

Benchmark: MA.912.A.2.3; Describe the concept of a function, use function notation, determine whether a given relation is a function, and link equations to functions.

➤ Also assesses MA.912.A.2.13; Solve real-world problems involving relations and functions.

Problem 1:

As a diver swims deeper underwater, the water pressure in pounds per square inch (PSI) increases on the diver. The table below shows the pressure in PSI for several depths of water.

WATER PRESSURE

Depth (in feet)	Pressure (in PSI)
10	4.3
20	8.6
30	12.9
40	17.2
50	21.5

Which equation represents p , the water pressure in square inches, as a function of d , the depth in feet?

- A. $p = 4.3d$
- B. $p = 0.43d$
- C. $p = 23.3d$
- D. $p = 2.33d$

Problem 2:

For one child, a childcare facility charges \$300 per month for preschool and \$3.50 per hour for each hour of childcare after preschool. The function below can be used to determine $f(h)$, the monthly fee for childcare and preschool, where h represents the number of hours spent in childcare after preschool.

$$f(h) = 300 + 3.5h$$

If the one-month charges for one child totaled \$637.75, what was the total number of hours the child spent in childcare after preschool?

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Problem 3:

What equation models the data in the table if d = number of days and c = cost?

Days	Cost
2	44
3	66
5	110
6	132

A. $d = 22c$ B. $c = 22d$ C. $c = d + 22d$ D. $c = d + 22$

Problem 4:

You can use the formula $C = \frac{5}{9}(F - 32)$ to convert temperature in degrees Fahrenheit, F , to temperature in degrees Celsius, C . What is 62°F in degrees Celsius? Round your answer to the nearest tenth.

- A. 30 degrees Celsius
- B. 16.7 degrees Celsius
- C. 52.2 degrees Celsius
- D. 2.4 degrees Celsius

Problem 5:

If $f(x) = 2x + 6$, find $f(3)$

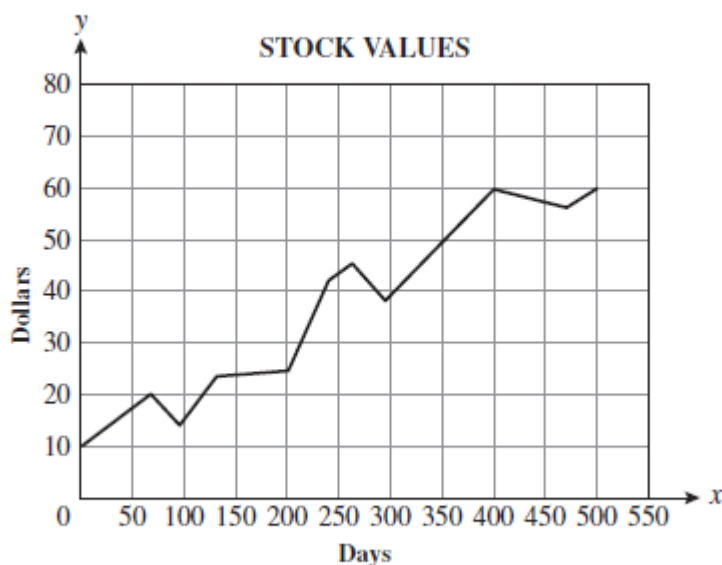
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Benchmark: MA.912.A.2.4; Determine the domain and range of a relation.

➤ Also assesses MA.912.A.2.13 Solve real-world problems involving relations and functions.

Problem 1:

An economics teacher plotted the value of a stock on 11 different days during a 500-day period and used line segments to connect them. In the graph below, the horizontal axis is measured in days and the vertical axis is measured in dollars.



Based on the graph, which of the following best describes the range of the value of the stock for this 500-day period?

- A. $0 \leq x \leq 500$
- B. $1 \leq x \leq 500$
- C. $10 \leq y \leq 60$
- D. $0 \leq y \leq 80$

Problem 2:

The set of ordered pairs shown below defines a relation.

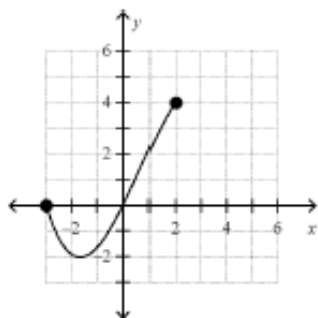
$\{(0, 0), (1, 5), (2, 8), (3, 9), (4, 8), (5, 5), (6, 0)\}$

What is the value of the greatest element in the range of this relation?

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Problem 3:

Give the domain and range of the relation.



- A. D: $-2 \leq x \leq 4$; R: $-3 \leq y \leq 2$ C. D: $-3 \leq x \leq 2$ R: $-3 \leq y \leq 6$
 B. D: $-3 \leq x \leq 2$; R: $-2 \leq y \leq 4$ D. D: $-3 \leq x \leq 2$; R: $0 \leq y \leq 4$

Problem 4:

Given $f(x) = x^2 + 1$ with domain D: $\{-2, -1, 0, 1, 3\}$. What is the range, R?

- A. R: $\{-1, -2, 0, 1, 3\}$ C. R: $\{5, 2, 1, 2, 10\}$
 B. R: $\{4, 1, 0, 1, 9\}$ D. R: $\{3, 0, -1, 0, 8\}$

Problem 5:

A cab company charges a fixed flag rate of \$20 and \$1.40 for every mile covered. Write an expression for the total cab fare as a function of distance driven.

Then solve for the total fare after the cab traveled for 36 miles.

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Benchmark: MA.912.A.3.1; Solve linear equations in one variable that include simplifying algebraic expressions.

- Also assesses MA.912.A.3.2; Identify and apply the distributive associative, and commutative properties of real numbers and the properties of equality.

Problem 1:

Mario needs to cut three book shelves from a board that is 1.8 meters long. The second shelf is 15 centimeters longer than twice the length of the first shelf. The remaining shelf is 5 centimeters longer than the first shelf. The equation below represents this situation, where x is the length of the first shelf in meters.

$$x + (2x + 0.15) + (x + 0.05) = 1.8$$

Which of the following is the length, in meters, of the first shelf?

- A. 0.40
- B. 0.45
- C. 0.53
- D. 0.96

Problem 2:

Bill is planning to drive from his house to a baseball stadium and arrive in time for the beginning of the championship game. His arrival time depends on the traffic. If traffic is light, he will travel at an average speed of 50 miles per hour and arrive 1 hour early. If traffic is heavy, he will travel at an average speed of 30 miles per hour and arrive on time. The equation below can be used to model this situation, where t represents Bill's driving time, in hours.

$$50(t - 1) = 30t$$

What is the distance, in miles, from Bill's house to the baseball stadium?

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Problem 3:

Solve the problem.

$$3x - 1 = 5(x - 1) - 2(7 - 2x)$$

- A. 3 B. 0 C. -9 D. -10

Problem 4:

Isabel reads 12 books from the library each month for m months in a row. Each month her sister, Emma, reads $\frac{1}{2}$ as many books as Isabel reads. Together they have read 108 books. The following equation represents this situation where m is the number of months that the girls have read.

$$12m + \frac{1}{2}(12m) = 108$$

Which of the following is the number of months it took Isabel and Emma to read 108 books?

