New York State Testing Program

2019

Mathematics Test

Grade 8

Scoring Leader Materials

Training Set

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	$C = \pi d$ 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	$a^2 + b^2 = c^2$

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 • 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 • 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

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 • 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 • 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 • 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).

2019 2- and 3-Point Mathematics Scoring Policies

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

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

41

The approximate areas of two states are listed below.

- Texas: 2.69×10^5 square miles
- Rhode Island: 1.21×10^3 square miles

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

Show your work.

Answer _____ square miles

EXEMPLARY RESPONSE

41

The approximate areas of two states are listed below.

- Texas: 2.69×10^5 square miles
- Rhode Island: 1.21×10^3 square miles

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

Show your work.

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

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

or

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

or

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

or other valid process

Answer 2.6779×10^5 square miles

41

The approximate areas of two states are listed below.

- Texas: 2.69×10^5 square miles
- Rhode Island: 1.21×10^3 square miles

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

Show your work.

$(2.69 \times 10^5) - (1.21 \times 10^3)$
$(2.69 \times 10^5) - (0.0121 \times 10^5)$
2.6779×10^5

Answer 2.6779×10^5 square miles

Score Point 2 (out of 2 points)

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

GUIDE PAPER 2

41

The approximate areas of two states are listed below.

- Texas: 2.69×10^5 square miles
- Rhode Island: 1.21×10^3 square miles

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

Show your work.

$2.69 \times 10^5 = 269000$

$1.21 \times 10^3 = 1210$

$269000 - 1210 = 267790$

2.6779×10^5

Answer 2.6779×10^5 square miles

Score Point 2 (out of 2 points)

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

GUIDE PAPER 3

41

The approximate areas of two states are listed below.

- Texas: 2.69×10^5 square miles
- Rhode Island: 1.21×10^3 square miles

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

Show your work.

$2.69 \times 10^5 = 269000$
$1.21 \times 10^3 = 1210$
$269000 - 1210 = 267790$

Answer 2.6779×10^5 square miles

Score Point 2 (out of 2 points)

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

GUIDE PAPER 4

41

The approximate areas of two states are listed below.

- Texas: 2.69×10^5 square miles
- Rhode Island: 1.21×10^3 square miles

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

Show your work.

$2.69 \times 10^5 = 269000$
$1.21 \times 10^3 = 1210$
$269000 - 1210 = 267790$ square miles

Answer 267790 square miles

Score Point 1 (out of 2 points)

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

GUIDE PAPER 5

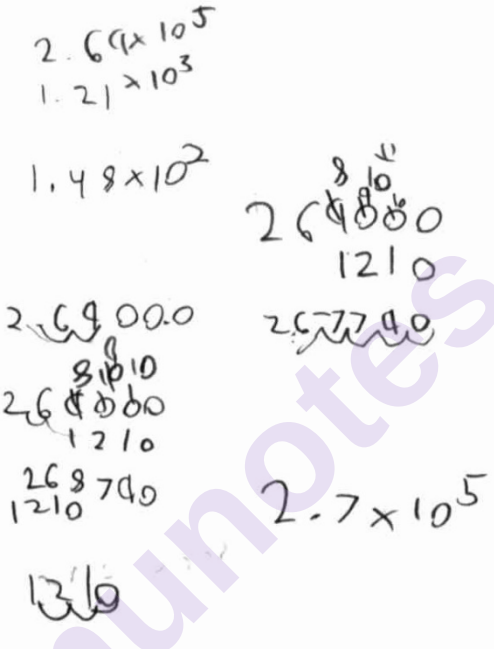
41

The approximate areas of two states are listed below.

- Texas: 2.69×10^5 square miles
- Rhode Island: 1.21×10^3 square miles

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

Show your work.



Answer 2.7 × 10^5 square miles

Score Point 1 (out of 2 points)

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

GUIDE PAPER 6

41

The approximate areas of two states are listed below.

- Texas: 2.69×10^5 square miles
- Rhode Island: 1.21×10^3 square miles

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

Show your work.

2.69 × 10 exponent 5 + 1.21 × 10 exponent 3

269000 + 1210 = 270210

2.70210 × 10 exponent 5

Answer 2.70210 × 10 exponent 5 square miles

Score Point 1 (out of 2 points)

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

GUIDE PAPER 7

41

The approximate areas of two states are listed below.

- Texas: 2.69×10^5 square miles
- Rhode Island: 1.21×10^3 square miles

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

Show your work.

Texas= $2.69 \times 10^5 = 269{,}000$
Rhode island= $1.21 \times 10^3 = 1{,}210$

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

Score Point 0 (out of 2 points)

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

41

The approximate areas of two states are listed below.

- Texas: 2.69×10^5 square miles
- Rhode Island: 1.21×10^3 square miles

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

Show your work.

$$\frac{2.96 \times 10^5 - 1.21 \times 10^3}{1.75 \times 10^2}$$

Answer 1.75×10^2 square miles

Score Point 0 (out of 2 points)

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

42

The set of ordered pairs below represents a linear function.

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

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

Show your work.

Answer $x =$ _____

$y =$ _____

EXEMPLARY RESPONSE

42

The set of ordered pairs below represents a linear function.

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

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

Show your work.

When x increases by 2, y increases by 1. Continuing that pattern of $(x+2, y+1)$, the next pair will be $(4, 0)$.
The pattern may also be continued to more negative values to $(-4,-4)$.

OR

The rate of change of the linear function is $\frac{-2-(-3)}{0-(-2)} = \frac{1}{2}$.
The point $(0,-2)$ represents the y-intercept of -2, so the equation of the function is $y = \frac{1}{2}x - 2$.

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

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

or other valid process

Answer $x =$ 4

$y =$ 0 *or other valid coordinates*

42

The set of ordered pairs below represents a linear function.

{(−2, −3), (0, −2), (2, −1), (x, y)}

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

Show your work.

