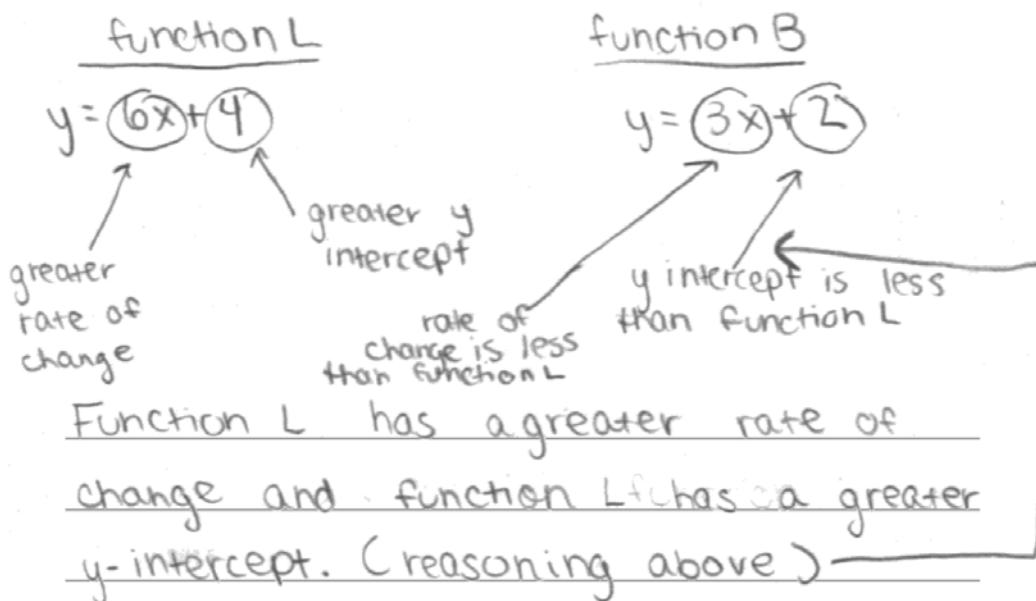
function L		function B	
x	y	x	y
-3	-14	-3	-7
-1	-2	-1	-1
1	10	1	5
3	22	3	11

$y = 6x + 4$

$y = 3x + 2$

Function L is represented by the equation $y = 6x + 4$. Compare Functions B and L by determining which one has the greater rate of change and which one has the greater y-intercept. Explain why your answers are correct.

Show your work.



Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The rate of change and y-intercept of Function B are correctly calculated and compared to Function L; however, the explanation incorrectly includes the variable x in the rates of change. The response correctly addresses only some elements of the task.

GUIDE PAPER 6

56

The values in the table below represent Function B, which is a linear function.

x	y
-3	-7
-1	-1
1	5
3	11

Function L is represented by the equation $y = 6x + 4$. Compare Functions B and L by determining which one has the greater rate of change and which one has the greater y -intercept. Explain why your answers are correct.

Show your work.

$$\frac{-7+1}{-3+1} = \frac{-6}{-2} = 3$$

(-3, -7)

$$\begin{aligned}-7 &= 3(-3) + b \\ -7 &= -9 + b \\ -7 &= b\end{aligned}$$

$$y = 3x - 7$$

Function L has the greater rate of change and y -intercept.

My answer is correct because I used two pair of points from Function B to determine the slope and y -intercept. After that I saw Function L being greater.

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The rate of change of Function B is calculated correctly and the explanation correctly compares the functions; however, the y -intercept of Function B is calculated incorrectly and the explanation is weak (*After that I saw Function L being greater*). The response correctly addresses only some elements of the task.

GUIDE PAPER 7

56

The values in the table below represent Function B, which is a linear function.

x	y
-3	-7
-1	-1
1	5
3	11

Function L is represented by the equation $y = 6x + 4$. Compare Functions B and L by determining which one has the greater rate of change and which one has the greater y-intercept. Explain why your answers are correct.

Show your work.

y goes up 6

x goes up 2

$$-7+6=-1$$

$$-1+6=5$$

$$-3+2=-1$$

$$-1-2=-3$$

I found the answer by looking at the difference
for x it was 2 because -3 and -1 are +2 away. y is bigger
because -7 and -1 has a difference of 6. My answers are
correct because I took the 4 numbers used 2 and saw the differ-
ence and looked at the other 2 to make sure,

Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The response only addresses the changes in x -values and y -values of Function B without taking their ratio to determine the rate of change of the function. Function L and the y -intercepts of both functions are not addressed.

GUIDE PAPER 8

Additional

56

The values in the table below represent Function B, which is a linear function.

x	y
-3	-7
-1	-1
1	5
3	11

Function L is represented by the equation $y = 6x + 4$. Compare Functions B and L by determining which one has the greater rate of change and which one has the greater y-intercept. Explain why your answers are correct.

Show your work.

$$L = y = 6x + 4$$
$$B = \frac{1}{3}x + 7$$

Function L has a higher slope ↗

Y-intercept has a _____

Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The rate of change and y-intercept of Function B are incorrect and have no supporting work. Although the comparison of the rates of change is correct, the comparison of the y-intercepts is incorrect for the values shown.

EXEMPLARY RESPONSE

57

The values given in the table below lie on the graph of a linear function.

x	y
0.25	1.00
0.50	1.75
0.75	2.50

What equation represents this linear function?

Show your work.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1.75 - 1.00}{0.50 - 0.25} = \frac{0.75}{0.25} = 3$$

$$y = mx + b$$

$$(1.00) = (3)(0.25) + b$$

$$1.00 = 0.75 + b$$

$$b = 0.25 \quad \text{or other valid process}$$

Answer $y = 3x + 0.25$

GUIDE PAPER 1

Additional

57

The values given in the table below lie on the graph of a linear function.

x	y
0.25	1.00
0.50	1.75
0.75	2.50

What equation represents this linear function?

Show your work.

$$y = mx + b$$

$$m = \frac{\Delta y}{\Delta x}$$

$$m = \frac{1.75 - 1}{0.5 - 0.25}$$

$$m = \frac{0.75}{0.25}$$

$$m = 3$$

$$y = 3x + b$$

$$1.75 = 3(0.50) + b$$

$$b = 1.75 - 1.50$$

$$b = 0.25$$

$$y = 3x + 0.25$$

Answer $y = 3x + 0.25$

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The slope and y-intercept are correctly calculated and a correct equation is provided.

GUIDE PAPER 2

57

The values given in the table below lie on the graph of a linear function.

x	y
0.25	1.00
0.50	1.75
0.75	2.50

What equation represents this linear function?

Show your work.

$$(0.25, 1.00) (0.50, 1.75)$$

$$\begin{array}{r} 1.00 - 1.75 = -0.75 \\ \hline 0.25 - 0.50 = -0.25 \end{array}$$

$$\begin{array}{r} 1.00 = 0.25(3) \\ -0.75 \quad 0.75 \end{array}$$

$$0.25$$

Answer $y = 3x + 0.25$

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The slope and y -intercept are correctly calculated and a correct equation is provided.

GUIDE PAPER 3

57

The values given in the table below lie on the graph of a linear function.

x	y
0.25	1.00
0.50	1.75
0.75	2.50

What equation represents this linear function?

Show your work.

$$\frac{1.75 - 1.00}{0.50 - 0.25} = \frac{0.75}{0.25} = 3$$

$$y = 3x + b$$

$$2.50 = 3(0.75) + b$$

$$\frac{2.50 - 2.25}{0.75 - 0.25} = \frac{0.25}{0.50} = 0.5$$

$$0.25 = b$$

$$y = 3x + 0.25$$

Answer $y = 3x + 0.25$

Score Point 2 (out of 2 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The slope and y-intercept are correctly calculated and a correct equation is provided.

GUIDE PAPER 4

57

The values given in the table below lie on the graph of a linear function.

x	y
0.25	1.00
0.50	1.75
0.75	2.50

What equation represents this linear function?

Show your work.

$$y = mx + b$$

$$\text{slope} = .75 \div .25 = 3$$

$$\text{slope} = 3$$

$$y = 3x + b$$

$$1.75 = 3(0.50) + b$$

$$1.75 = 1.5 + b$$

$$\begin{array}{r} 1.50 \\ - \\ \hline 0.25 \end{array}$$

$$0.25 = b$$

Answer b = 2.5

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The slope and y-intercept are correctly calculated; however, the solution for the y-intercept is chosen incorrectly as the answer. The response contains an incorrect solution but applies an appropriate process.

GUIDE PAPER 5

57

The values given in the table below lie on the graph of a linear function.

x	y
0.25	1.00
0.50	1.75
0.75	2.50

What equation represents this linear function?

Show your work.

$$\frac{2.50 - 1.75}{0.75 - 0.50} = \frac{0.75}{0.25} = 3$$

$$\frac{1.75 - 1.00}{0.50 - 0.25} = \frac{0.75}{0.25} = 3$$

$$y = 3x$$

Answer $y = 3x$

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The slope is calculated correctly and used appropriately in an equation; however, the y-intercept is not addressed. The response correctly addresses only some elements of the task.

GUIDE PAPER 6

57

The values given in the table below lie on the graph of a linear function.

x	y
0.25	1.00
0.50	1.75
0.75	2.50

What equation represents this linear function?

Show your work.

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{0.50 - 1.75}{0.75 - 0.50} = \frac{-0.75}{0.25} = -3$$

$$\begin{array}{r} .25 \\ \times 3 \\ \hline .75 \\ +1.00 \\ \hline 1.75 \end{array}$$

Answer 1.75

Score Point 1 (out of 2 points)

This response demonstrates only a partial understanding of the mathematical concepts in the task. The slope is calculated correctly; however, the y-intercept is not addressed and an equation is not provided. The response correctly addresses only some elements of the task.

GUIDE PAPER 7

57

The values given in the table below lie on the graph of a linear function.

-0.25	0.00	0.25	-0.75
0.25	0.25	1.00	.25
0.50	0.50	1.75	.25
0.75	0.75	2.50	.25

What equation represents this linear function?

Show your work.

0.25

Answer 0.25

Score Point 0 (out of 2 points)

Holistically, this response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. Although the y -intercept is correctly determined by extrapolating from the trend of the table, it is unclear if it is understood as the y -intercept. The slope is not addressed and an equation is not provided.

GUIDE PAPER 8

Additional

57

The values given in the table below lie on the graph of a linear function.

x	y
0.25	1.00
0.50	1.75
0.75	2.50

What equation represents this linear function?

Show your work.

$$y = mx + b$$
$$y = \frac{1}{3}x -$$

Answer $y = \frac{1}{3}x$

Score Point 0 (out of 2 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The slope and equation provided are incorrect and are not supported by the work. The y -intercept is not addressed.

EXEMPLARY RESPONSE

58

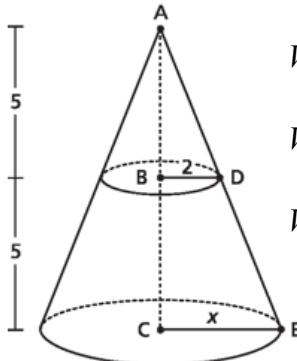
The circular base of the cone below has center C. Another circle, with center B, is parallel to the base. This circle is the base of a smaller cone with height AB. The measurements in the diagram are given in inches.