- | | |
|-------------|--------------|
| A. 2 months | C. 6 months |
| B. 3 months | D. 12 months |

Problem 5:

Solve the following equation for x : $3(2x + 5) = 10x - 3 + 2x$

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Benchmark: MA.912.A.3.3; Solve literal equations for a specified variable.

Problem 1:

The Gross Domestic Product of a country for a given year is the sum of the market values of all goods and services produced within the country during that year. The Gross Domestic Product per capita is found by using the following formula.

$$S = \frac{C + I + G + N}{P}$$

where:

S = Gross Domestic Product per capita

C = consumer spending

I = investment

G = government purchases

N = net exports

P = population

Which of the following shows the Gross Domestic Product per capita formula solved for C ?

A. $C = \frac{PS}{I - G - N}$

B. $C = \frac{PS}{I + G + N}$

C. $C = PS - I - G - N$

D. $C = PS - I + G + N$

Problem 2:

What is the solution of $-3 \geq -\frac{2}{3}z$?

F. $z \leq -\frac{9}{2}$

G. $z \leq \frac{9}{2}$

H. $z \geq -\frac{9}{2}$

I. $z \geq \frac{9}{2}$

Problem 3:

Taylor has a total of \$25 to spend on dinner, which includes a 6.5% sales tax and a 20% tip. Taylor used the inequality shown below to calculate the amount in dollars, a , she can spend before tax and tip.

$$1.2(a + 0.065a) \leq 25$$

Which of the following shows the solution to this inequality?

A. $a \leq 22.74$

B. $a \leq 22.34$

C. $a \leq 19.76$

D. $a \leq 19.56$

Problem 4:

What is the solution of $2(y + 5) + 7y \leq 19$?

F. $y < 1$

G. $y \leq 1$

H. $y > 1$

I. $y \geq 1$

Problem 5:

Solve the following equation for p : $q = 4p - 11$

A. $p = (1/4)(q + 11)$

B. $p = q/4 + 11$

C. $p = (q-11)/4$

D. $p = q/4 - 11$

Benchmark: MA.912.A.3.4; Solve and graph simple and compound inequalities in one variable and be able to justify each step in a solution.

Problem 1:

Taylor has a total of \$25 to spend on dinner, which includes a 6.5% sales tax and a 20% tip. Taylor used the inequality shown below to calculate the amount in dollars, a , she can spend before tax and tip.

$$1.2(a + 0.065a) \leq 25$$

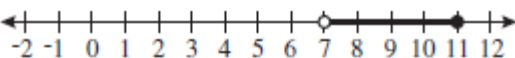
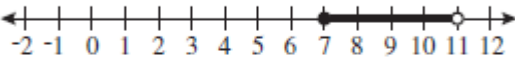
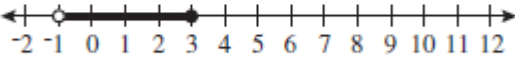
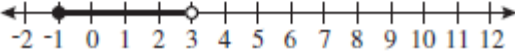
Which of the following shows the solution to this inequality?

- A. $a \leq 22.74$
- B. $a \leq 22.34$
- C. $a \leq 19.76$
- D. $a \leq 19.56$

Problem 2:

Which graph shows the solution to the inequality shown below?

$$15 \leq 7n - 2(n - 10) < 35$$

- A. 
- B. 
- C. 
- D. 

Problem 3:

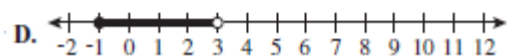
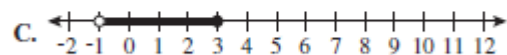
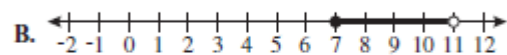
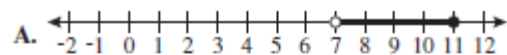
What is the solution of $2(y + 5) + 7y \leq 19$?

- F. $y < 1$
- G. $y \leq 1$
- H. $y > 1$
- I. $y \geq 1$

Problem 4:

Which graph shows the solution to the inequality shown below?

$$15 \leq 7n - 2(n - 10) < 35$$



Problem 5:

Solve the inequality for x: $(\frac{3}{5})x \leq 10 + (\frac{1}{5})x$

A. $x \leq 25$

B. $x \leq 4$

C. $x \geq 25$

D. $x \geq 4$

Benchmark: MA.912.A.3.5; Symbolically represent and solve multi-step and real-world applications that involve linear equations and inequalities.

Problem 1:

The out-of-pocket costs to an employee for health insurance and medical expenses for one year are shown in the table below.

EMPLOYEE'S ANNUAL HEALTH CARE COSTS

Type of Cost	Definition	Cost to Employee
Premium	Total amount employee pays insurance company for the policy	\$3,626
Deductible	Amount of medical expenses employee pays before insurance company pays for anything	\$500
Co-payment	Percentage of medical expenses after the first \$500 that employee has to pay	20%

According to the plan outlined in the table, total annual health care costs, C , depend on the employee's medical expenses for that year. If x represents the total medical expenses of an employee on this plan and $x \geq 500$, which of the following equations can be used to determine this employee's total health care costs for that year?

- A. $C = 3,626 - 500 + 0.20(x - 500)$
- B. $C = 3,626 - 500 + 0.20x$
- C. $C = 3,626 + 500 + 0.20(x - 500)$
- D. $C = 3,626 + 500 + 0.20x$

Problem 2:

Karen works as a salesperson for a local marketing company. Using the equations shown below, the company calculates her monthly earnings based upon her total sales for the month.

MONTHLY EARNINGS EQUATIONS

Total Sales for the Month (s in dollars)	Earnings Equation
$s \leq \$5,000$	$E = 1,600 + 0.1s$
$s > \$5,000$	$E = 1,600 + 0.1s + 0.15(s - 5000)$

where:

E represents total monthly earnings before taxes and withholding
 s represents the dollar amount of her total sales

Karen's total sales were greater than \$5,000 in October. If her total monthly earnings for October were \$3,000, what was the value of her total monthly sales, s ?

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Problem 3:

The function rule for the profit a company expects to earn is

$P = 1500m + 2700$, where P represents profit and m represents the number of months the company has been in business. How much profit should the company earn after 12 months in business?

- A. \$15,700 B. \$17,700 C. \$18,000 D. \$20,700

Problem 4:

Use the formula $distance = (rate)(time)$ to determine which equation represents the information in the question.

The distance the boat traveled is 4 miles. The rate is determined by adding the rate of the boat in still water (r) to the average speed of the downstream current (c). The time is 1.5 hours.

- A. $4 = (r + c) 1.5$
 B. $4 = (r - c) 1.5$
 C. $1.5 = (r + c) 4$
 D. $1.5 = (r - c)4$

Problem 5:

Working together, Paul and Daniel can pick forty bushels of apples in 4.95 hours. Had he done it alone, it would have taken Daniel 9 hours. Find how long it would take Paul to do it alone.

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Benchmark: MA.912.A.3.8; Graph a line given any of the following information: a table of values, the x- and y-intercepts, two points, the slope and a point, the equation of the line in slope-intercept form, standard form, or point-slope form.