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

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

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

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

$-3.5 = -3.5$ ✓

Answer $x = -3$

$y = -3.5$

Score Point 2 (out of 2 points)

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

GUIDE PAPER 2

42

The set of ordered pairs below represents a linear function.

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

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

Show your work.

(4,0)

$0-(-2)=2$

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

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

$x-2=2$

$y+1=1$

$y=0$

$x=4$

(4,0)

Answer $x =$ 4

$y =$ 0

Score Point 2 (out of 2 points)

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

GUIDE PAPER 3

42

The set of ordered pairs below represents a linear function.

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

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

Show your work.

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

-2	-3	
0	-2	b = -2
2	-1	
x	y	m = $\frac{1}{2}$

Answer: $(4,0)$ Check: $y = \frac{1}{2}x - 2$

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

$0 = 2 - 2$ Check

Answer $x =$ 4

$y =$ 0

Score Point 2 (out of 2 points)

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

GUIDE PAPER 4

42

The set of ordered pairs below represents a linear function.

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

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

Show your work.

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

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

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

Score Point 1 (out of 2 points)

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

GUIDE PAPER 5

42

The set of ordered pairs below represents a linear function.

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

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

Show your work.

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

Answer $x =$ 4

$y =$ -1

Score Point 1 (out of 2 points)

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

GUIDE PAPER 6

42

The set of ordered pairs below represents a linear function.

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

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

Show your work.

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

Answer $x =$ 4

$y =$ 0

Score Point 1 (out of 2 points)

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

GUIDE PAPER 7

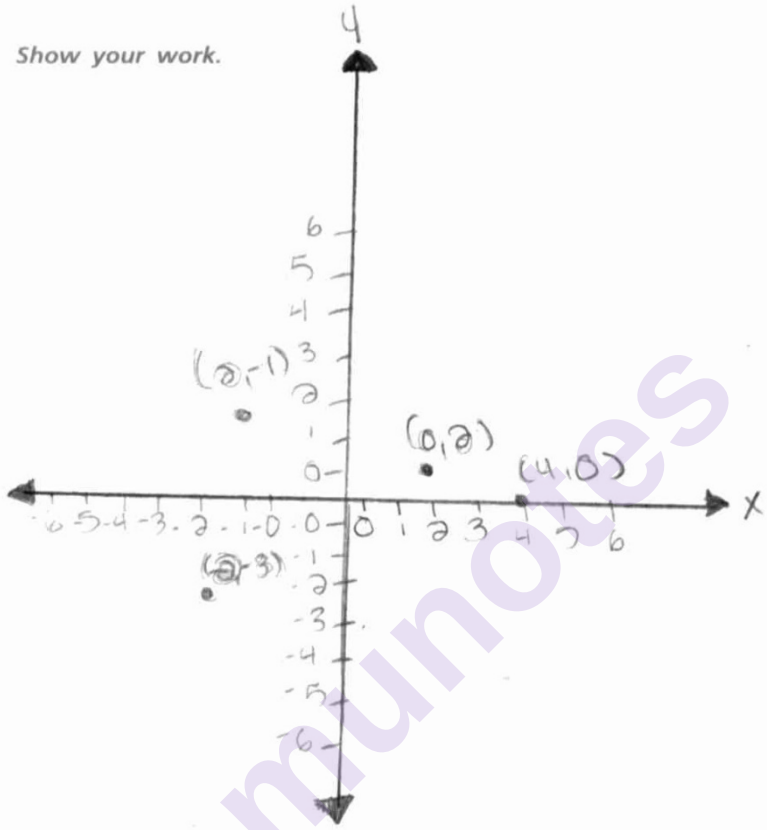
42

The set of ordered pairs below represents a linear function.

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

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

Show your work.



Answer $x =$ 4

$y =$ 0

Score Point 0 (out of 2 points)

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

42

The set of ordered pairs below represents a linear function.

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

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

Show your work.

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

Answer $x =$ (4,0)

$y =$

Score Point 0 (out of 2 points)

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

43

Solve the system of equations shown below.

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

Show your work.

Answer _____

EXEMPLARY RESPONSE

43

Solve the system of equations shown below.

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

Show your work.

Using the substitution method:

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

$$2x - 6y = -12$$
$$2(14 - 2y) - 6y = -12$$
$$28 - 4y - 6y = -12$$
$$-10y = -40$$
$$y = 4$$

$$x + 2(4) = 14$$
$$x = 14 - 8$$
$$x = 6$$

or other valid process

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

43

Solve the system of equations shown below.

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

Show your work.

$-.5(2x - 6y = -12) = -1x + 3y = 6$
$x + 2y = 14 = x + 2y = 14$
$= 5y = 20$
$= y = 4$

$x + 2(4) = 14$
$x + 8 = 14$
$x = 6$

Answer (6,4)

Score Point 2 (out of 2 points)

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

GUIDE PAPER 2

43

Solve the system of equations shown below.

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

Show your work.

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

Answer Solution: (6,4)

Score Point 2 (out of 2 points)