Similar triangles mean that

$$\frac{CE}{BD} = \frac{AC}{AB} \text{ so:}$$

$$\frac{x}{2} = \frac{5+5}{5}$$

$$x = 4$$



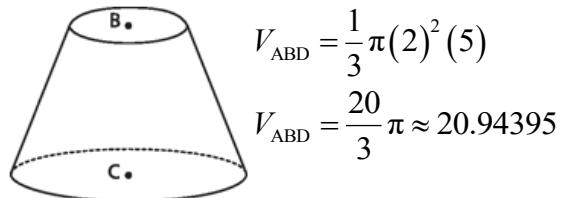
$$V_{\text{cone}} = \frac{1}{3}\pi r^2 h$$

$$V_{ACE} = \frac{1}{3}\pi(4)^2(10)$$

$$V_{ACE} = \frac{160}{3}\pi \approx 167.551608$$

Triangle ABD is similar to triangle ACE.

The smaller cone is removed to create a new object, as shown below.



$$V_{ABD} = \frac{1}{3}\pi(2)^2(5)$$

$$V_{ABD} = \frac{20}{3}\pi \approx 20.94395$$

What is the volume of this new object? Round your answer to the nearest tenth.

Show your work.

$$V = V_{ACE} - V_{ABD} = \frac{160}{3}\pi - \frac{20}{3}\pi = \frac{140}{3}\pi \approx 146.607657$$

or other valid process

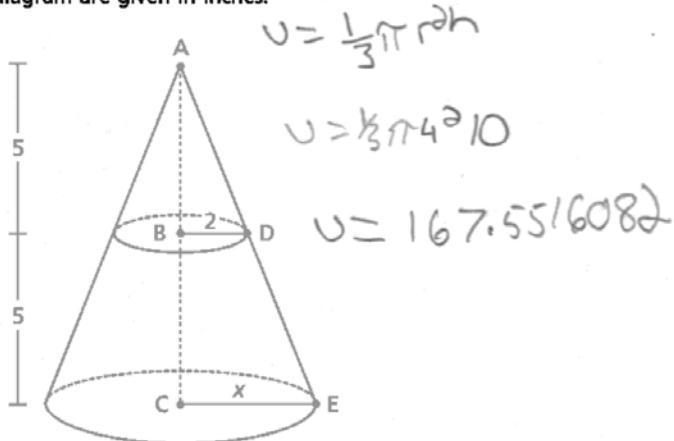
Answer 146.6 cubic inches

GUIDE PAPER 1

Additional

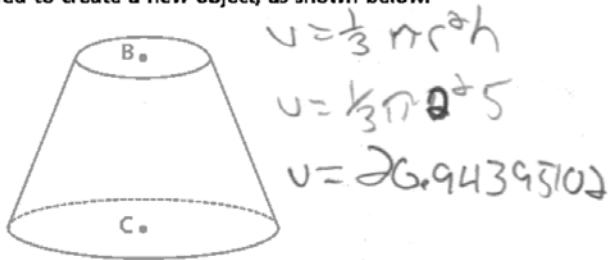
58

The circular base of the cone below has center C. Another circle, with center B, is parallel to the base. This circle is the base of a smaller cone with height AB. The measurements in the diagram are given in inches.



Triangle ABD is similar to triangle ACE.

The smaller cone is removed to create a new object, as shown below.



What is the volume of this new object? Round your answer to the nearest tenth.

Show your work.

Answer $V \approx 146.6 \text{ in}^3$ cubic inches

$$\begin{array}{r}
 167.5516082 \\
 - 26.94395102 \\
 \hline
 146.606572 \\
 \boxed{146.6}
 \end{array}$$

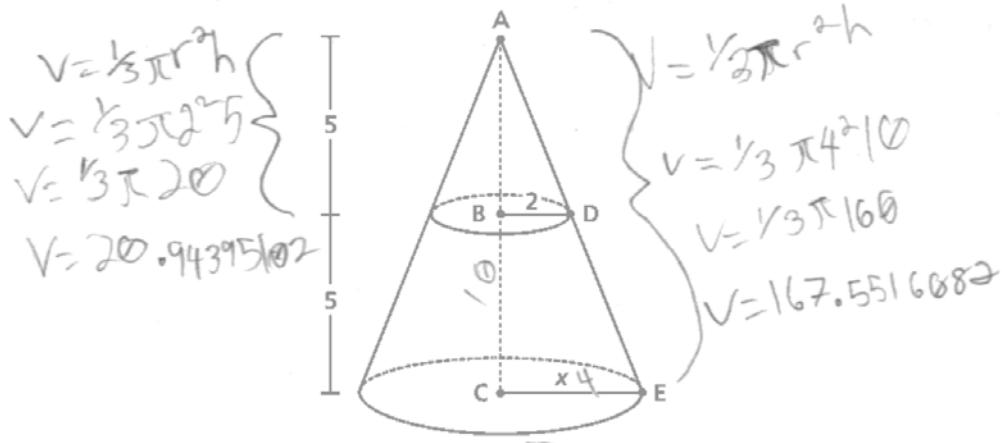
Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The volume of the new object is calculated correctly by subtracting the volume of the smaller cone from the volume of the whole cone and the solution is correctly rounded to the nearest tenth.

GUIDE PAPER 2

58

The circular base of the cone below has center C. Another circle, with center B, is parallel to the base. This circle is the base of a smaller cone with height AB. The measurements in the diagram are given in inches.



Triangle ABD is similar to triangle ACE.

The smaller cone is removed to create a new object, as shown below.



What is the volume of this new object? Round your answer to the nearest tenth.

Show your work.

Answer 146.6 cubic inches

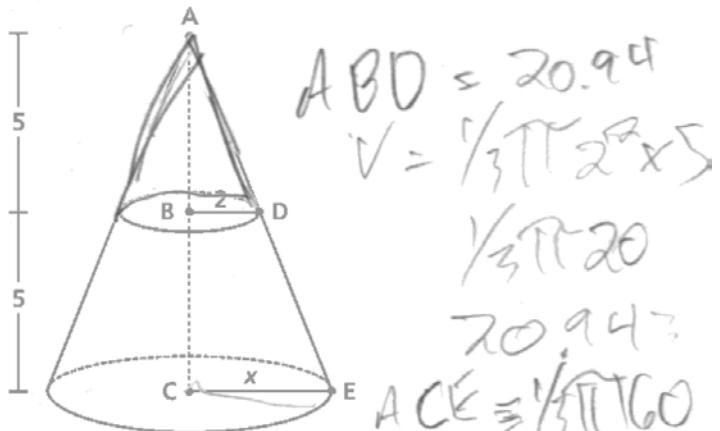
Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The volume of the new object is calculated correctly by subtracting the volume of the smaller cone from the volume of the whole cone and the solution is correctly rounded to the nearest tenth.

GUIDE PAPER 3

58

The circular base of the cone below has center C. Another circle, with center B, is parallel to the base. This circle is the base of a smaller cone with height AB. The measurements in the diagram are given in inches.



Triangle ABD is similar to triangle ACE.

The smaller cone is removed to create a new object, as shown below.



What is the volume of this new object? Round your answer to the nearest tenth.

Show your work.

Answer 146.6 cubic inches

$$V = \frac{1}{3}\pi(11) \times 5$$
$$167.55$$
$$- 20.94$$
$$\hline 146.6$$

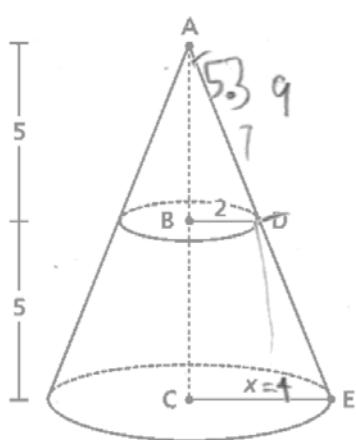
Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The volume of the new object is calculated correctly by subtracting the volume of the smaller cone from the volume of the whole cone and the solution is correctly rounded to the nearest tenth.

GUIDE PAPER 4

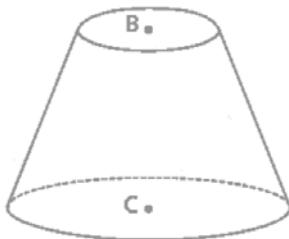
58

The circular base of the cone below has center C. Another circle, with center B, is parallel to the base. This circle is the base of a smaller cone with height AB. The measurements in the diagram are given in inches.



Triangle ABD is similar to triangle ACE.

The smaller cone is removed to create a new object, as shown below.



What is the volume of this new object? Round your answer to the nearest tenth.

Show your work.

Answer 146.6 cubic inches

$$\begin{aligned} & \cancel{\frac{5^2 \pi}{3}} - \cancel{\frac{2^2 \pi}{3}} \\ & \frac{25\pi}{3} - \frac{4\pi}{3} \\ & \frac{21\pi}{3} \\ & 7\pi \end{aligned}$$

$$\begin{aligned} & V = \frac{1}{3}\pi(2)^2(7) \\ & V = \frac{1}{3}\pi 4(7) \\ & V = 167.5 \end{aligned}$$

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The volume of the new object is calculated correctly by subtracting the volume of the smaller cone from the volume of the whole cone and the solution is correctly rounded to the nearest tenth; however, there is no work to demonstrate how the volume of the smaller cone was obtained. The response appropriately addresses most, but not all aspects of the task.

GUIDE PAPER 5

58

The circular base of the cone below has center C. Another circle, with center B, is parallel to the base. This circle is the base of a smaller cone with height AB. The measurements in the diagram are given in inches.

Show your work:

$$\frac{1}{3} \times \pi \times 4^2 \times 10$$

$\swarrow \searrow$

167.55

$$\begin{array}{r} 167.55 \\ - 20.94 \\ \hline 146.61 \end{array}$$

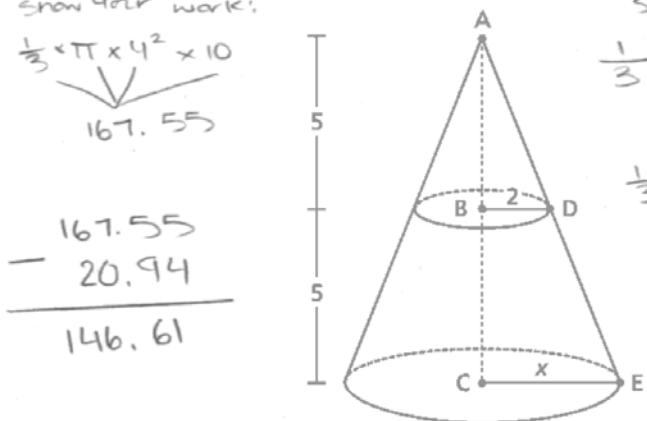
Show your work:

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

$$\frac{1}{3} \times \pi \times 2^2 \times 5$$

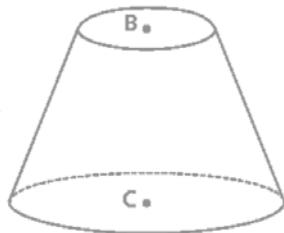
$\swarrow \searrow$

20.94



Triangle ABD is similar to triangle ACE.

The smaller cone is removed to create a new object, as shown below.



What is the volume of this new object? Round your answer to the nearest tenth.