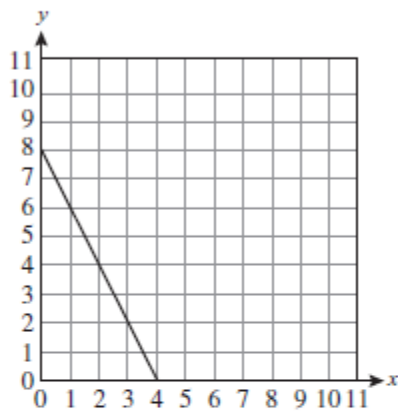
- Also assesses MA.912.A.3.12; Graph a linear equation or inequality in two variables with and without graphing technology. Write an equation or inequality represented by a given graph.

Problem 1:

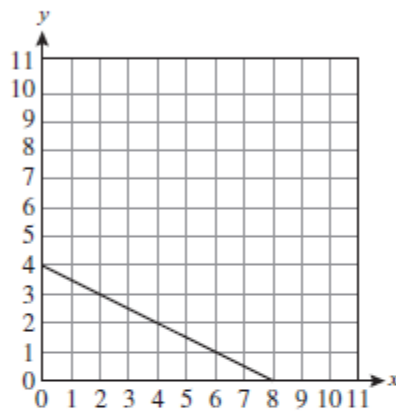
Roger went to a garage sale where hardback books sold for \$5 each and paperback books sold for \$2.50 each. He has \$20 to spend. The equation below can be used to find how many books of each type Roger can buy, where x is the number of hardback books and y is the number of paperback books.

$$5x + 2.5y = 20$$

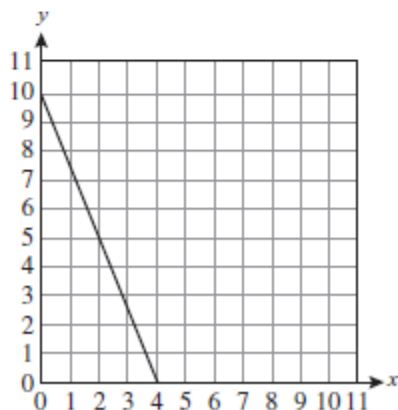
Which of the following shows the graph of this equation?



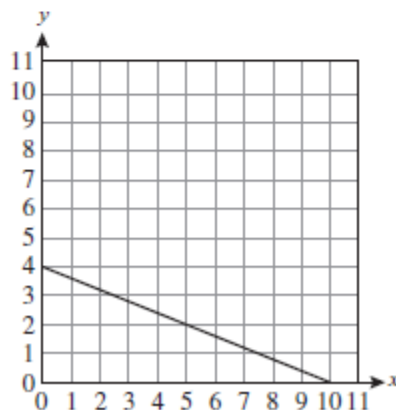
A.



C.



B.



D.

Problem 2:

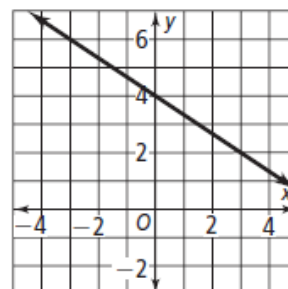
What is an equation of the line shown in the graph at the right?

A. $y = -\frac{3}{2}x + 4$

C. $y = -\frac{2}{3}x + 4$

B. $y = \frac{2}{3}x + 4$

D. $y = -\frac{2}{3}x + 6$



Problem 3:

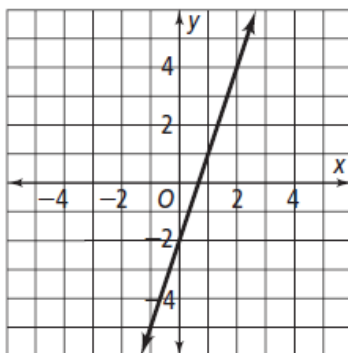
Which equation represents the line shown?

A. $y = 3x - 2$

B. $y = 3x + 2$

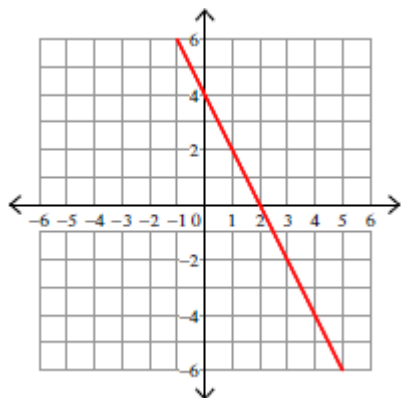
C. $y = -3x - 2$

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

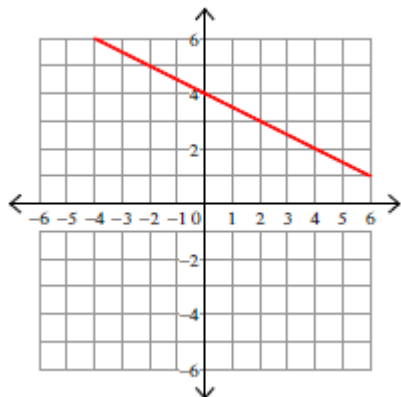


Problem 4:

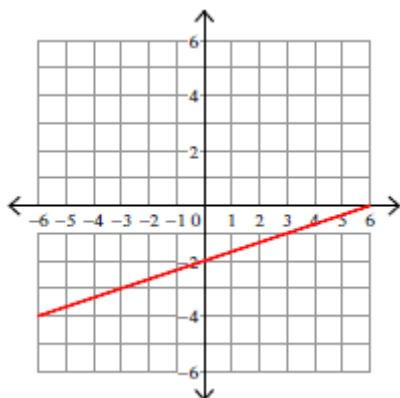
Which of the following is a graph of the equation $2x + y = 4$?



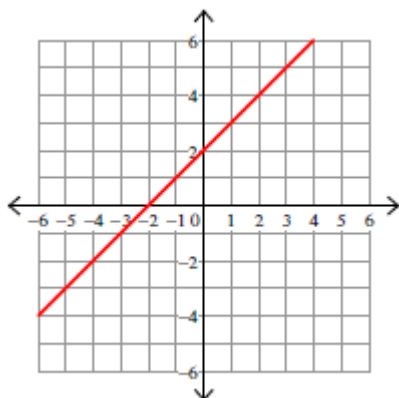
A.



B.

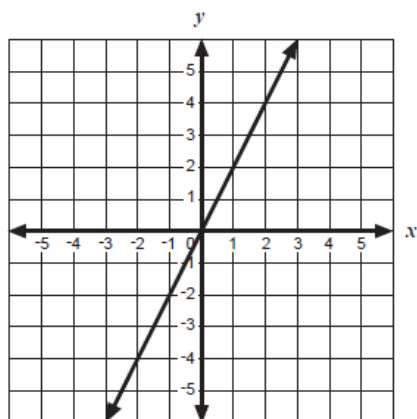


C.



D.

Problem 5:



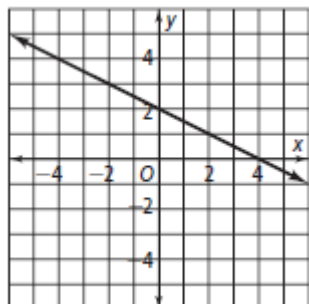
Which equation *best* represents the graph above?