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

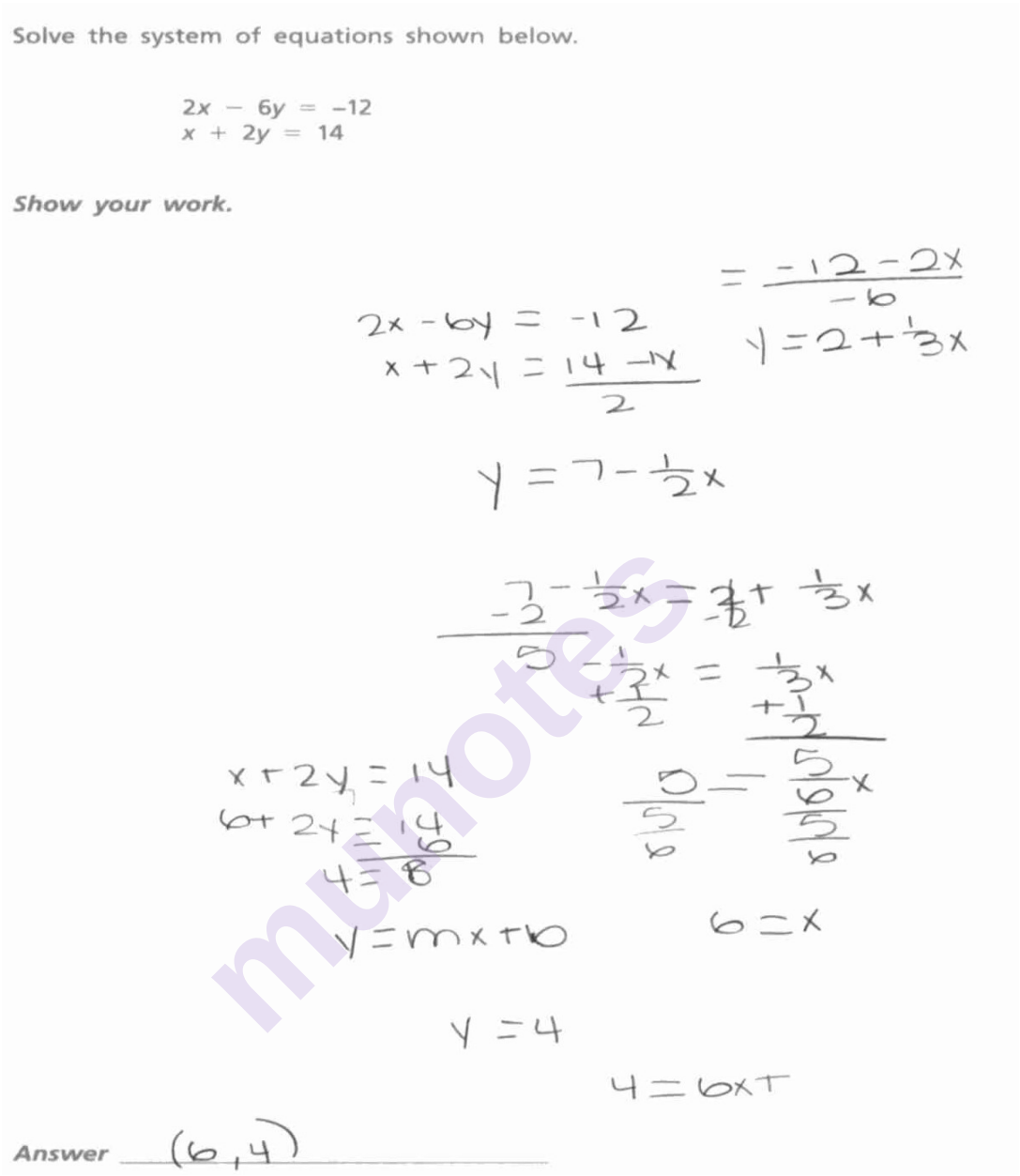
GUIDE PAPER 3

43

Solve the system of equations shown below.

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

Show your work.



Answer (6, 4)

Score Point 2 (out of 2 points)

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

GUIDE PAPER 4

43

Solve the system of equations shown below.

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

Show your work.

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

$2x-6y=-12$ $\quad 2x-6y=-12$
$-2(x+2y=14)$ $-2x+-4y=-28$
$-10y=-40$
$\frac{}{-10} \quad \frac{}{-10}$
$y = 4$

Answer $y=4$

Score Point 1 (out of 2 points)

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

GUIDE PAPER 5

43

Solve the system of equations shown below.

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

Show your work.

$2(x + 2y = 14) = \begin{array}{r} 2x + 4y = 28 \\ -\ 2x - 6y = -12 \\ \hline 10y = 16 \end{array}$

$16 \div 10 = 1.6$
$y = 1.6$

$x + 2(1.6) = 14$

$\begin{array}{r} -\ x + 3.2 = 14 \\ 3.2 \quad 3.2 \\ \hline x = 10.8 \end{array}$

Answer $x = 10.8\ y = 1.6$

Score Point 1 (out of 2 points)