Show your work.

Answer 146.61 cubic inches

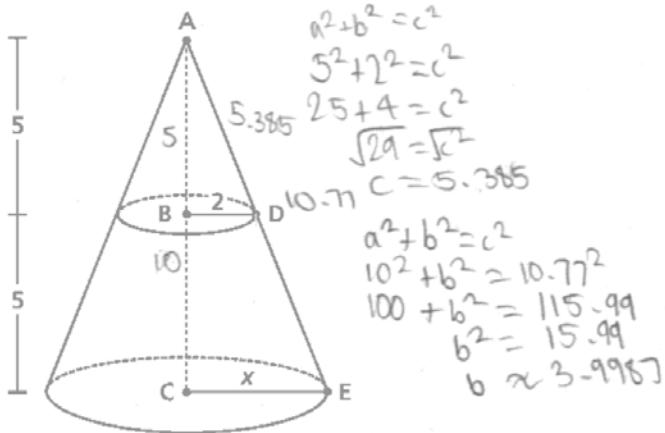
Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The volume of the new object is calculated correctly by subtracting the volume of the smaller cone from the volume of the whole cone; however, the solution is not rounded to the nearest tenth as required. The response appropriately addresses most, but not all aspects of the task.

GUIDE PAPER 6

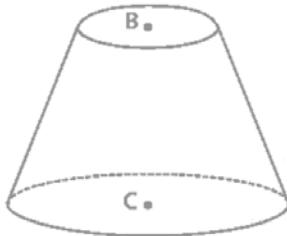
58

The circular base of the cone below has center C. Another circle, with center B, is parallel to the base. This circle is the base of a smaller cone with height AB. The measurements in the diagram are given in inches.



Triangle ABD is similar to triangle ACE.

The smaller cone is removed to create a new object, as shown below.



What is the volume of this new object? Round your answer to the nearest tenth.

Show your work.

$$\begin{aligned} V &= \frac{1}{3}\pi r^2 h \\ V &= \frac{1}{3}\pi (2)^2 (5) \\ V &= 20.94395 \end{aligned}$$

Answer 146.5 cubic inches

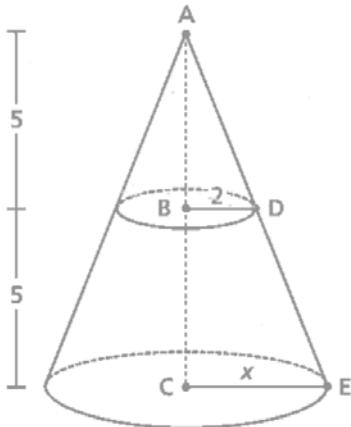
Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The volume of the new object is calculated appropriately by subtracting the volume of the smaller cone from the volume of the whole cone; however, early rounding when using the Pythagorean Theorem to determine the value of x results in an incorrect solution. The response contains an incorrect solution but provides sound procedures and reasoning.

GUIDE PAPER 7

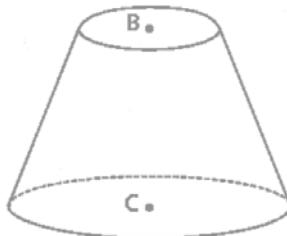
58

The circular base of the cone below has center C. Another circle, with center B, is parallel to the base. This circle is the base of a smaller cone with height AB. The measurements in the diagram are given in inches.



Triangle ABD is similar to triangle ACE.

The smaller cone is removed to create a new object, as shown below.



What is the volume of this new object? Round your answer to the nearest tenth.

Show your work.

$$V = \frac{1}{3} \pi r^2 h$$
$$V = \frac{1}{3} \pi (2)^2 (5)$$

Answer 20.9 cubic inches

Score Point 1 (out of 3 points)

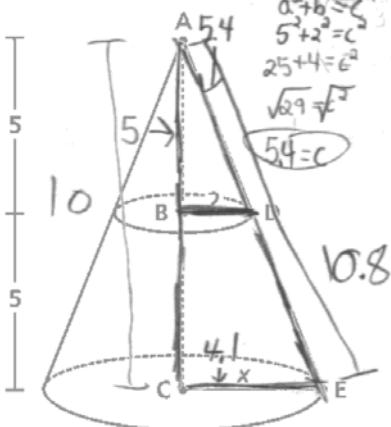
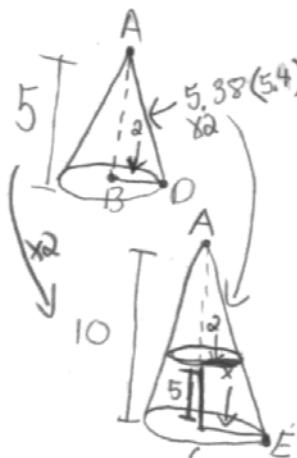
This response demonstrates only a limited understanding of the mathematical concepts in the task. The volume of the smaller cone is calculated correctly and appropriately rounded to the nearest tenth; however, the volumes of the whole cone and the new object are not addressed. The response addresses some elements of the task correctly but is incomplete.

GUIDE PAPER 8

Additional

58

The circular base of the cone below has center C. Another circle, with center B, is parallel to the base. This circle is the base of a smaller cone with height AB. The measurements in the diagram are given in inches.



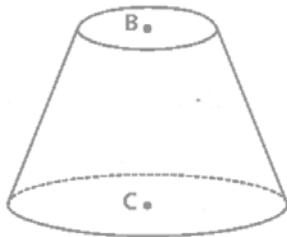
$$\begin{aligned} a^2 + b^2 &= c^2 \\ 5^2 + 2^2 &= c^2 \\ 25 + 4 &= c^2 \\ \sqrt{29} &= c \\ 5.4 &= c \end{aligned}$$

$$\begin{aligned} V &= \frac{1}{3} \pi r^2 h \\ V &= \frac{1}{3} \pi \cdot 2^2 \cdot 5 \\ V &= \frac{1}{3} \pi \cdot 4 \cdot 5 \\ V &= \frac{1}{3} \pi \cdot 20 \\ V &= 6.67\pi \end{aligned}$$

Triangle ABD is similar to triangle ACE.

The smaller cone is removed to create a new object, as shown below.

$$\begin{aligned} a^2 + b^2 &= c^2 \\ 10^2 + b^2 &= 10.8^2 \\ 100 + b^2 &= 116.64 \\ b^2 &= 116.64 - 100 \\ b^2 &= 16.64 \\ b &= \sqrt{16.64} \\ b &= 4.1 \end{aligned}$$



$$\begin{aligned} V &= \frac{1}{3} \pi \cdot 4.1^2 \cdot 10 \\ V &= \frac{1}{3} \pi \cdot 16.81 \cdot 10 \\ V &= 56.033\pi \end{aligned}$$

56.033

What is the volume of this new object? Round your answer to the nearest tenth.

Show your work.

Answer _____ cubic inches

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. The volume of the smaller cone is calculated correctly; however, early rounding when using the Pythagorean Theorem to determine the value of x results in an incorrect value for the volume of the whole cone. The volumes are not subtracted to determine the volume of the new object. The response addresses some elements of the task correctly but provides faulty and incomplete reasoning.

GUIDE PAPER 9

58

The circular base of the cone below has center C. Another circle, with center B, is parallel to the base. This circle is the base of a smaller cone with height AB. The measurements in the diagram are given in inches.

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

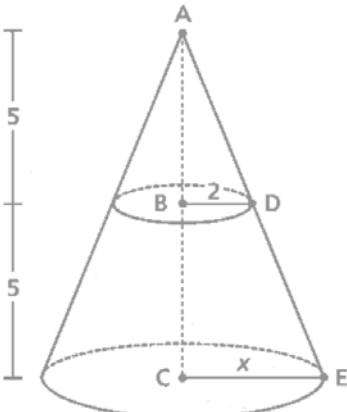
$$V = \frac{1}{3}\pi 2^2 5$$

$$V = \frac{1}{3} \cdot \pi \cdot 4 \cdot 5$$

$$V = \frac{1}{3} \pi \cdot 20$$

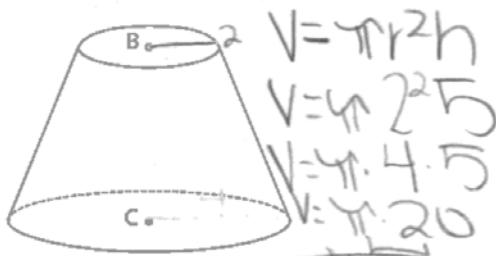
$$V = 105.20$$

$$\cancel{V = 20.94}$$



Triangle ABD is similar to triangle ACE.

The smaller cone is removed to create a new object, as shown below.



What is the volume of this new object? Round your answer to the nearest tenth.

Show your work.

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

$$V = \pi 2^2 5$$

$$V = \pi \cdot 4 \cdot 5$$

$$V = \pi \cdot 20$$

$$\cancel{V = 102.83}$$

Answer 62.8 cubic inches

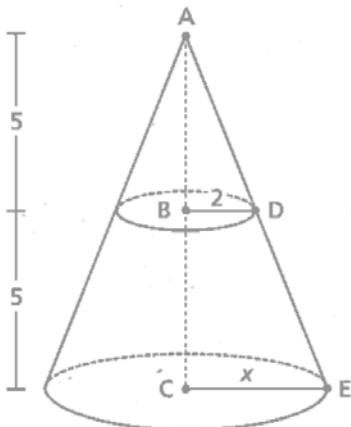
Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. The volume of the smaller cone is calculated correctly; however, the volume of the new object is calculated directly by inappropriately using the formula for the volume of a cylinder. The response addresses some elements of the task correctly but provides faulty and incomplete reasoning.

GUIDE PAPER 10

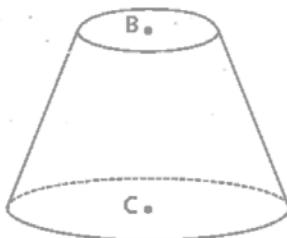
58

The circular base of the cone below has center C. Another circle, with center B, is parallel to the base. This circle is the base of a smaller cone with height AB. The measurements in the diagram are given in inches.



Triangle ABD is similar to triangle ACE.

The smaller cone is removed to create a new object, as shown below.



What is the volume of this new object? Round your answer to the nearest tenth.

Show your work.

$$V = \frac{1}{3}\pi r^2 h \rightarrow \frac{1}{3}\pi \cdot 16 \cdot 5 \approx 83.8$$

Answer 83.8 cubic inches

Score Point 0 (out of 3 points)

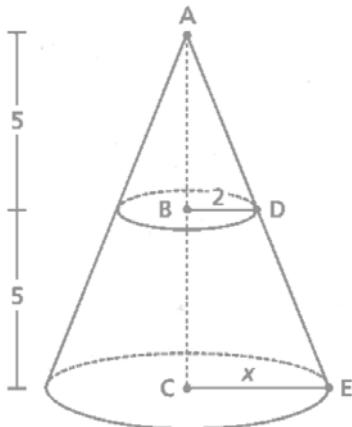
Holistically, this response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The volume of the whole cone is calculated using an incorrect height and the volumes of the smaller cone and the new object are not addressed.