- A $y = x$
- B $y = 2x$
- C $y = x + 2$
- D $y = 2x + 2$

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Problem 3:

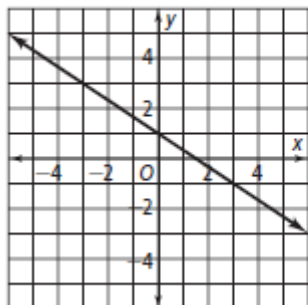
Determine the slope of the given line.



- A. $-1/2$
- B. $2/1$
- C. $-2/1$
- D. $1/2$

Problem 4:

What is the slope of the line shown below?

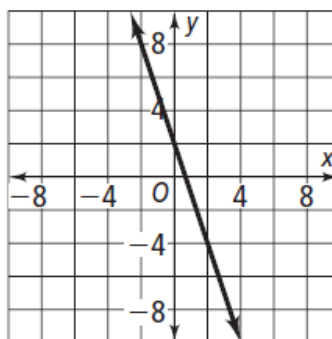


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Problem 5:

Which equation represents the line shown in the graph?

- F. $y = -3x - 2$
- G. $y = 3x + 2$
- H. $y + 4 = -3(x - 2)$
- I. $y + 8 = -3(x - 2)$



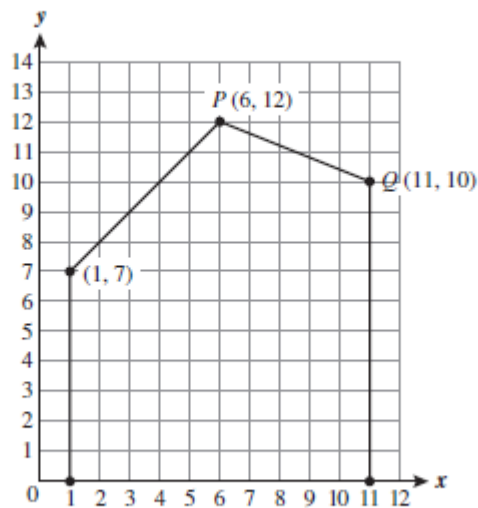
Benchmark: MA.912.A.3.10; Write an equation of a line given any of the following information: two points on the line, its slope and one point on the line, or its graph. Also, find an equation of a new line parallel to a given line, or perpendicular to a given line, through a given point on the new line.

➤ Also assesses

- MA.912.A.3.7; Rewrite equations of a line into slope-intercept form and standard form.
- MA.912.A.3.12; Graph a linear equation or inequality in two variables with and without graphing technology. Write an equation of inequality represented by a given graph.
- MA.912.A.G.1.4; Use coordinate geometry to find slopes, parallel lines, perpendicular lines and equations of lines

Problem 1:

In a technical drawing class, students are analyzing the side view of a house that has been positioned on a coordinate grid, as shown below.

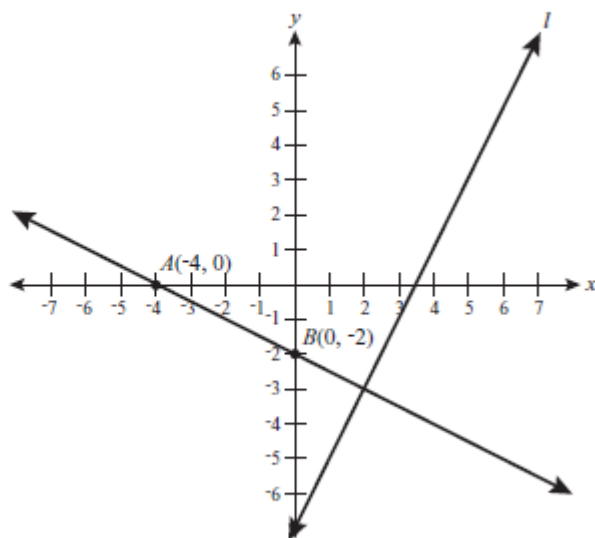


Which of the following equations best represents the line that contains $\overline{PQ}$?

- A. $y = -\frac{5}{2}x + 14.4$
- B. $y = \frac{5}{2}x + 27$
- C. $y = -\frac{2}{5}x + 14.4$
- D. $y = \frac{2}{5}x + 27$

Problem 2:

On the coordinate grid below, line l is perpendicular to $\overleftrightarrow{AB}$.



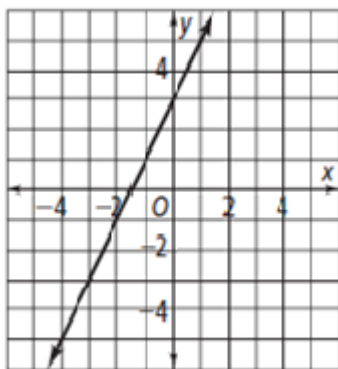
What is the slope of line l ?

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Problem 3:

What is the slope-intercept form of the line that passes through $(6, -7)$ and is perpendicular to the line shown?

- A. $y = 2x + 3$
- B. $y = 4x - 1.5$
- C. $y = \frac{1}{2}x + 4$
- D. $y = -\frac{1}{2}x - 4$



Problem 4:

Find an equation of the line that goes through the point (5, -2) with a slope of -2 .

A. $y = -2x + 12$

B. $y = 2x - 8$

C. $y = 8x - 2$

D. $y = -2x + 8$

Problem 5:

Find an equation of the line parallel to $y = 3x + 2$ that passes through the origin.

A. $y = 3x$

B. $y = -3x$

C. $y = (1/3)x$

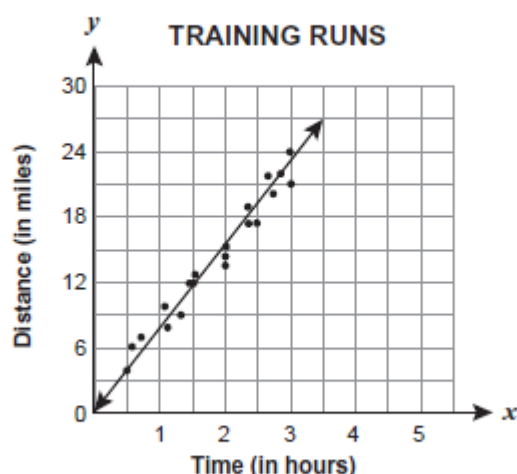
D. $y = (-1/3)x$

Benchmark: MA.912.A.3.11; Write an equation of a line that models a data set, and use the equation or the graph to make predictions. Describe the slope of the line in terms of the data, recognizing that the slope is the rate of change.

- Also assesses MA.912.A.3.12; Graph a linear equation or inequality in two variables with and without graphing technology. Write an equation or inequality represented by a given graph.

Problem 1:

David is training for a marathon. He writes down the time and distance for each training run and then records the data on a scatter plot. He has drawn a line of best fit on the scatter plot, as shown below.