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

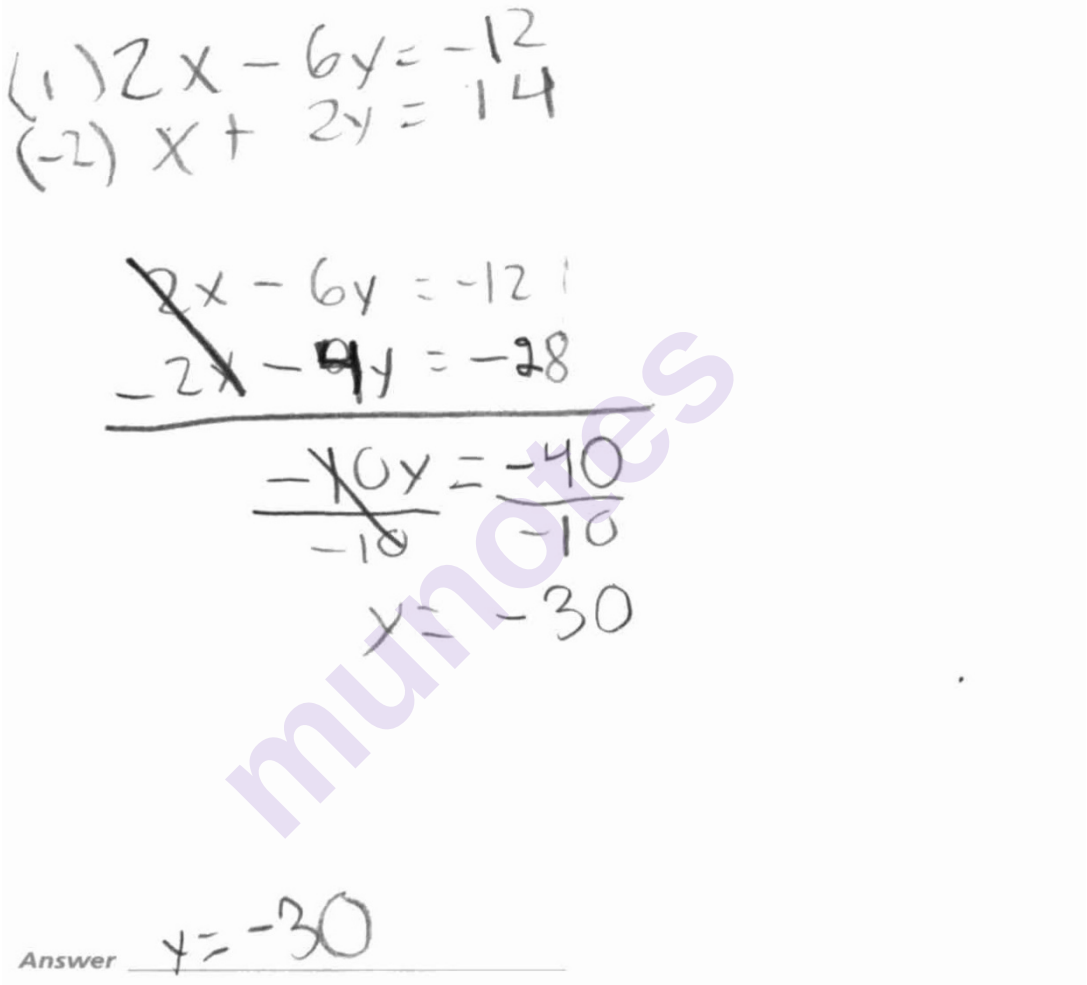
GUIDE PAPER 6

43

Solve the system of equations shown below.

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

Show your work.



Answer $y = -30$

Score Point 1 (out of 2 points)

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

GUIDE PAPER 7

43

Solve the system of equations shown below.

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

Show your work.

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

$y = 2 - 0.3x$

x	y
-2	2.6
-1	2.3
0	2
1	1.7
2	1.4
3	1.1
4	0.8
5	0.5
6	0.2
7	-0.1
8	-0.4

$\frac{x + 2y = 14 - x}{2}$

$y = 7 - x$

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

x	y
-2	2.6
-1	2.3
0	2
1	1.7
2	1.4
3	1.1
4	0.8
5	0.5
6	0.2
7	-0.1
8	-0.4

Answer (7, 0)

Score Point 0 (out of 2 points)

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

43

Solve the system of equations shown below.

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

Show your work.

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

3x-8y=2
-8 -8
3x=6
-3-3

x=3

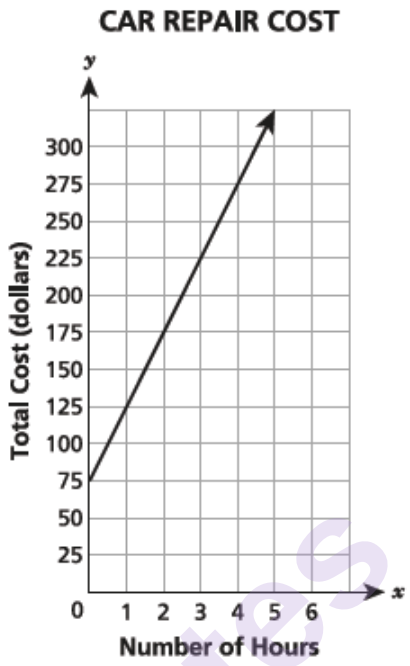
Answer 1x=2

Score Point 0 (out of 2 points)

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

44

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



What equation represents this linear function?

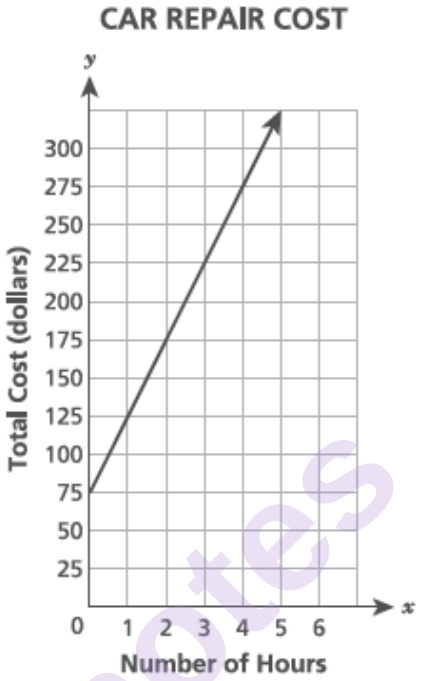
Show your work.

Equation _____

EXEMPLARY RESPONSE

44

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



What equation represents this linear function?

Show your work.

$$y = mx + b$$

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

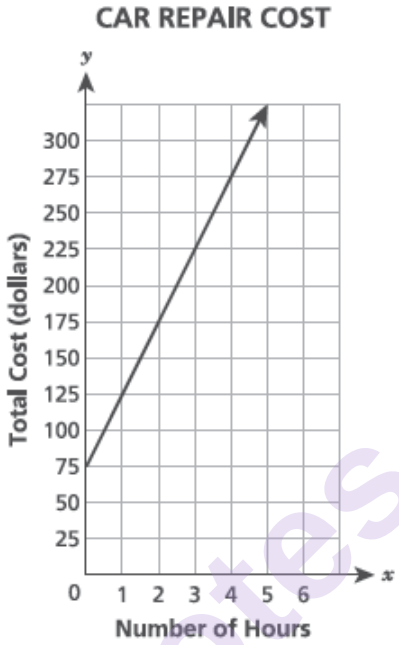
$b = 75$ from the point $(0, 75)$

or other valid process

Equation $y = 50x + 75$

44

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



What equation represents this linear function?

Show your work.