GUIDE PAPER 11

Additional

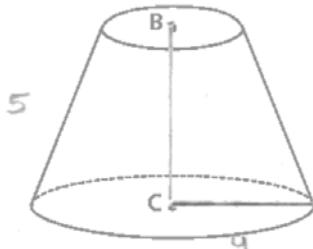
58

The circular base of the cone below has center C. Another circle, with center B, is parallel to the base. This circle is the base of a smaller cone with height AB. The measurements in the diagram are given in inches.



Triangle ABD is similar to triangle ACE.

The smaller cone is removed to create a new object, as shown below.



What is the volume of this new object? Round your answer to the nearest tenth.

Show your work.

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

$$V = 4\pi^2 \times 5$$

$$V = 16\pi \times 5$$

$$V = 80\pi$$

$$V = 251.3$$

Answer 251.3 cubic inches

Score Point 0 (out of 3 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. Although the value of x is correctly determined to be 4, the volume of the new object is calculated directly by inappropriately using the formula for the volume of a cylinder.

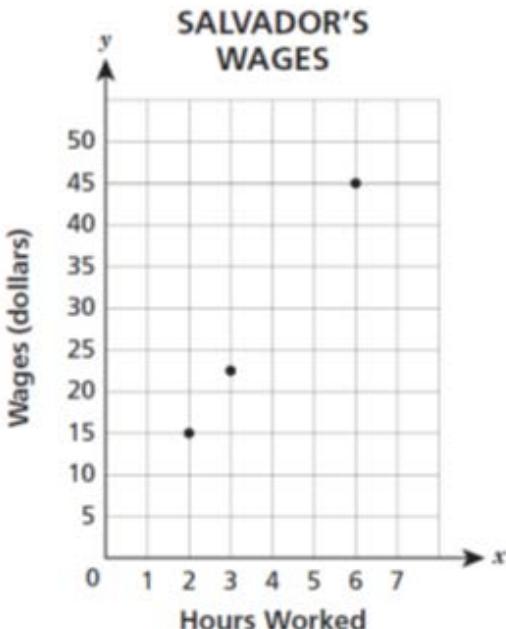
EXEMPLARY RESPONSE

59

The table and the graph below show Josie's and Salvador's wages, respectively, based on the number of hours worked.

JOSIE'S WAGES

Hours Worked	Wages (dollars)
3	26.25
5	43.75
7	61.25



In 2010, Josie and Salvador each worked an eight-hour day for five days each week. How many weeks did it take Josie to earn \$1,000 more than Salvador?

Show your work.

$$\text{Josie: } \$26.25 \div 3 \text{ hr} = \$8.75 / \text{hr}$$

$$\$8.75 / \text{hr} \times 40 \text{ hr / week} = \$350 / \text{week}$$

$$\text{Salvador: } \$15.00 \div 2 \text{ hr} = \$7.50 / \text{hr}$$

$$\$7.50 / \text{hr} \times 40 \text{ hr / week} = \$300 / \text{week}$$

$$8 \times 5 = 40 \text{ hr/week}$$

$$8.75h = 7.50h + 1000$$

OR

$$\$350 - \$300 = \$50 / \text{week difference}$$

$$1.25h = 1000$$

$$h = \frac{1000}{1.25} = 800 \text{ hr}$$

$$\frac{\$1000}{\$50 / \text{week}} = 20 \text{ weeks}$$

$$\frac{800 \text{ hr}}{40 \text{ hr/week}} = 20 \text{ weeks}$$

or other valid process

Answer 20 weeks

GUIDE PAPER 1

Additional

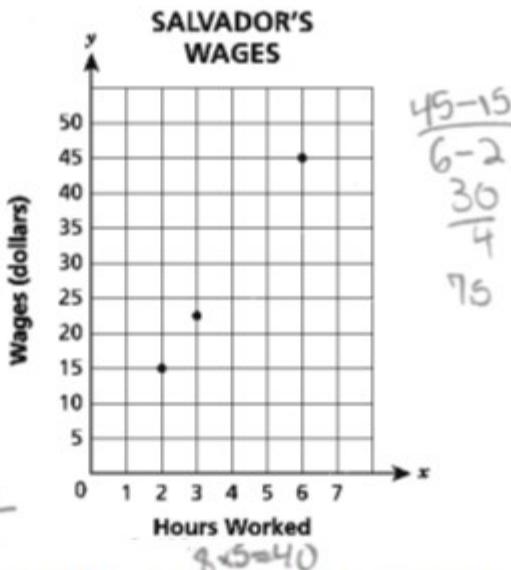
59

The table and the graph below show Josie's and Salvador's wages, respectively, based on the number of hours worked.

JOSIE'S WAGES

Hours Worked	Wages (dollars)
3	26.25
5	43.75
7	61.25

$$\begin{array}{r} 61.25 - 43.75 \\ \hline 17.5 \\ \hline 9.75 \end{array}$$



In 2010, Josie and Salvador each worked an eight-hour day for five days each week. How many weeks did it take Josie to earn \$1,000 more than Salvador?

Show your work.

$$\begin{aligned} \text{Let } x &= \text{number of weeks worked} \\ 40(6.75)x - 1000 &= 40(7.5)x \end{aligned}$$

$$\begin{aligned} 350x - 1000 &= 300x \\ -350x &= -350x \\ 1000 &= 50x \\ 20 &= x \end{aligned}$$

(I will take Josie 20 weeks to earn
\$1,000 more than Salvador.)

Answer

20

weeks

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The number of weeks it took Josie to earn \$1000 more than Salvador is calculated correctly using an appropriate equation.

GUIDE PAPER 2

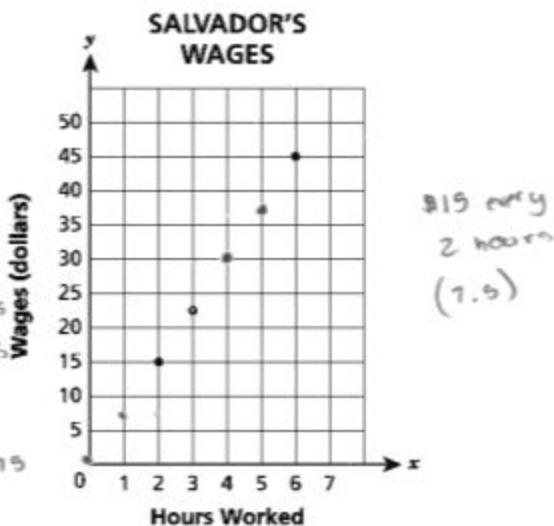
59

The table and the graph below show Josie's and Salvador's wages, respectively, based on the number of hours worked.

JOSIE'S WAGES

Hours Worked	Wages (dollars)
3	26.25
5	43.75
7	61.25

$$\frac{17.5}{2} = \$7.5$$



In 2010, Josie and Salvador each worked an eight-hour day for five days each week. How many weeks did it take Josie to earn \$1,000 more than Salvador?

Show your work.

$$10 \text{ weeks} = 500 \text{ more}$$

$$20 \text{ weeks} = 1000 \text{ more}$$

$$300 : (20) = 15$$

$$300 : (20) = 15$$

Answer

20

Week	Josie	Salvador
1	\$500	\$300
2	\$1000	\$600
3	\$1500	\$900
4	\$2000	\$1200
5	\$2500	\$1500
6	\$3000	\$1800
7	\$3500	\$2100
8	\$4000	\$2400
9	\$4500	\$2700
10	\$5000	\$3000

600 more

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The number of weeks it took Josie to earn \$1000 more than Salvador is determined correctly using an appropriate table listing the cumulative earnings for a given week.

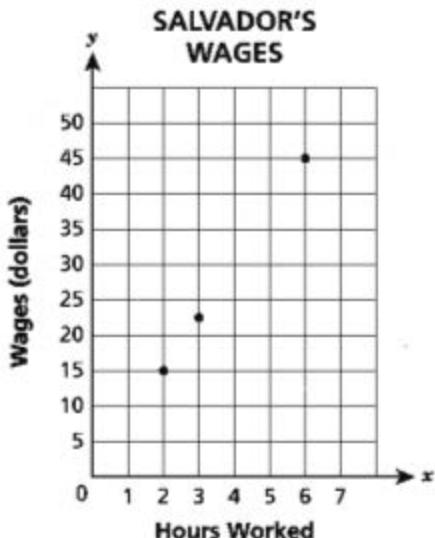
GUIDE PAPER 3

59

The table and the graph below show Josie's and Salvador's wages, respectively, based on the number of hours worked.

JOSIE'S WAGES

Hours Worked	Wages (dollars)
3	26.25
5	43.75
7	61.25



In 2010, Josie and Salvador each worked an eight-hour day for five days each week. How many weeks did it take Josie to earn \$1,000 more than Salvador?

Show your work.

$$\begin{aligned} 8.75 \times 40 &= 350 \\ 1.5 \times 40 &= 60 \\ \frac{1,000}{50} &= 20 \end{aligned}$$

Answer

20

weeks

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. The number of weeks it took Josie to earn \$1000 more than Salvador is calculated correctly by determining their weekly earnings and dividing \$1000 by the \$50 per week difference in the earnings.

GUIDE PAPER 4

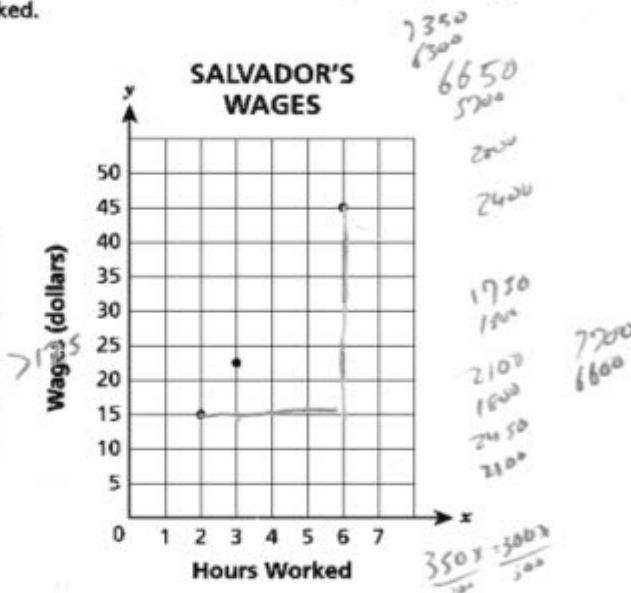
59

The table and the graph below show Josie's and Salvador's wages, respectively, based on the number of hours worked.

JOSIE'S WAGES

Hours Worked	Wages (dollars)
3	26.25
5	43.75
7	61.25

$$\begin{array}{l} \text{26.25} \\ + 17.50 \\ \hline 43.75 \end{array}$$



In 2010, Josie and Salvador each worked an eight-hour day for five days each week. How many weeks did it take Josie to earn \$1,000 more than Salvador?

Show your work.