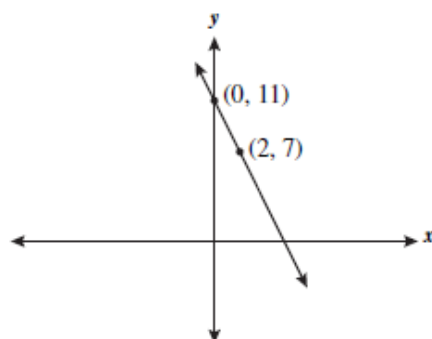


Which statement best expresses the meaning of the slope as a rate of change for this line of best fit?

- A. It represents the number of miles he will have to run to finish the marathon.
- B. It represents the average speed, in miles per hour, of his training runs.
- C. It represents the number of hours he will need to finish the marathon.
- D. It represents the distances, in miles, that he ran while he was training.

Problem 2:

Joel graphed the line shown on the coordinate plane below.

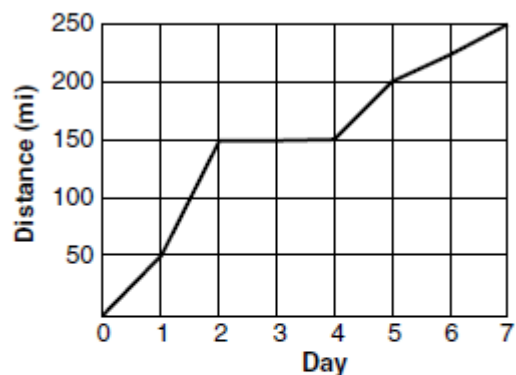


What is the x -coordinate of the point at which this line intersects the x -axis?

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Problem 3:

The graph shows the cumulative distance Yolanda traveled on her week-long bicycle trip.

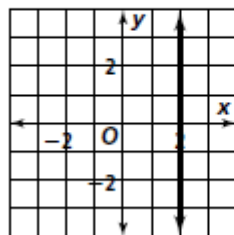


Which best describes what happened during Days 2–4?

- F Yolanda rode downhill.
- G Yolanda rode through an area with no hills or valleys.
- H Yolanda took a break from riding.
- I Yolanda rode 150 miles each of those days.

Problem 4:

What is the equation of the graph shown below?



- A. $y = 2$
- B. $x = 2$
- C. $y = -2$
- D. $x = 0$

Problem 5:

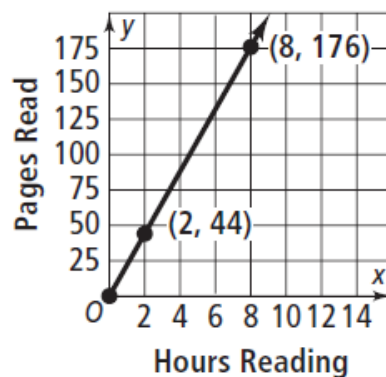
Shawn needs to read a book that is 374 pages long. The graph shown at the right shows his progress over the first 5 hours of reading. If he continues to read at the same rate, how many hours total will it take for Shawn to read the entire book?

A. 15 hours

C. 19 hours

B. 17 hours

D. 21 hours



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Problem 4:

What is the value of x in the ordered pair that is the solution of the system?

$$3x + 7y = 12$$

$$-5x + 8y = 39$$

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Problem 5:

What is the value of y in the ordered pair that is the solution for the system?

$$\begin{cases} y = 2x \\ 2x + 3y = 12 \end{cases}$$

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Benchmark: MA.912.A.4.1; Simplify monomials and monomial expressions using the laws of integral exponents.

Problem 1:

The expression $(m^6n^5q^3)^2$ is equivalent to which of the following?

- A. $m^{12}n^{10}q^6$
- B. $m^{36}n^{25}q^9$
- C. $2m^8n^7q^5$
- D. $2m^{12}n^{10}q^6$

Problem 2:

Mina simplified the expression shown below.

$$(a^3b^6)(a^2b^2)$$

Her final answer was in the form a^nb^n . If she simplified the expression correctly, what is the value of n , the exponent on b ?

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Problem 3:

Which expression is equivalent to $3ab^2(2ab^2)^3$?

- A $18a^4b^8$
- B $24a^4b^8$
- C $24a^5b^8$
- D $24a^4b^7$

Problem 4:

What is the coefficient of the simplified expression below?

$$(3\sqrt{6n})^2$$

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Problem 5:

Simplify. Write the exponent of the y in the simplified answer.

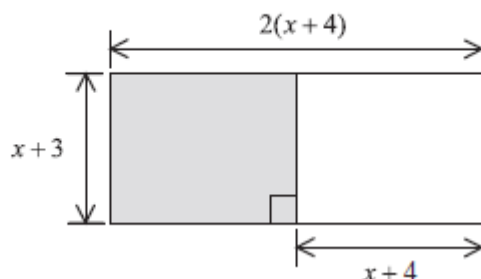
$$\left(\frac{a^2 b^5}{ab^2} \right), a \neq 0, b \neq 0$$

- A. 7
- B. 3
- C. 1
- D. -3

Benchmark: MA.912.A.4.2; Add, subtract, and multiply polynomials.

Problem 1:

Which expression is equivalent to the perimeter of the shaded portion of the rectangle?



- A. $2x + 10$
- B. $2x + 12$
- C. $4x + 14$
- D. $8x + 28$

Problem 2:

New photo imaging techniques on computers allow artists to distort an image from its original shape. Figure 1 is a square image. Figure 2 is stretched 4 units wider and shrunk 4 units shorter than Figure 1.

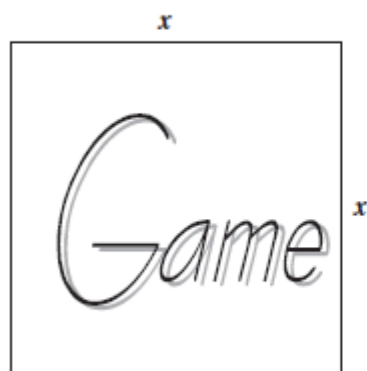


Figure 1

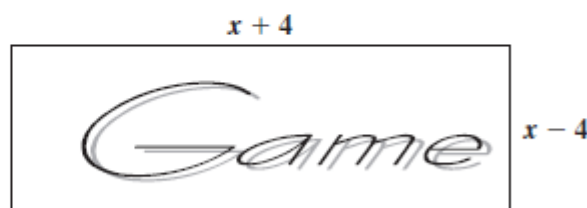


Figure 2

How many square units greater is the area of Figure 1 than the area of Figure 2?

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Problem 3:

Which answer choice is equivalent to the product of the polynomials shown below?

$$(8x + 3)(2x + 1)$$

- ☐ A. $16x + 3$
- ☐ B. $16x(14x + 4)$
- ☐ C. $16x^2 + 14x + 3$
- ☐ D. $16x^2(14x + 4)$

Problem 4:

Which answer choice is equivalent to the sum of the polynomials shown below?

$$(10x^2 + 3x - 6) + (2x^2 - 9x - 12)$$

- ☐ A. $3(4x^2 - 2x + 6)$
- ☐ B. $6(2x^2 - x - 3)$
- ☐ C. $6(x - 3)$
- ☐ D. $18(x^3 - 1)$

Problem 5:

$$(4x^2 - 7x + 2) - (x^2 + 4x - 5) = ?$$

- A. $5x^2 - 3x - 3$
- B. $3x^2 - 3x - 3$
- C. $3x^2 - 11x + 7$
- D. $4x^2 - 11x + 7$

Benchmark: MA.912.A.4.3; Factor polynomial expressions.