$y=mx+b$
$b=75$
$m=\frac{\triangle y}{\triangle x}$
$\frac{125-175}{1-2}=\frac{-50}{-1}=\frac{50}{1}=50$
$y=50x+75$

Equation $y=50x+75$

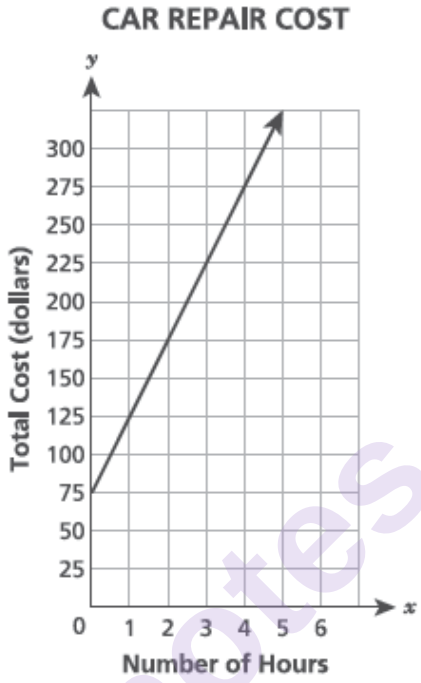
Score Point 2 (out of 2 points)

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

GUIDE PAPER 2

44

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



What equation represents this linear function?

Show your work.

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

Equation y = 50x + 75

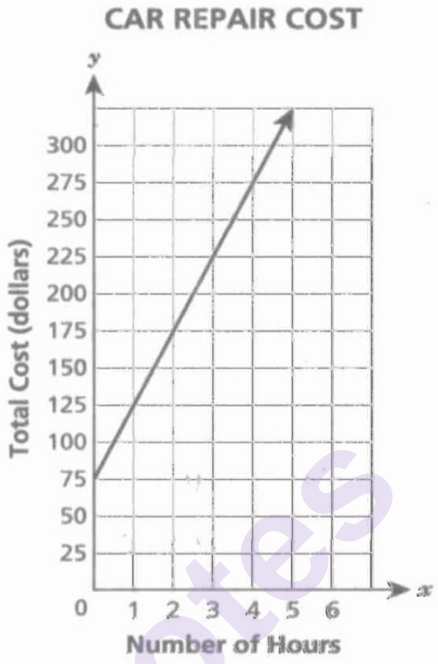
Score Point 2 (out of 2 points)

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

GUIDE PAPER 3

44

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



125
−75
50

What equation represents this linear function?

Show your work.

$y = 75 + 50x$

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

Equation $y = 75 + 50x$

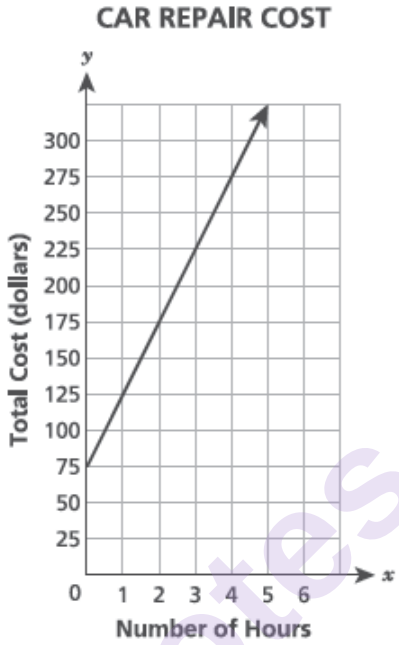
Score Point 2 (out of 2 points)

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

GUIDE PAPER 4

44

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



What equation represents this linear function?

Show your work.

(1,125) (2,175)

$\frac{175-125}{2-1}$

$\frac{50}{1}$

Slope = 50

Y=Mx+B

125=50 × 1+B

125=50+b

$-\frac{125}{50}$

75

75=b

Equation Y=50+75

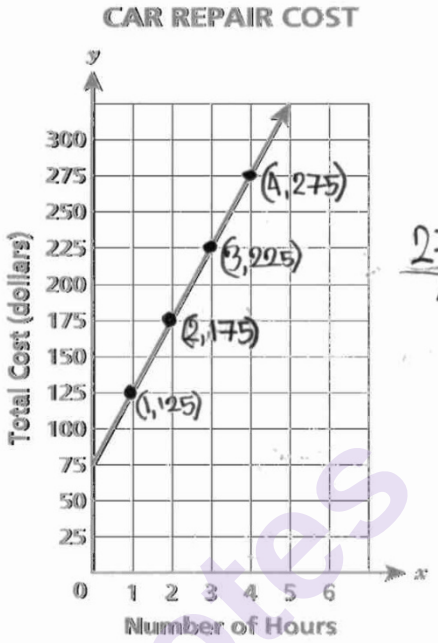
Score Point 1 (out of 2 points)

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

GUIDE PAPER 5

44

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



$\frac{275-225}{4-3}=\frac{50}{1}=50$

What equation represents this linear function?

Show your work.

Equation $y=75x+50$

GO ON

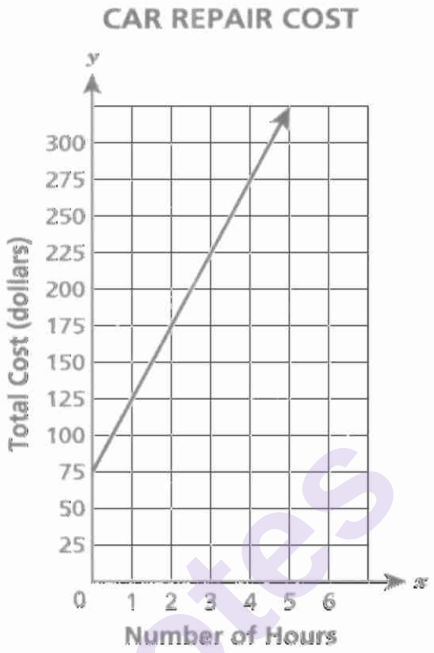
Score Point 1 (out of 2 points)

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

GUIDE PAPER 6

44

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



What equation represents this linear function?