Find how much Josie and Salvador earn per hour by calculating unit rates and initial values of each.

$$\begin{array}{l} 3 \text{ } 26.25 \text{ calculating unit rates and initial values of each} \\ 5 \text{ } 43.75 \text{ } 7.5 \\ 17.5 \div 2 = 8.75 \end{array}$$

$$\begin{array}{l} 8.75 \times 3 = 26.25 \quad \downarrow \quad \frac{30 \text{ wages in dollars}}{4 \text{ hours worked}} = 7.5 \\ \text{Josie's hourly pay} = 8.75x + y \quad 8.75 \times 40 = 350 \text{ weekly} \quad 7.5 \times 2 = 15 \\ 350 \times 5 = 1750 \text{ weekly} \quad \text{Salvador's hourly pay} = 7.5x + y \\ 350x = 300x \quad \text{substitute values for } x \text{ to get } \$1,000 \\ \text{Answer} \quad 22 \quad \text{weeks} \end{array}$$

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The amount of money each person earns per week is calculated correctly and an appropriate trial-and-error process is described to determine the number of weeks it took Josie to earn \$1000 more than Salvador (*substitute values for x to get \$1,000 more for Josie than Salvador*); however, the solution is incorrect. The response appropriately addresses most, but not all aspects of the task.

GUIDE PAPER 5

59

The table and the graph below show Josie's and Salvador's wages, respectively, based on the number of hours worked.

JOSIE'S WAGES

Hours Worked	Wages (dollars)
3	26.25
5	43.75
7	61.25

$$y = 8.75x$$



In 2010, Josie and Salvador each worked an eight-hour day for five days each week. How many weeks did it take Josie to earn \$1,000 more than Salvador?

Show your work.

$$\begin{aligned} -7.5x + 1000 &= 8.75x \\ \underline{-7.5x} &\quad \underline{-7.5x} \\ 1000 &= 1.25x \\ \underline{1.25} &\quad \underline{1.25} \\ 800 &= x \end{aligned}$$

Answer

800 weeks

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The number of hours it took Josie to earn \$1000 more than Salvador is calculated correctly using an appropriate equation; however, this value is not converted into weeks. The response appropriately addresses most, but not all aspects of the task.

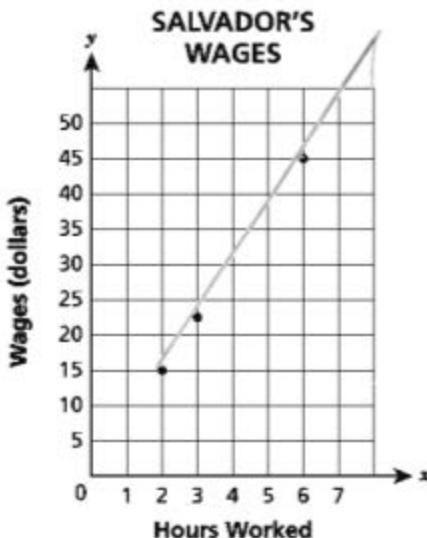
GUIDE PAPER 6

59

The table and the graph below show Josie's and Salvador's wages, respectively, based on the number of hours worked.

JOSIE'S WAGES

Hours Worked	Wages (dollars)
3	26.25
5	43.75
7	61.25



In 2010, Josie and Salvador each worked an eight-hour day for five days each week. How many weeks did it take Josie to earn \$1,000 more than Salvador?

Show your work.

Salvador

$$\begin{aligned} &\$60 \text{ per 8 hours} \\ &(60)30 = 1800 \\ &(60)40 = 2400 \\ &(60)5 = 300 \\ &(60)10 = 600 \\ &(60)15 = 900 \\ &(60)20 = 1200 \\ &(60)30 = 1800 \end{aligned}$$

Answer 10

Josie

$$\begin{aligned} &\$70 \text{ per 8 hours} \\ &(70)5 = 350 \\ &(70)10 = 700 \\ &(70)15 = 1050 \\ &(70)20 = 1400 \\ &(70)30 = 2100 \\ &(70)40 = 2800 \\ &(70)50 = 3500 \\ &(70)100 = 7000 \\ &(70)100 = 7000 \\ &6000 + 7000 = 13000 \\ &13000 - 10000 = 3000 \\ &3000 / 700 = 4.2857 \end{aligned}$$

weeks 10 weeks = 100 days

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The number of days it took Josie to earn \$1000 more than Salvador is calculated correctly using trial-and-error; however, this value is converted into weeks incorrectly. The response appropriately addresses most, but not all aspects of the task.

GUIDE PAPER 7

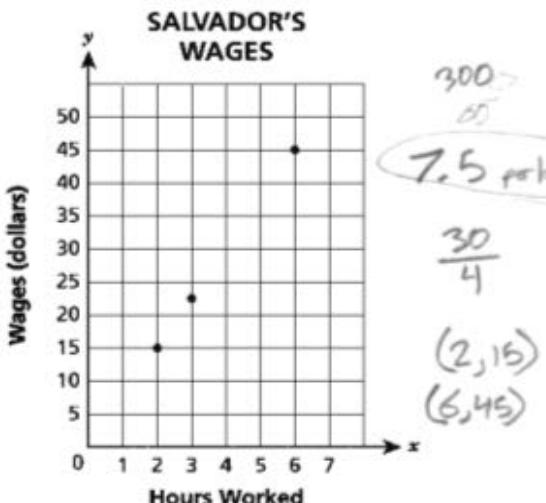
59

The table and the graph below show Josie's and Salvador's wages, respectively, based on the number of hours worked.

JOSIE'S WAGES

Hours Worked	Wages (dollars)
3	26.25
5	43.75
7	61.25

$$\begin{aligned} & \text{Slope: } \frac{17.5}{2} = 8.75 \text{ per hour} \\ & \text{Y-intercept: } 1000 - 8.75 \times 8 \times 5 = 1000 - 350 = 650 \\ & \text{Josie's weekly wage: } 650 + 350 = 1000 \end{aligned}$$



In 2010, Josie and Salvador each worked an eight-hour day for five days each week. How many weeks did it take Josie to earn \$1,000 more than Salvador?

Show your work.

↑
Work shown above

Answer

20

weeks

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. The number of weeks it took Josie to earn \$1000 more than Salvador is correctly identified; however, the work only includes the hourly and weekly wages with no calculations shown to demonstrate how they or the solution were obtained. The response contains the correct solution but the required work is limited.

GUIDE PAPER 8

Additional

59

The table and the graph below show Josie's and Salvador's wages, respectively, based on the number of hours worked.

JOSIE'S WAGES

Hours Worked	Wages (dollars)
3	26.25
5	43.75
7	61.25

$$1 = \$83$$



In 2010, Josie and Salvador each worked an eight-hour day for five days each week. How many weeks did it take Josie to earn \$1,000 more than Salvador?

Show your work.

- (Josie) $200 - 17.66$
 (Salvador) $200 - 15.00$
 (Josie) $500 - 44.15$?
 (Salvador) $500 - 37.50$
 (Josie) $800 - 40.64$
 (Salvador) $800 - 6.00$

$$\begin{array}{r}
 795 \quad (\text{Josie}) \\
 \times 8.83 \\
 \hline
 6843.25
 \end{array}$$

$$\begin{array}{r}
 975 \quad (\text{Salvador}) \\
 \times 7.5 \\
 \hline
 3812.5
 \end{array}$$

Answer

775

weeks

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. An appropriate trial-and-error procedure is used to determine the number of hours it took Josie to earn \$1000 more than Salvador; however, Josie's hourly wage is calculated incorrectly. This error makes trial-and-error difficult as carrying the error through causes the solution to no longer be an integer value of hours: as a result the trial-and-error process is stopped at a difference of \$1030.75 rather than \$1000 exactly. In addition, the solution in hours is not converted into weeks. The response addresses some elements of the task correctly but reaches an inadequate solution based on faulty and incomplete reasoning.

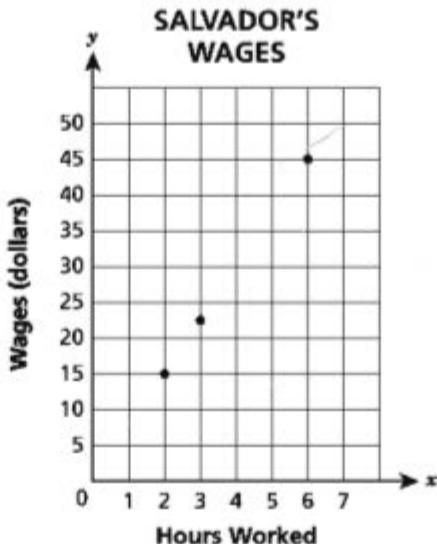
GUIDE PAPER 9

59

The table and the graph below show Josie's and Salvador's wages, respectively, based on the number of hours worked.

JOSIE'S WAGES

Hours Worked	Wages (dollars)
3	26.25
5	43.75
7	61.25



In 2010, Josie and Salvador each worked an eight-hour day for five days each week. How many weeks did it take Josie to earn \$1,000 more than Salvador?

Show your work.

Josie's

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{43.75 - 26.25}{5 - 3} = \frac{17.5}{2} = 8.75$$

$$8.75 \times 8 \times 5 = 40$$

$$1000 \div 40 = 25$$

Salvador's

$$15 \div 2 = 7.5$$

$$7.5 \times 8 \times 5 = 300$$

$$1000 \div 300 = 3.33$$

Answer 2.857 or 2.86 weeks

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. The amount of money each person earns per week is calculated correctly; however, these values are used incorrectly to determine the number of weeks it took each person to earn \$1000 rather than the number of weeks for Josie to earn \$1000 *more* than Salvador. The response reflects a lack of essential understanding of the underlying concepts.

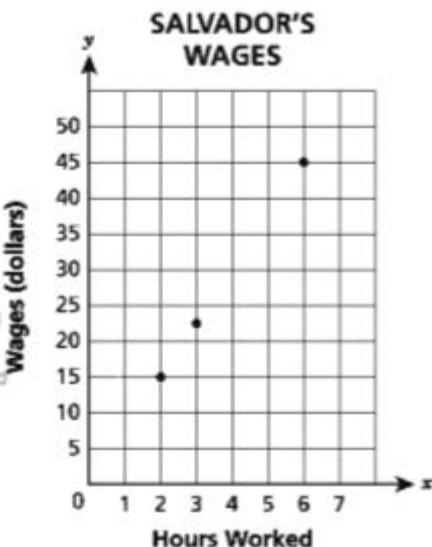
GUIDE PAPER 10

59

The table and the graph below show Josie's and Salvador's wages, respectively, based on the number of hours worked.

JOSIE'S WAGES

Hours Worked	Wages (dollars)
3	26.25
5	43.75
7	61.25



In 2010, Josie and Salvador each worked an eight-hour day for five days each week. How many weeks did it take Josie to earn \$1,000 more than Salvador?

Show your work.

Answer

Score Point 0 (out of 3 points)

Holistically, this response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. Although Josie's daily earnings are calculated correctly, they are used incorrectly to determine the number of days it took Josie to earn \$1000 rather than the number of weeks for Josie to earn \$1000 more than Salvador. Salvador's earnings are not addressed.