➤ Also assesses MA.912.A.5.1; Simplify algebraic ratios.

Problem 1:

Members of the art club want to raise money for their next field trip. They plan to decorate greeting cards with glitter and origami animals made of origami paper. They wrote the expression below to help calculate their total expenses.

$$(np + ng) + nc$$

where:

c = cost of one greeting card

g = cost of glitter per card

p = cost of origami animals per card

n = number of cards

Which of the following expressions is equivalent to the expression above?

- A. $n(p + g + c)$
- B. $n(p + g) + c$
- C. $3n(p + g) + c$
- D. $3n(p + g + c)$

Problem 2:

If $x \neq 3$, which of the following shows the expression below in simplest form?

$$\frac{3x^2 - 27}{x - 3}$$

- A. $3(x + 3)$
- B. $3(x - 3)$
- C. $3(x + 9)$
- D. $3(x - 9)$

Problem 3:

Which answer choice shows the expression below, factored completely?

$$18x^2y^2 + 36x^3y^3 - 27x^3y$$

- ☐ A. $3x^2y(6y + 12xy - 9x)$
- ☐ B. $3(6x^2y^2 + 12x^3y^3 - 9x^3y)$
- ☐ C. $9x^2y(2y + 4xy^2 - 3x)$
- ☐ D. $9(2x^2y^2 + 4x^3y^3 - 3x^3y)$

Problem 4:

Which answer choice shows the expression below, factored completely?

$$2x^2 + x - 28$$

- ☐ A. $(x - 7)(2x + 4)$
- ☐ B. $(x + 7)(2x - 4)$
- ☐ C. $(2x - 7)(x + 4)$
- ☐ D. $(2x + 7)(x - 4)$

Problem 5:

Factor $4x^2 - 25$

- A. $(2x + 5)(2x + 5)$
- B. $(2x + 5)(2x - 5)$
- C. $(2x - 5)(2x - 5)$
- D. $(4x - 1)(x + 25)$

Benchmark: MA.912.A.4.4; Divide polynomials by monomials and polynomials with various techniques, including synthetic division.

Problem 1:

Charlie needs to simplify the expression below before he substitutes values for x and y .

$$\frac{x^{18}y^{12} + x^9y^8}{x^3y^4}$$

If $x \neq 0$ and $y \neq 0$, which of the following is a simplified version of the expression above?

- A. x^9y^5
- B. $x^{24}y^{16}$
- C. $x^6y^3 + x^3y^2$
- D. $x^{15}y^8 + x^6y^4$

Problem 2:

Kanesha tries to divide a binomial by a monomial.

$$\frac{20x^2 + 5x}{5x}$$

Which of the following is the correct result?

- ☐ A. $4x + 1$
- ☐ B. $20x^2 + 1$
- ☐ C. $20x^2$
- ☐ D. $4x$

Problem 3:

The area of the rectangle below can be shown by the expression $(16x + 4y)$ square feet. If the width of the rectangle is 4 feet, what is the length of the rectangle?

$A = 16x + 4y$

- A. $(12x + 1y)$ B. $(4x + y)$ C. $4x + 4y$ D. $16x + 1y$

Problem 4:

The perimeter of the square below can be show by the expression below. What is the length of each side of the square?

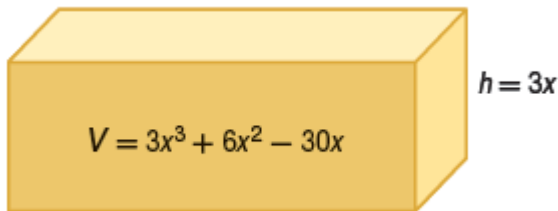


$$P = 12x^2 + 24x$$

- A.** $3x^2 + 6x$ **B.** $8x^2 + 20x$ **C.** $3x^2 + 24x$ **D.** $12x^2 + 6x$

Problem 5:

A contractor built a basement for a new home. The volume of the rectangular basement shown at the right is represented by the expression $3x^3 + 6x^2 - 30x$. If the height of the basement is $3x$, what is the area of the base?

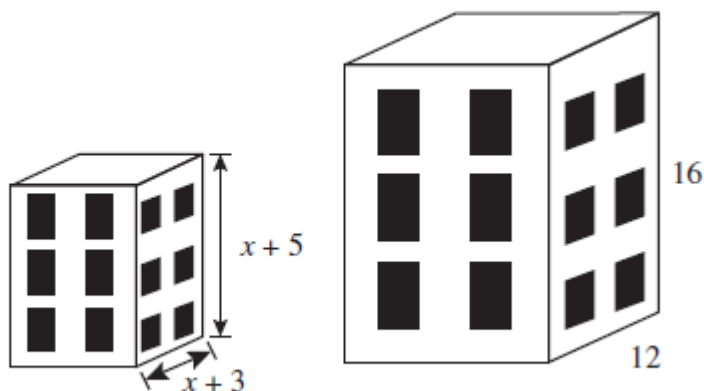


- A.** $x^3 + 2x^2 - 10$ **B.** $x^4 + 2x^3 - 10$ **C.** $x^2 + 2x - 10$ **D.** $9x^4 + 18x^3 - 90x^2$

Benchmark: MA.912.A.5.4; Solve algebraic proportions.

Problem 1:

Tammy made similar models of a building, with dimensions, in inches, as shown in the diagram below.



What is the value, in inches, of x ?

- A. 3
- B. 4
- C. 5
- D. 6

Problem 2:

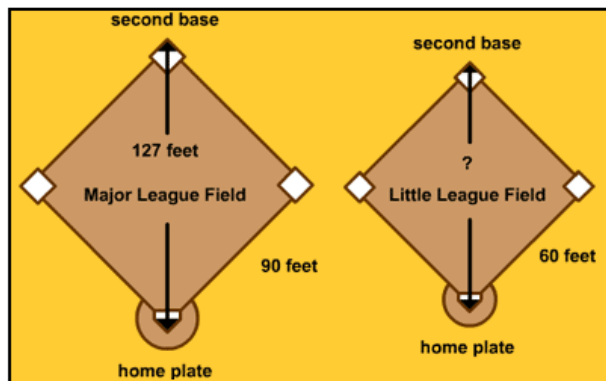
What is the solution of the equation below?

$$\frac{2}{x - 14} = \frac{3}{4x}$$

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Problem 3:

The distance between bases on a Major League Baseball field is 90 feet, and the distance from home plate to second base is approximately 127 feet. The distance between bases on a Little League Baseball field is 60 feet. What is the approximate distance from home plate to second base on a Little League field?