Show your work.

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

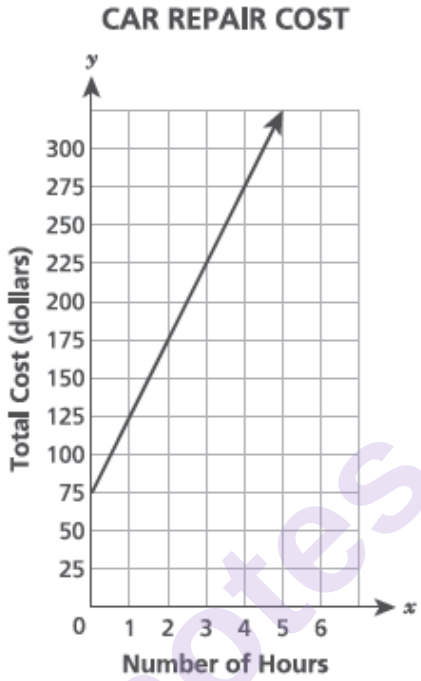
Score Point 1 (out of 2 points)

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

GUIDE PAPER 7

44

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



What equation represents this linear function?

Show your work.

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

Equation

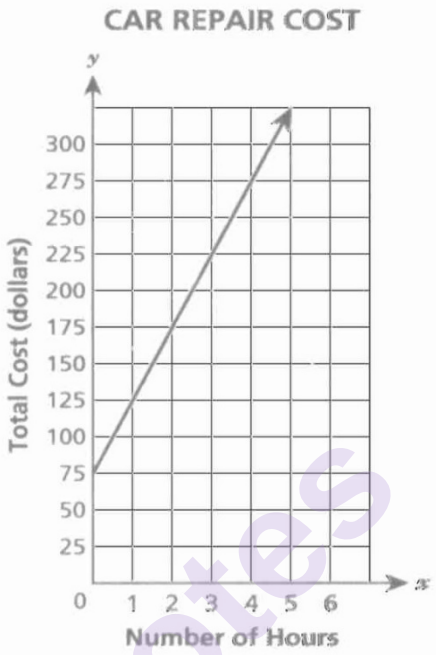
1 hour=$125
2 hours=$175
3 hours=$225

Score Point 0 (out of 2 points)

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

44

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



What equation represents this linear function?

Show your work.

Equation $y = 25x + 75$

Score Point 0 (out of 2 points)

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

45

Billy is comparing gasoline prices at two different gas stations.

- At the first gas station, the equation $c = 2.80g$ gives the relationship between g, the number of gallons of gasoline, and c, the total cost, in dollars.
- At the second gas station, the cost of 2.5 gallons of gasoline is \$8.30, and the cost of 5 gallons of gasoline is \$16.60.

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

Show your work.

Answer \$_____ per gallon

EXEMPLARY RESPONSE

45

Billy is comparing gasoline prices at two different gas stations.

- At the first gas station, the equation $c = 2.80g$ gives the relationship between g, the number of gallons of gasoline, and c, the total cost, in dollars.
- At the second gas station, the cost of 2.5 gallons of gasoline is \$8.30, and the cost of 5 gallons of gasoline is \$16.60.

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

Show your work.

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

$$3.32 - 2.8 = 0.52$$

or other valid process

Answer \$ 0.52 per gallon

45

Billy is comparing gasoline prices at two different gas stations.

- At the first gas station, the equation $c = 2.80g$ gives the relationship between g, the number of gallons of gasoline, and c, the total cost, in dollars.
- At the second gas station, the cost of 2.5 gallons of gasoline is \$8.30, and the cost of 5 gallons of gasoline is \$16.60.

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

Show your work.

$$\frac{8.30}{2.5} = 3.32$$

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

Answer \$ .52 per gallon

Score Point 2 (out of 2 points)

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

GUIDE PAPER 2

45

Billy is comparing gasoline prices at two different gas stations.

- At the first gas station, the equation $c = 2.80g$ gives the relationship between g, the number of gallons of gasoline, and c, the total cost, in dollars.
- At the second gas station, the cost of 2.5 gallons of gasoline is \$8.30, and the cost of 5 gallons of gasoline is \$16.60.

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

Show your work.

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

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

$3.32 - 2.80 = 0.52$

Answer \$ 0.52 per gallon

Score Point 2 (out of 2 points)

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

GUIDE PAPER 3

45

Billy is comparing gasoline prices at two different gas stations.

- At the first gas station, the equation $c = 2.80g$ gives the relationship between g, the number of gallons of gasoline, and c, the total cost, in dollars.
- At the second gas station, the cost of 2.5 gallons of gasoline is \$8.30, and the cost of 5 gallons of gasoline is \$16.60.

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

Show your work.

gas station 2 = $\frac{\$8.3}{2.5} = \$3.32$

2 = \$3.32 per gallon

1 = \$2.80 per gallon

3.32
- 2.80
\$0.52

Answer \$ 0.52 per gallon

Score Point 2 (out of 2 points)

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

GUIDE PAPER 4

45

Billy is comparing gasoline prices at two different gas stations.

- At the first gas station, the equation $c = 2.80g$ gives the relationship between g, the number of gallons of gasoline, and c, the total cost, in dollars.
- At the second gas station, the cost of 2.5 gallons of gasoline is \$8.30, and the cost of 5 gallons of gasoline is \$16.60.

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

Show your work.

$\frac{1}{x} = \frac{2.5}{8.30}$

$\frac{2.5x}{2.5} = \frac{8.30}{2.5}$

$x = 3.32$

Answer \$ 2.80 per gallon

Score Point 1 (out of 2 points)

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

GUIDE PAPER 5

45

Billy is comparing gasoline prices at two different gas stations.