GUIDE PAPER 11

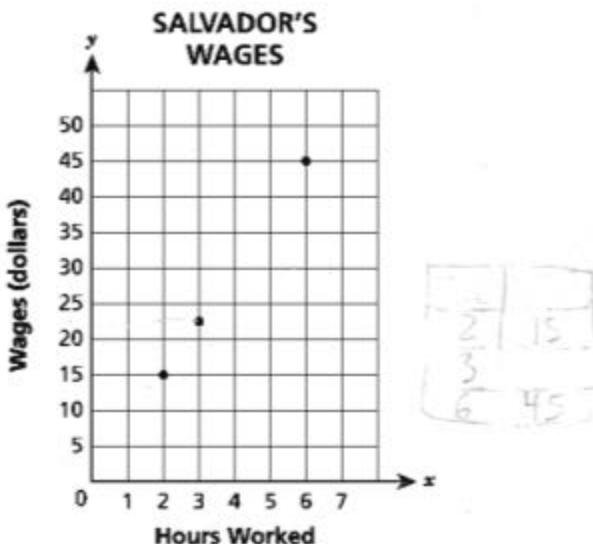
Additional

59

The table and the graph below show Josie's and Salvador's wages, respectively, based on the number of hours worked.

JOSIE'S WAGES

Hours Worked	Wages (dollars)
3	26.25
5	43.75
7	61.25



In 2010, Josie and Salvador each worked an eight-hour day for five days each week. How many weeks did it take Josie to earn \$1,000 more than Salvador?

Show your work.

Answer

20 weeks

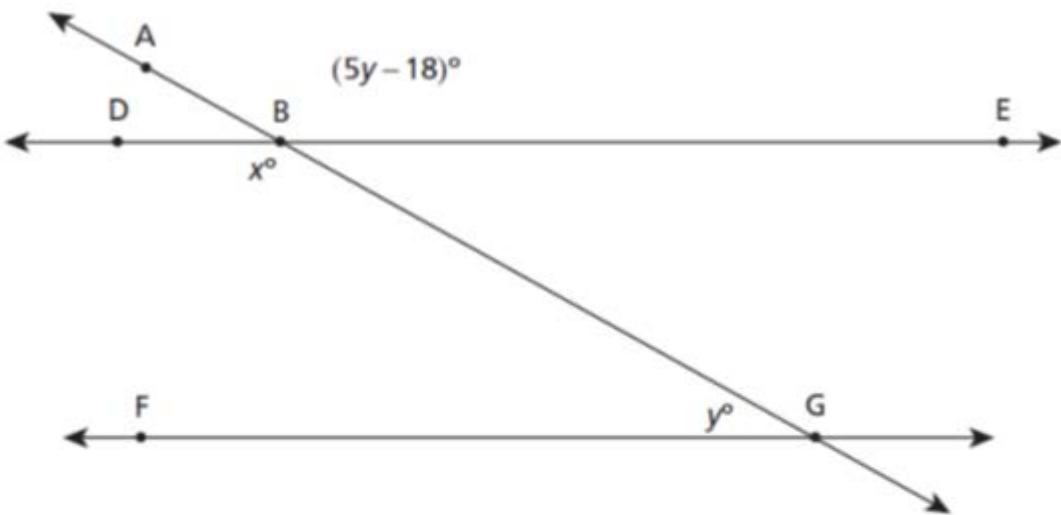
Score Point 0 (out of 3 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The correct solution is obtained using an obviously incorrect procedure.

EXEMPLARY RESPONSE

60

In the figure below, line DE is parallel to line FG, with transversal AG.



Write and solve a system of linear equations to determine the values of x and y .

Show your work.

$$x = 5y - 18$$

$$x + y = 180$$

$$x + (33) = 180$$

$$x = 147$$

$$(5y - 18) + y = 180$$

or other valid process

$$6y = 180 + 18$$

$$6y = 198$$

$$y = 33$$

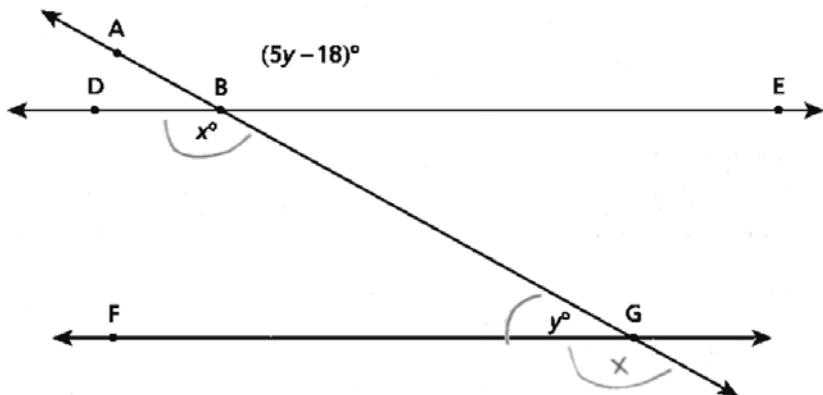
Answer $x = \underline{\hspace{2cm}}^{147}$ and $y = \underline{\hspace{2cm}}^{33}$

GUIDE PAPER 1

Additional

60

In the figure below, line DE is parallel to line FG, with transversal AG.



Write and solve a system of linear equations to determine the values of x and y .

Show your work.

$$\begin{aligned}x &= 5y - 18 \\x + y &= 180\end{aligned}$$

$$5y - 18 + y = 180$$

$$\begin{array}{r} 6y - 18 = 180 \\ +18 \quad +18 \\ \hline 6y = 198 \end{array}$$

$$y = 33$$

$$\begin{array}{r} x + 33 = 180 \\ - 33 \quad - 33 \\ \hline x = 147 \end{array}$$

Answer $x = 147$ and $y = 33$

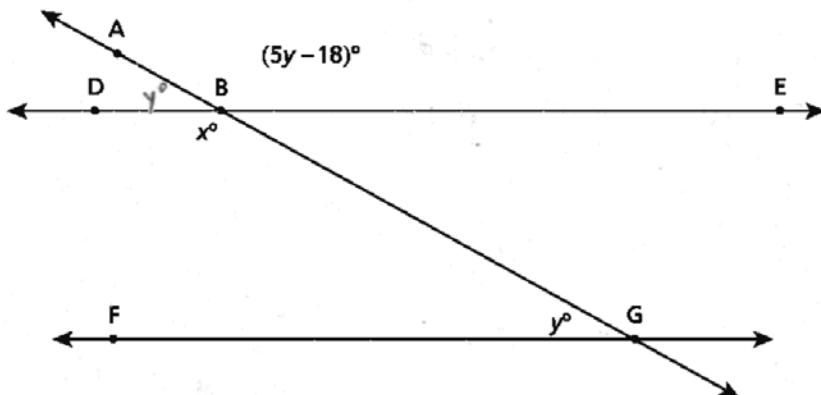
Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. A correct system of equations is provided and it is correctly solved to determine the values of x and y .

GUIDE PAPER 2

60

In the figure below, line DE is parallel to line FG, with transversal AG.



Write and solve a system of linear equations to determine the values of x and y .

Show your work.

$$\begin{array}{ll} y + (5y - 18) = 180 & 6y - 18 = 180 \\ y + 5y - 18 = 180 & 5y - 18 = x \\ 6y - 18 = 180 & 5(33) - 18 = x \\ 6y = 198 & 165 - 18 = x \\ \boxed{y = 33^\circ} & \boxed{147^\circ = x} \end{array}$$

Answer $x = 147^\circ$ and $y = 33^\circ$

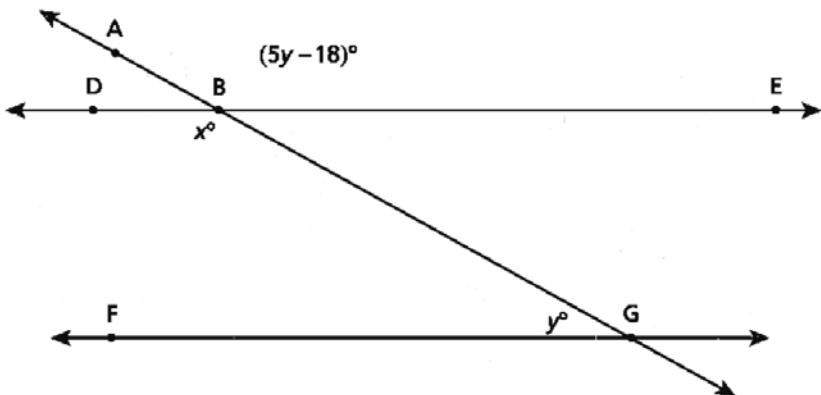
Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. A correct system of equations is provided and it is correctly solved to determine the values of x and y .

GUIDE PAPER 3

60

In the figure below, line DE is parallel to line FG, with transversal AG.



Write and solve a system of linear equations to determine the values of x and y .

Show your work.

$$x = 5y - 18$$

$$y = 140 - x$$

$$x = 5(140 - x) - 18$$

$$x = 980 - 5x - 18$$

$$x = 882 - 5x$$

$$\frac{16x}{6x} = \frac{882 + 18}{5x}$$

Answer

$$x = 47^\circ \quad \text{and} \quad y = 33^\circ$$

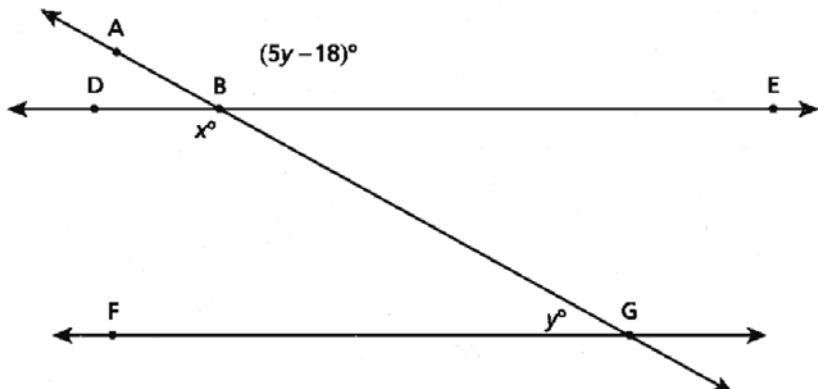
Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. A correct system of equations is provided and it is correctly solved to determine the values of x and y .

GUIDE PAPER 4

60

In the figure below, line DE is parallel to line FG, with transversal AG.



Write and solve a system of linear equations to determine the values of x and y .

Show your work.

$$\begin{array}{r}
 5y - 18 + x = 180 \\
 \underline{+18} \\
 5y = 198 \\
 \underline{\times 6} \\
 y = 33
 \end{array}
 \qquad
 \begin{array}{r}
 5y - 18 \\
 5(33) - 18 \\
 165 - 18 \\
 147
 \end{array}$$

Answer $x = 147^\circ$ and $y = 33^\circ$

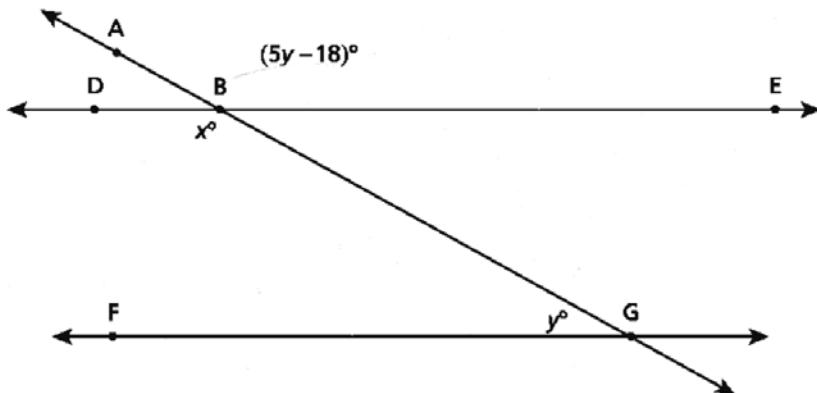
Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. One correct equation is provided and the values of x and y are correctly determined; however, a second equation is not provided to form a complete system of equations. The response appropriately addresses most, but not all aspects of the task.