- ☐ A. 75 feet
- ☐ B. 80 feet
- ☐ C. 85 feet
- ☐ D. 90 feet

Problem 4:

In a box of graham crackers, 2 unbroken sheets of crackers contain 120 calories and make up one serving. Hans used the proportion below to determine the number of calories that are in 7 unbroken sheets of crackers. What is the value of x ?

$$\frac{2}{120} = \frac{7}{x}$$

- ☐ A. 14
- ☐ B. 42
- ☐ C. 210
- ☐ D. 420

Problem 5:

Solve.

$$\frac{7}{b+5} = \frac{10}{5}$$

A. 1.5 B. -1.5 C. 3 D. 4

Benchmark: MA.912.A.6.2; Add, subtract, multiply, and divide radical expressions (square roots and higher).

➤ Also assesses MA.912.A.6.1; Simplify radical expressions.

Problem 1:

Neelam simplified the expression below for a homework assignment.

$$\sqrt{12} + \sqrt{3x} + 7\sqrt{3}$$

If Neelam simplified the expression correctly, which of the following is her answer?

- A. $9\sqrt{3} + \sqrt{3x}$
- B. $11\sqrt{3} + \sqrt{3x}$
- C. $7\sqrt{15} + \sqrt{3x}$
- D. $8\sqrt{15} + \sqrt{3x}$

Problem 2:

Which answer choice is equivalent to the expression below?

$$\sqrt{4} \times \frac{\sqrt{25}}{5}$$

- ☐ A. $\frac{1}{2}$
- ☐ B. 2
- ☐ C. 4
- ☐ D. 20

Problem 3:

What is the value of x in the equation shown below?

$$(8x)[(2x)]^{-2} = 8$$

- ☐ A. $\frac{1}{8}$
- ☐ B. $\frac{1}{4}$
- ☐ C. 1
- ☐ D. 4

Problem 4:

What is the simplified form of $\sqrt{8}(\sqrt{5} + 4)$?

F. $16\sqrt{10}$

G. $2\sqrt{10} + 4\sqrt{2}$

H. $4\sqrt{10} + 4\sqrt{2}$

I. $2\sqrt{10} + 8\sqrt{2}$

Problem 5:

The pendulum of a cuckoo clock completes one full swing every t seconds.

The variable t is determined by the function $t = 2\sqrt{\frac{l}{3.3}}$ where l is the length in meters of the pendulum. Each swing takes 0.5 seconds. How many centimeters long is the pendulum?

A. 20.625 cm

B. 41.25 cm

C. 82.5 cm

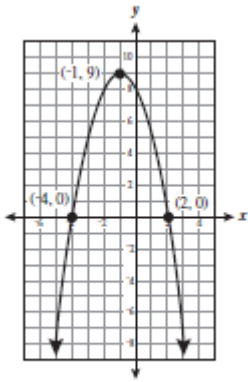
D. 330 cm

Benchmark: MA.912.A.7.1; Graph quadratic equations with and without graphing technology.

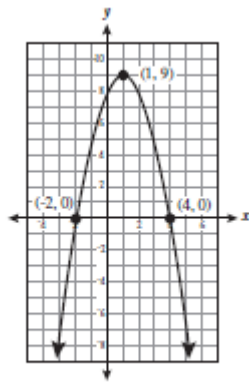
➤ Also assesses MA.912.A.7.8; Use quadratic equations to solve real-world problems.

Problem 1:

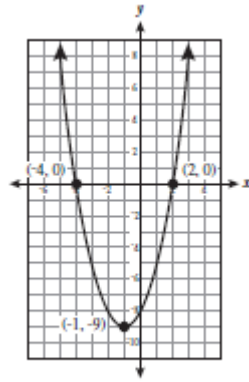
Which of the following is the graph of $y = x^2 + 2x - 8$?



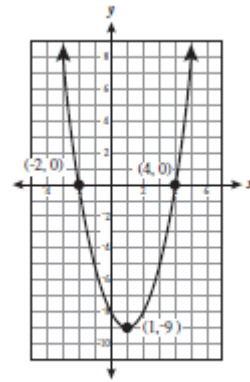
A.



B.



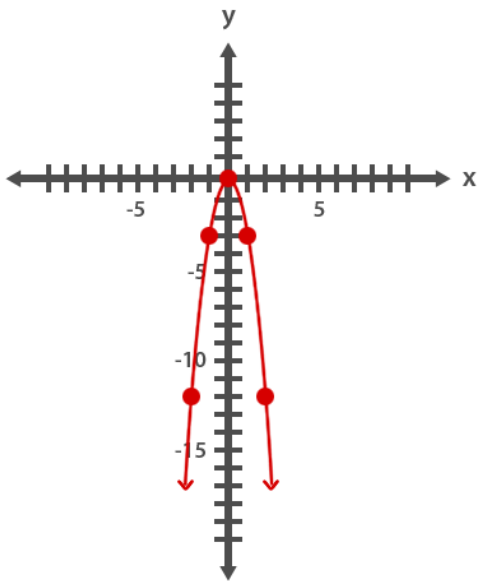
C.



D.

Problem 2:

Which of the following equations represents the graph shown below?



A. $y = -x^2$

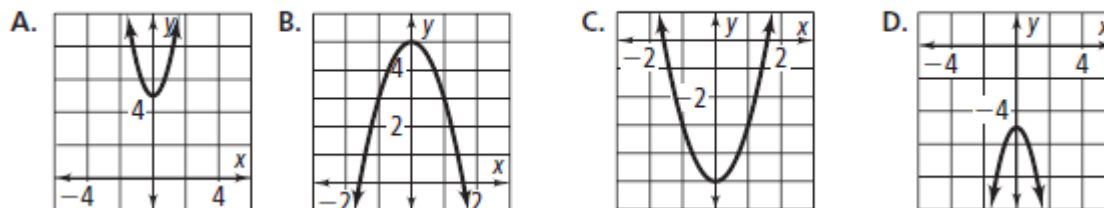
B. $y = x^2$

C. $y = -3x^2$

D. $y = 3x^2$

Problem 3:

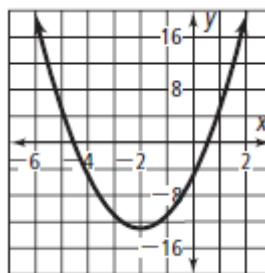
Which graph represents the function $y = -2x^2 - 5$?



Problem 4:

Which equation matches the graph shown at the right?

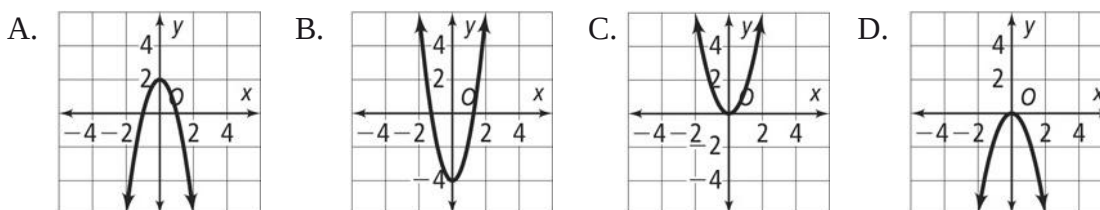
- A. $y = 8x^2 + 2x - 5$
- B. $y = 8x^2 + 2x + 5$
- C. $y = 2x^2 + 8x + 5$
- D. $y = 2x^2 + 8x - 5$



Problem 5:

Match the graph with its equation.

$$y = -2x^2 + 2$$



Benchmark: MA.912.A.7.2; Solve quadratic equations over the real numbers by factoring and by using the quadratic formula.