- At the first gas station, the equation $c = 2.80g$ gives the relationship between g, the number of gallons of gasoline, and c, the total cost, in dollars.
- At the second gas station, the cost of 2.5 gallons of gasoline is \$8.30, and the cost of 5 gallons of gasoline is \$16.60.

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

Show your work.

$8.30 \div 2.5 = 3.32$

Answer \$ 3.32 per gallon

Score Point 1 (out of 2 points)

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

GUIDE PAPER 6

45

Billy is comparing gasoline prices at two different gas stations.

- At the first gas station, the equation $c = 2.80g$ gives the relationship between g, the number of gallons of gasoline, and c, the total cost, in dollars.
- At the second gas station, the cost of 2.5 gallons of gasoline is \$8.30, and the cost of 5 gallons of gasoline is \$16.60.

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

Show your work.

C = 2.80g
C = 3.32g

2 13
3.32
−2.80
.52

Answer \$ 0.52 per gallon

Score Point 1 (out of 2 points)

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

GUIDE PAPER 7

45

Billy is comparing gasoline prices at two different gas stations.

- At the first gas station, the equation $c = 2.80g$ gives the relationship between g, the number of gallons of gasoline, and c, the total cost, in dollars.
- At the second gas station, the cost of 2.5 gallons of gasoline is \$8.30, and the cost of 5 gallons of gasoline is \$16.60.

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

Show your work.

$2.80 \times 5 = 14$
$16.60 - 14 = 2.60$
$2.80 \times 2.5 = 7$
$8.30 - 7 = 1.30$

Answer \$ 1.30 per gallon

Score Point 0 (out of 2 points)

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

45

Billy is comparing gasoline prices at two different gas stations.

- At the first gas station, the equation $c = 2.80g$ gives the relationship between g, the number of gallons of gasoline, and c, the total cost, in dollars.
- At the second gas station, the cost of 2.5 gallons of gasoline is \$8.30, and the cost of 5 gallons of gasoline is \$16.60.

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

Show your work.

4.15 = 1.25 g

$ 8.30 = 2.5 g

$ 16.60 = 5g

24.9 = 10g

C = 2.80g

8.3 ~ 2.5
8.6 ~ 2.6
8.9 ~ 2.7
9.2 ~ 2.8
9.5 ~ 2.9
9.8 ~ 3.0
10.1 ~ 3.1
10.4 ~ 3.2
10.7 ~ 3.3
11 ~ 3 4
11.3 ~ 3.5
11.6 ~ 3.6
11.9 ~ 3.7

12.2 ~ 3.8
12.5 ~ 4.0
12.8 ~ 4.1
13.1 ~ 4.2
13.4 ~ 4.3
13.7 ~ 4.4
14 ~ 4.5
14.3 ~ 4.6
14.6 ~ 4.7
14.9 ~ 4.8
15.2 ~ 4.9
15.5 ~ 5 0

Answer $ .15 per gallon

GO ON

Score Point 0 (out of 2 points)

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

46

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

- a rotation 180° clockwise about the origin
- a reflection over the x-axis
- a reflection over the y-axis

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

Explain your answer.

EXEMPLARY RESPONSE

46

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

- a rotation 180° clockwise about the origin
- a reflection over the x-axis
- a reflection over the y-axis

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

Explain your answer.

Transformation 1
A 180° rotation maps (x, y) to $(-x, -y)$,
so vertex $A(2, -3)$ moves to $(-2, 3)$.

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

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

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

or other valid explanation

46

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

- a rotation 180° clockwise about the origin
- a reflection over the x-axis
- a reflection over the y-axis

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

Explain your answer.

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

Score Point 2 (out of 2 points)

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

GUIDE PAPER 2

46

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

- a rotation 180° clockwise about the origin
- a reflection over the *x*-axis
- a reflection over the *y*-axis

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

Explain your answer.

(2, -3)

The rotation is 180, reflecting over the X "first" then Y is the same as doing an rotation of 180 again making A=A'

(2, -3)

(-2, 3) rotation

(-2, -3) reflection of X

(2, -3) reflection of Y

Score Point 2 (out of 2 points)

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

GUIDE PAPER 3

46

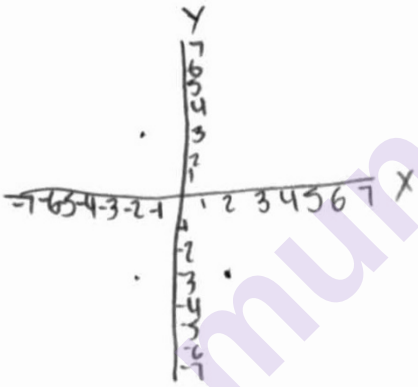
Triangle ABC goes through a series of three transformations, resulting in triangle A'B'C'. The three transformations are listed below.

- a rotation 180° clockwise about the origin
- a reflection over the *x*-axis
- a reflection over the *y*-axis

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

Explain your answer.

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



Score Point 2 (out of 2 points)

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

GUIDE PAPER 4

46

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

- a rotation 180° clockwise about the origin
- a reflection over the x-axis
- a reflection over the y-axis

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

Explain your answer.

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

Score Point 1 (out of 2 points)

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

GUIDE PAPER 5

46

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

- a rotation 180° clockwise about the origin
- a reflection over the *x*-axis
- a reflection over the *y*-axis

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

Explain your answer.

The three transformations map vertex A into vertex A' which will be from (2, -3) → (2, -3), which is no change because you'll first start off with using the formula, of 180° clockwise 180° → (-x, -y) → (-2, 3). Then, since you are reflecting across the x axis, you will change the value of x, to the absolute value of x. (-2, 5) → (2, 3) Lastly, since you are reflecting across the y-axis, you will change the value of y to the absolute value of y. (2, 3) → (2, -3). Therefore, vertex A is preserved.