GUIDE PAPER 5

60

In the figure below, line DE is parallel to line FG, with transversal AG.



Write and solve a system of linear equations to determine the values of x and y .

Show your work.

$$\begin{aligned}
 x &= 5y - 18 \rightarrow 5y = x + 18 \\
 y &= 180 - x \rightarrow + y = -x + 180 \\
 \hline
 6y &= 162 \\
 y &= 27 \\
 x &= 5(27) - 18 \\
 x &= 135 - 18 \\
 x &= 117
 \end{aligned}$$

Answer $x = 117$ and $y = 27$

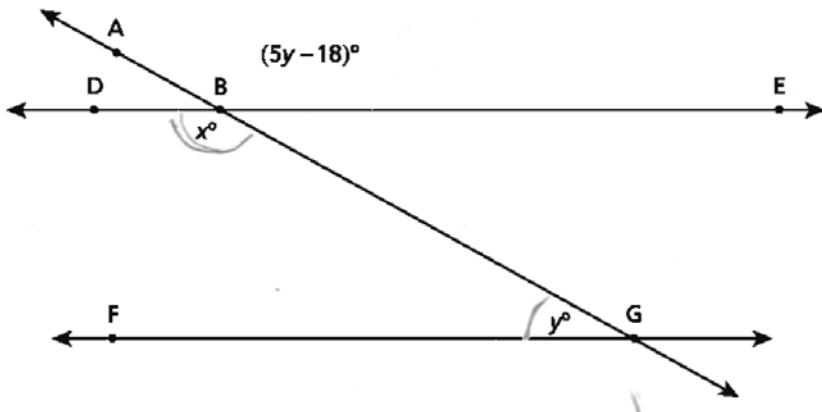
Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. A correct system of equations is provided; however, one of the equations is rearranged incorrectly when solving the system ($x = 5y - 18 \rightarrow 5y = x - 18$), resulting in an incorrect solution. The response reflects some minor misunderstanding of the underlying procedures.

GUIDE PAPER 6

60

In the figure below, line DE is parallel to line FG, with transversal AG.



Write and solve a system of linear equations to determine the values of x and y .

Show your work.

$$\begin{aligned}x &= 5y - 18 \\y &= -2x + 360\end{aligned}$$

$$\begin{aligned}y &= -2(162) + 360 \\y &= -324 + 360 \\y &= 36\end{aligned}$$

$$\begin{aligned}x &= 5(-2x + 360) - 18 \\x &= -10x + 1800 - 18 \\x &= -10x + 1782 \\+10x &+ 10x \\11x &= 1782 \\x &= 162\end{aligned}$$

Answer $x = 162^\circ$ and $y = 36^\circ$

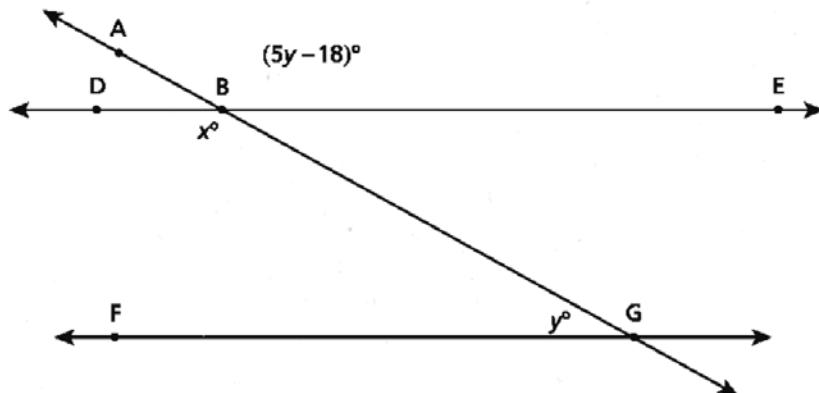
Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. The system of equations provided is partially correct: the equation $y = -2x + 360$ is missing a coefficient of 2 for the variable y . Although the system of equations is incorrect, it is then solved correctly to determine the values of x and y . The response contains an incorrect solution but provides sound procedures.

GUIDE PAPER 7

60

In the figure below, line DE is parallel to line FG, with transversal AG.



Write and solve a system of linear equations to determine the values of x and y .

Show your work.

$$\begin{array}{r} x - y = \\ + 35 \\ \hline 175 \\ - 18 \\ \hline 157 \\ + 35 \\ \hline 192 \end{array}$$
$$\begin{array}{r} x - y = \\ + 35 \\ \hline 175 \\ - 18 \\ \hline 157 \\ + 35 \\ \hline 147 \end{array}$$

Answer $x = 147$ and $y = 33$

Score Point 1 (out of 3 points)

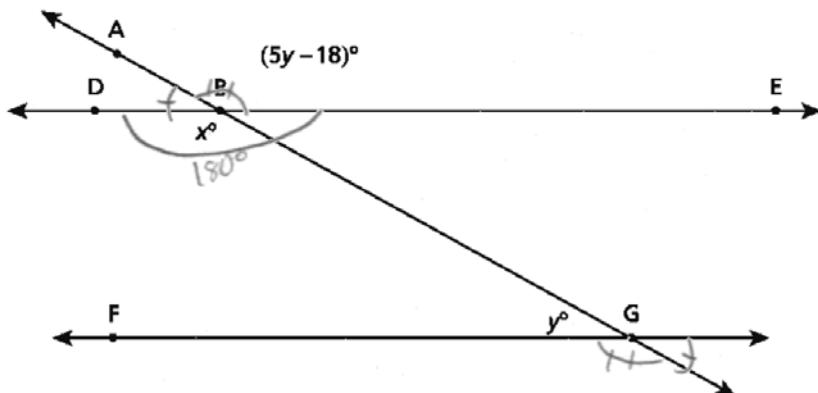
This response demonstrates only a limited understanding of the mathematical concepts in the task. The values of x and y are correctly determined using trial-and-error; however, the response does not provide a system of equations. The response reflects a lack of essential understanding of the underlying concepts.

GUIDE PAPER 8

Additional

60

In the figure below, line DE is parallel to line FG, with transversal AG.



Write and solve a system of linear equations to determine the values of x and y .

Show your work.

$$\begin{aligned}x &= (5y - 18) \\y &= 180 - (5y - 18)\end{aligned}$$

Answer $x = (5y - 18)$ and $y = 180 - (5y - 18)$

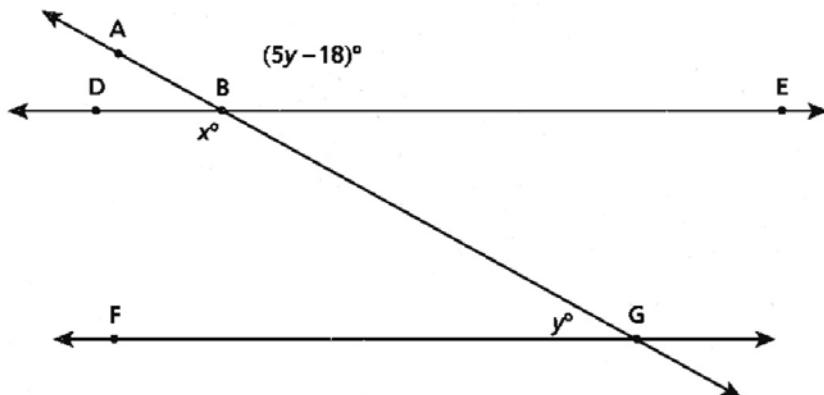
Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. A correct system of equations is provided; however, it is not solved. The response addresses some elements of the task correctly, but is incomplete.

GUIDE PAPER 9

60

In the figure below, line DE is parallel to line FG, with transversal AG.



Write and solve a system of linear equations to determine the values of x and y .

Show your work.

$$(5y - 18) = x \quad x + y = 180$$

$$\cancel{y + y = 180}$$

$$\cancel{5y - 18 = x}$$

$$\begin{array}{r} (6x - 162) \\ \hline 2x \end{array}$$

$$\begin{array}{r} 3x - 81 \\ \hline 3x \end{array}$$

$$5x - 18 = x$$

$$\begin{array}{r} 5x - 18 \\ \hline 18 \end{array}$$

$$\begin{array}{r} 5x = -9 \\ \hline -9 \end{array}$$

$$x = -0,5$$

Answer $x = -27$ and $y = -0,5$

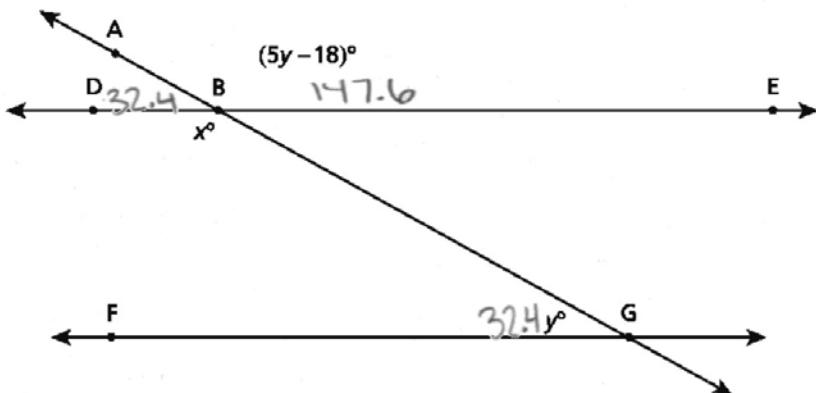
Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. A correct system of equations is provided; however, it is solved incorrectly. The response addresses some elements of the task correctly, but reflects a lack of essential understanding of the underlying concepts.

GUIDE PAPER 10

60

In the figure below, line DE is parallel to line FG, with transversal AG.



Write and solve a system of linear equations to determine the values of x and y .

Show your work.

$$\begin{array}{r} 180 = 5y - 18 \\ -18 \quad -18 \end{array}$$

$$\frac{180 - 18}{5} = \frac{162}{5}$$

$$y = 32.4$$

Answer $x = 147.6^\circ$ and $y = 32.4^\circ$

Score Point 0 (out of 3 points)

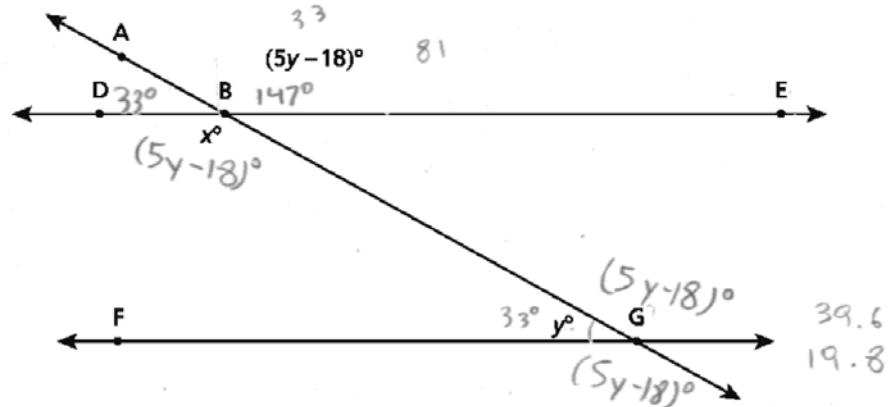
Holistically, this response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. Only one equation is provided and it is incorrect. Although this equation is solved correctly for the value of y and the value of x is correct based on the incorrect value of y , no work is shown for the determination of the value of x .