➤ Also assesses

- MA.912.1.8; Use the zero product property of real numbers in a variety of contexts to identify solutions to equations.
- MA.912.A.7.8; Use quadratic equations to solve real-world problems.

Problem 1:

Jeannie solved the quadratic equation shown below by factoring.

$$x^2 + 2x - 8 = 0$$

Which of the following shows a step in solving the equation shown?

- A. $(x + 2)(x + 4) = 0$
- B. $(x + 2)(x - 4) = 0$
- C. $(x - 2)(x + 4) = 0$
- D. $(x - 2)(x - 4) = 0$

Problem 2:

A ball is kicked from ground level into the air. Its height y , in feet, after x seconds can be represented by the equation $y = 40x - 16x^2$. What is the total elapsed time, in seconds, from the time the ball is kicked until it reaches ground level again?

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Problem 3:

Marly needs to solve the problem shown below by using the quadratic formula.

$$f(x) = x^2 + 7x + 1 = 31$$

Which of the following shows the quadratic formula being used correctly to determine the solutions for this problem?

- ☐ A. $x = \frac{-7 \pm \sqrt{7^2 - 4(1)(1)}}{2(1)}$
- ☐ B. $x = \frac{-7 \pm \sqrt{7^2 - 4(1)(31)}}{2(1)}$
- ☐ C. $x = \frac{-7 \pm \sqrt{7^2 - 4(1)(-30)}}{2(1)}$
- ☐ D. $x = \frac{7 \pm \sqrt{7^2 - 4(1)(-30)}}{2(1)}$

Problem 4:

Julianne used a quadratic function to solve a problem. The factored form of the function is shown below.

$$(x - 3)(x - 4) = 0$$

What is the sum of the solutions to the problem?

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Problem 5:

Solve the following equation for x : $x^2 - 3x + 2 = 0$

- A. $x = 2$ or $x = 1$
- B. $x = -2$ or $x = -1$
- C. $x = -2$ or $x = 1$
- D. $x = 2$ or $x = -1$

Benchmark: MA.912.D.7.1; Perform set operations such as union and intersection, complement, and cross product.

Problem 1:

The set T represents several Taurine breeds of cattle.

$$T = \{\text{Angus, Devon, Shorthorn, Texas Longhorn}\}$$

The set Z represents several Zebu breeds of cattle.

$$Z = \{\text{Boran, Nelore, Ponwar}\}$$

What is the total number of elements in the set $T \times Z$?

- A. 7
- B. 9
- C. 12
- D. 20

Problem 2:

Set D lists the ages of Dianna's grandchildren.

$$D = \{2, 5, 6, 8, 10, 11\}$$

Set K lists the ages of Karen's grandchildren.

$$K = \{2, 10, 18\}$$

Set P lists the ages of Patrick's grandchildren.

$$P = \{10, 11, 14\}$$

What is the greatest age in the set $(K \cup P) \cap D$?

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Problem 3:

Let $A = \{3, 6, 9, 12\}$ and $B = \{2, 4, 6, 8\}$. Which of the following represents the union of A and B ?

- ☐ A. $\{6\}$
- ☐ B. $\{2, 3, 4, 8, 9, 12\}$
- ☐ C. $\{2, 3, 4, 6, 8, 9, 12\}$
- ☐ D. $\{2, 4, 6, 8\}$

Problem 4:

Let $A = \{a, e, i, o, u\}$ and $B = \{a, b, c, d\}$ in the universe $U = \{a, b, c, d, e, i, o, u\}$. What is the complement of A ?

- ☐ A. $\{a\}$
- ☐ B. $\{b, c, d\}$
- ☐ C. $\{b, c, d, e, i, o, u\}$
- ☐ D. $\{a, b, c, d, e, i, o, u\}$

Problem 5:

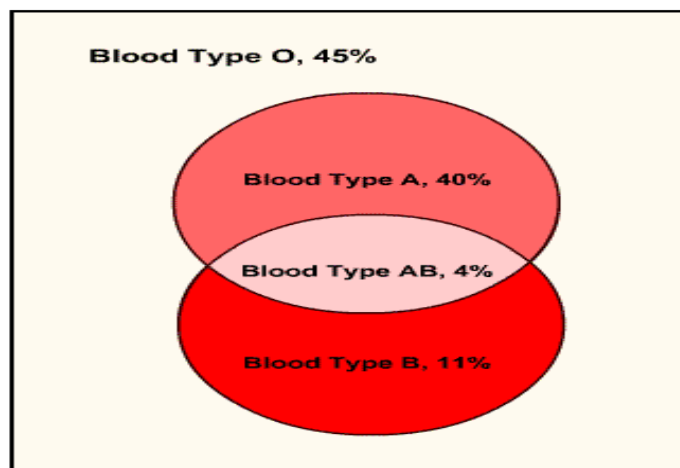
Let $F = \{-1, 0, 1, 2, 3\}$, $G = \{1, 3, 5, 7\}$, and $H = \{2, 4, 6, 8\}$. What is the difference of the number of elements of $G \cup H$ and the number of elements of $F \cap G$?

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Problem 3:

There are two proteins in human blood, which are known as A and B. A person with only the A protein is blood type A; a person with only the B protein is blood type B; a person with both proteins is blood type AB; and a person with neither is blood type O.

The Venn diagram below shows the percentages of the general population with each blood type. What percent of the population has the A protein in their blood?

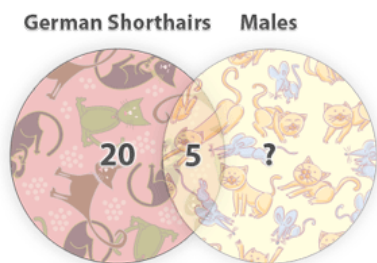


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Problem 4:

A cat show has 52 cats entered. Some of the cats are German Shorthairs, some are males, and some are both, as shown in the diagram below.

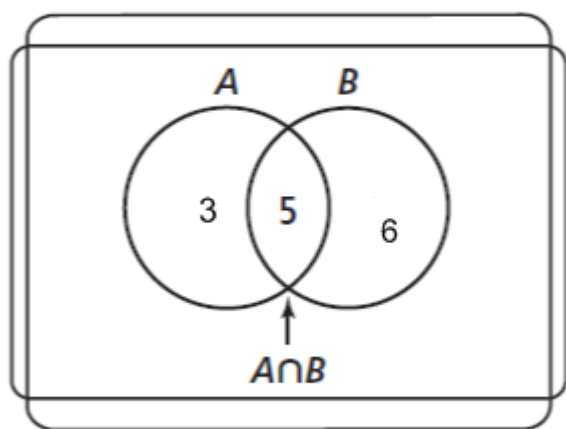
How many of the cats in the show are males, but are not German Shorthairs?



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Problem 5:

Eight boxes of juice are organic and 11 are unsweetened. Five of the boxes of juice are both organic and unsweetened. How many boxes of juice are there?



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