(2, -3) → (2, -3)

(2, -3)

180° → (-x, -y) → (-2, 3)

Reflection over x-axis

(-2, 3) → (2, 3)

Reflection over y-axis

(2, 3) → (2, -3) Vertex A =

GO ON

Score Point 1 (out of 2 points)

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

GUIDE PAPER 6

46

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

- a rotation 180° clockwise about the origin
- a reflection over the x-axis
- a reflection over the y-axis

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

Explain your answer.

Rotation 180 degrees clockwise about the origin = 2, - 3 × -x ,-y = -2, 3
I rotated point A by 180 degrees by multiplying the coordinatesto -x , -y so it would equal -2 , 3

A' =-2 , 3

Score Point 1 (out of 2 points)

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

GUIDE PAPER 7

46

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

- a rotation 180° clockwise about the origin
- a reflection over the x-axis
- a reflection over the y-axis

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

Explain your answer.

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

Score Point 0 (out of 2 points)

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

46

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

- a rotation 180° clockwise about the origin
- a reflection over the *x*-axis
- a reflection over the *y*-axis

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

Explain your answer.

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

Score Point 0 (out of 2 points)

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

47

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

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

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

Explain your answer.

EXEMPLARY RESPONSE

47

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

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

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

Explain your answer.

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

or other valid explanation

47

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

MATT'S WORK

Step 1: $V = \frac{4}{3}\pi r^3$ ✓

Step 2: $V = \frac{4}{3}\pi(15)^3$ ✗

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

Step 4: $V = 4500\pi$

BILLY'S WORK

Step 1: $V = \frac{4}{3}\pi r^3$ ✓

Step 2: $V = \frac{4}{3}\pi(7.5)^3$ ✓

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

Step 4: $V = \frac{1125}{2}\pi$ ✓

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

Explain your answer.

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

Score Point 2 (out of 2 points)

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

GUIDE PAPER 2

47

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

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

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

Explain your answer.

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

Score Point 2 (out of 2 points)

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

GUIDE PAPER 3

47

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

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

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

Explain your answer.

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

Score Point 2 (out of 2 points)

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

GUIDE PAPER 4

47

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

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

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

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

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

DO NOT WRITE BEYOND THIS AREA

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

Explain your answer.

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

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

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

$V=\frac{4}{3}\pi 25$

GO ON

Score Point 1 (out of 2 points)

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

GUIDE PAPER 5

47

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

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

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

Explain your answer.

Matt made an error when he substituted r for 15

Score Point 1 (out of 2 points)

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

GUIDE PAPER 6

47

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

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

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

Explain your answer.

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

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

Score Point 1 (out of 2 points)

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

GUIDE PAPER 7

47

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

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

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

Explain your answer.

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

Score Point 0 (out of 2 points)

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

47

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

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

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

Explain your answer.

Billy Made an error. He Made an error by Put 7.5 instead of 15 which Makes it a different answer. Billy Put 7.5 for the Diameter When it Should've been 15.

Score Point 0 (out of 2 points)

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

48

The two equations shown below represent different functions.

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

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

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

Function P _____

State your reason.

_____

_____

_____

Function Q _____

State your reason.

_____

_____

_____

EXEMPLARY RESPONSE

48

The two equations shown below represent different functions.

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

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

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

Function P nonlinear

State your reason.

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

or other valid explanation

Function Q linear

State your reason.

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

or other valid explanation

48

The two equations shown below represent different functions.

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

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

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

Function P nonlinear

State your reason.

function P isn't in Y=MX+B format, and cannot be simplified to be so.

Function Q linear

State your reason.

functionQ is in Y=MX+B format, the universially linear format.

Score Point 3 (out of 3 points)

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

GUIDE PAPER 2

48

The two equations shown below represent different functions.

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

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

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

Function P nonlinear

State your reason.

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

Function Q linear

State your reason.

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

Score Point 3 (out of 3 points)

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

GUIDE PAPER 3

48

The two equations shown below represent different functions.

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

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

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

Function P nonlinear

State your reason.

this is because the 3 is divivded by x

Function Q linear

State your reason.

beacause it follows y=mx+b

Score Point 3 (out of 3 points)

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

GUIDE PAPER 4

48

The two equations shown below represent different functions.

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

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

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

Function P non-linear

State your reason.

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

Function Q Linear

State your reason.

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

Score Point 2 (out of 3 points)

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

GUIDE PAPER 5

48

The two equations shown below represent different functions.

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

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

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

Function P nonlinear

State your reason.

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

Function Q linear

State your reason.

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

Score Point 2 (out of 3 points)

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

GUIDE PAPER 6

48

The two equations shown below represent different functions.

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

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

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

Function P Nonlinear

State your reason.

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

Function Q Linear

State your reason.

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

Score Point 2 (out of 3 points)

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

GUIDE PAPER 7

48

The two equations shown below represent different functions.

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

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

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

Function P Nonlinear

State your reason.

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

Function Q Is linear

State your reason.

It is linear because it can be on a graph

Score Point 1 (out of 3 points)

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

48

The two equations shown below represent different functions.

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

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

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

Function P Nonlinear

State your reason.

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

Function Q Linear

State your reason.

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

Score Point 1 (out of 3 points)

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

GUIDE PAPER 9

48

The two equations shown below represent different functions.

Function P: $y = \frac{3}{x} + 2$ $\frac{3}{1}$ ↑ →

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

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

Function P linear

State your reason.

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

Function Q linear

State your reason.

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

Score Point 1 (out of 3 points)

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

GUIDE PAPER 10

48

The two equations shown below represent different functions.

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

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

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

Function P linear

State your reason.

linear is straight and non linear is not straight

Function Q non linear

State your reason.

not straight an straight

Score Point 0 (out of 3 points)

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

48

The two equations shown below represent different functions.

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

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

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

Function P linear $Y = \frac{3}{x} + 2$ $\frac{3}{1} + 2 = 5$

State your reason. $Y = \frac{1}{3}x + 2 =$

because it comes to an end and is a whole number

Function Q nonlinear

State your reason.

is a repeating decimal that doesn't end.

Score Point 0 (out of 3 points)

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