GUIDE PAPER 11

Additional

60

In the figure below, line DE is parallel to line FG, with transversal AG.



Write and solve a system of linear equations to determine the values of x and y .

Show your work.

$$\begin{aligned} 180 &= (5y - 18) \\ 180 &- 5y + 18 \\ + 18 & \hline 198 &= 5y \\ \hline 5 & \quad 5 \\ 39.6 &= y \end{aligned}$$

$$\begin{aligned} 180 &= (5y - 18) + x \\ 180 &- 5y + 18 + x \\ \hline 198 &= 5y + x \end{aligned}$$

Answer $x = 147^\circ$

$$\begin{aligned} 180 - (5y - 18) &= 180 \\ 180 - 5y + 18 &= 180 \\ \hline 180 - 5y + 18 &= 180 \\ 180 - 5y + 18 &= 180 \\ 33(5y - 18) &= 147 \\ 108 &= 5y + x \\ \hline 5 & \quad 5 \\ 39.6 &= y + x \end{aligned}$$

and $y = 33^\circ$

Score Point 0 (out of 3 points)

Holistically, this response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The work contains only one correct equation, $x = 5y - 18$, which is not used correctly in the rest of the work. The work does not support how the correct solution was obtained.

EXEMPLARY RESPONSE

61

Four equations are shown below.

Equation 1: $y = 2^x$

Equation 2: $y = 2x - 5$

Equation 3: $y = x^2 + 6$

Equation 4: $y = \frac{x}{2}$

Identify one linear equation and one nonlinear equation from the list. State a reason why each equation you identified is linear or nonlinear.

Linear equation Equation 2 ($y = 2x - 5$) OR Equation 4 ($y = x/2$)

It is linear because the exponent is either 1 or 0 OR it is

written in $y = mx + b$ form OR when graphed it makes a

straight line OR other valid response

Nonlinear equation Equation 1 ($y = 2^x$) OR Equation 3 ($y = x^2 + 6$)

It is nonlinear because the variable is an exponent (Equation 1 only)

OR the exponent is *not* either 1 or 0 OR when graphed it does

not make a straight line OR other valid response

GUIDE PAPER 1

Additional

61

Four equations are shown below.

Equation 1: $y = 2^x$

Equation 2: $y = 2x - 5$

Equation 3: $y = x^2 + 6$

Equation 4: $y = \frac{x}{2}$

Identify one linear equation and one nonlinear equation from the list. State a reason why each equation you identified is linear or nonlinear.

Linear equation

Equation 2: $y = 2x - 5$

This is a linear equation because it's written in the form $y = mx + b$, and it has a constant rate of change.

Nonlinear equation

Equation 3: $y = x^2 + 6$

This is a nonlinear equation because it will not have a straight line when graphed, because it has an exponent, so it's not written in proper $y = mx + b$ form.

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. Correct equations are chosen as linear and nonlinear and the choices are appropriately justified.

GUIDE PAPER 2

61

Four equations are shown below.

Equation 1: $y = 2^x$

Equation 2: $y = 2x - 5$

Equation 3: $y = x^2 + 6$

Equation 4: $y = \frac{x}{2}$

Identify one linear equation and one nonlinear equation from the list. State a reason why each equation you identified is linear or nonlinear.

Linear equation

Equation 2

It is linear because it is in $y = mx + b$ format. It can be shown in a straight line on a graph. It can go up at a constant rate.

Nonlinear equation

Equation 3

It is nonlinear because it is squared, and cannot go up at a constant rate. It would be a parabola on a graph.

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. Correct equations are chosen as linear and nonlinear and the choices are appropriately justified.

GUIDE PAPER 3

61

Four equations are shown below.

Equation 1: $y = 2^x$

Equation 2: $y = 2x - 5$

Equation 3: $y = x^2 + 6$

Equation 4: $y = \frac{x}{2}$

Identify one linear equation and one nonlinear equation from the list. State a reason why each equation you identified is linear or nonlinear.

Linear equation $y = 2x - 5$

It is Linear because it stays
constant rate of change and the
x has a exponent of 1

Nonlinear equation $y = x^2 + 6$

It is Non-Linear because the exponent
of x must be 1 in order to be
Linear

Score Point 3 (out of 3 points)

This response demonstrates a thorough understanding of the mathematical concepts in the task. Correct equations are chosen as linear and nonlinear and the choices are appropriately justified.

GUIDE PAPER 4

61

Four equations are shown below.

Equation 1: $y = 2^x$

Equation 2: $y = 2x - 5$

Equation 3: $y = x^2 + 6$

Equation 4: $y = \frac{x}{2}$

Identify one linear equation and one nonlinear equation from the list. State a reason why each equation you identified is linear or nonlinear.

Linear equation $y = 2x - 5$

This is a linear equation because it is written in the general form, $y = mx + b$, and the x value is 1.

Nonlinear equation $y = x^2 + 6$

This is a nonlinear equation because the x value is not 1, it is 2.

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. Correct equations are chosen as linear and nonlinear and the choice for the linear equation is appropriately justified; however, the explanations incorrectly refer to the exponents as x -values. The response reflects some minor misunderstanding of the underlying concepts.

GUIDE PAPER 5

61

Four equations are shown below.

Equation 1: $y = 2^x$

Equation 2: $y = 2x - 5$

Equation 3: $y = x^2 + 6$

Equation 4: $y = \frac{x}{2}$

Identify one linear equation and one nonlinear equation from the list. State a reason why each equation you identified is linear or nonlinear.

Linear equation

Equation 2

Equation 2 is a linear equation because if you graphed the equation, it would evenly be a straight line down and across.

Nonlinear equation

Equation 3

Equation 3 is a non linear because if you graphed this equation, the line would not be straight.

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. Correct equations are chosen as linear and nonlinear and the choices are appropriately justified; however, the phrase “*down and across*” is a misstatement of the slope, which for Equation 2 is positive rather than negative. The response reflects some minor misunderstanding of the underlying concepts.

GUIDE PAPER 6

61

Four equations are shown below.

Equation 1: $y = 2^x$

Equation 2: $y = 2x - 5$

Equation 3: $y = x^2 + 6$

Equation 4: $y = \frac{x}{2}$

Identify one linear equation and one nonlinear equation from the list. State a reason why each equation you identified is linear or nonlinear.

Linear equation

Equation #2

#2 is a linear equation because it has all the parts needed to make an equation. In the equation, it includes a slope, x, and a y-intercept.

Nonlinear equation

Equation #1

#1 is a nonlinear equation because when you square a number it can never be x. This makes it a non linear equation.

Score Point 2 (out of 3 points)

This response demonstrates a partial understanding of the mathematical concepts in the task. Correct equations are chosen as linear and nonlinear and the choice for the linear equation is appropriately justified; however, although the explanation for the nonlinear equation is conceptually correct it does not match the chosen equation: Equation 1 does not contain a squared value. The response reflects some minor misunderstanding of the underlying concepts.

GUIDE PAPER 7

61

Four equations are shown below.

Equation 1: $y = 2^x$

Equation 2: $y = 2x - 5$

Equation 3: $y = x^2 + 6$

Equation 4: $y = \frac{x}{2}$

Identify one linear equation and one nonlinear equation from the list. State a reason why each equation you identified is linear or nonlinear.

Linear equation

$$y=2x-5$$

This is a linear equation because the equation is in a linear form

Nonlinear equation

$$y=x^2+6$$

this is nonlinear because you can't have a variable squared

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. Correct equations are chosen as linear and nonlinear; however, the explanation “*the equation is in a linear form*” is not specific about what makes the form linear. As written, the explanation “*you can’t have a variable squared*” implies that nonlinear equations cannot contain squared variables rather than the statement being a condition for linear equations. The response correctly addresses only some elements of the task.

GUIDE PAPER 8

Additional

61

Four equations are shown below.

Equation 1: $y = 2^x$

Equation 2: $y = 2x - 5$

Equation 3: $y = x^2 + 6$

Equation 4: $y = \frac{x}{2}$

Identify one linear equation and one nonlinear equation from the list. State a reason why each equation you identified is linear or nonlinear.

Linear equation $y = 2x - 5$

This equation is linear because when you plot this on a graph it is a straight line

Nonlinear equation $y = \frac{x}{2}$

This equation is nonlinear because when you plot this on a graph it is not a straight line

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. A correct equation is chosen as linear and appropriately justified; however, although the explanation for the nonlinear equation is conceptually correct, the chosen equation is incorrect and is not accurately described by the explanation. The response reflects a lack of essential understanding of how the graphical properties of linear functions relate to their algebraic forms.

GUIDE PAPER 9

61

Four equations are shown below.

Equation 1: $y = 2^x$

Equation 2: $y = 2x - 5$

Equation 3: $y = x^2 + 6$

Equation 4: $y = \frac{x}{2}$

Identify one linear equation and one nonlinear equation from the list. State a reason why each equation you identified is linear or nonlinear.

Linear equation

$y = x/2$

a nonlinear equation is $y = x^2 + 6$ because it has an exponent.

Nonlinear equation

(NO STUDENT RESPONSE GIVEN)

(NO STUDENT RESPONSE GIVEN)

Score Point 1 (out of 3 points)

This response demonstrates only a limited understanding of the mathematical concepts in the task. Correct equations are chosen as linear and nonlinear; however, the explanation for the nonlinear equation is incorrect and an explanation is not provided for the linear equation. The response correctly addresses only some elements of the task. Per Scoring Policy #1, the response should be fully considered even though some of it is not written in the designated areas.

GUIDE PAPER 10

61

Four equations are shown below.

Equation 1: $y = 2^x$

Equation 2: $y = 2x - 5$

Equation 3: $y = x^2 + 6$

Equation 4: $y = \frac{x}{2}$

Identify one linear equation and one nonlinear equation from the list. State a reason why each equation you identified is linear or nonlinear.

Linear equation $y = 2^x$

This is linear because it's
constant.

Nonlinear equation $y = \frac{x}{2}$

This isn't constant or a
straight line.

Score Point 0 (out of 3 points)

This response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. The equations chosen and explanations are incorrect.

GUIDE PAPER 11

Additional

61

Four equations are shown below.

Equation 1: $y = 2^x$

Equation 2: $y = 2x - 5$

Equation 3: $y = x^2 + 6$

Equation 4: $y = \frac{x}{2}$

Identify one linear equation and one nonlinear equation from the list. State a reason why each equation you identified is linear or nonlinear.

Linear equation

$y = 2x - 5$

they don't = each other

Nonlinear equation

$y = x \text{ over } 2$

x can't be on top

Score Point 0 (out of 3 points)

Holistically, this response is not sufficient to demonstrate even a limited understanding of the mathematical concepts in the task. Although a correct equation is chosen as linear, the choice for the nonlinear equation is incorrect. The explanations are incorrect and demonstrate no overall understanding of linearity.