

? Topic Essential Question

How can you use proportional and nonproportional linear relationships to solve problems? What does it mean to solve a system of equations?

Vocabulary Review

Complete each definition and provide an example of each vocabulary word.

Vocabulary slope of a line y-intercept slope-intercept form x-intercept

Definition	Example
1. The change in y divided by the change in x is the _____.	
2. The point on the graph where the line crosses the y -axis is the _____ of a line.	
3. The _____ of a line is $y = mx + b$. The variable m in the equation stands for the _____. The variable b in the equation stands for the _____.	

Use Vocabulary in Writing

Paddle boats rent for a fee of \$25, plus an additional \$12 per hour. What equation, in $y = mx + b$ form, represents the cost to rent a paddle boat for x hours? Explain how you write the equation. Use vocabulary words in your explanation.

Concepts and Skills Review

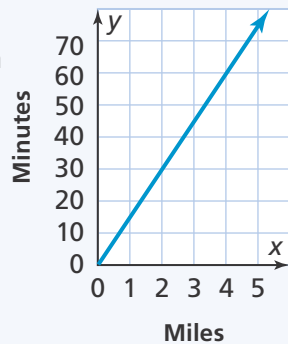
LESSON 4-1 Connect Proportional Relationships and Slope

Quick Review

The **slope** of a line in a proportional relationship is the same as the unit rate and the constant of proportionality.

Example

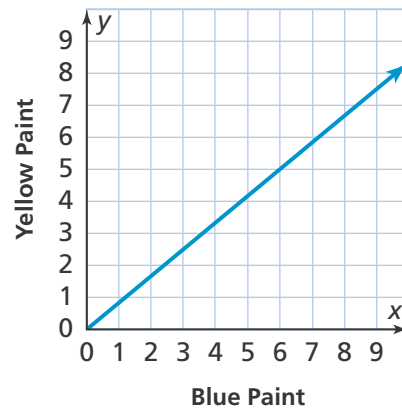
The graph shows the number of miles a person walked at a constant speed. Find the slope of the line.



$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{60 - 30}{4 - 2} = \frac{30}{2} = 15$$

Practice

1. The graph shows the proportions of blue paint and yellow paint that Briana mixes to make green paint. What is the slope of the line? Tell what it means in the problem situation.



LESSON 4-2 Analyze Linear Equations: $y = mx$

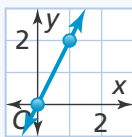
Quick Review

A proportional relationship can be represented by an equation in the form $y = mx$, where m is the slope.

Example

Graph the line $y = 2x$.

Plot a point at $(0, 0)$. Then use the slope to plot the next point.

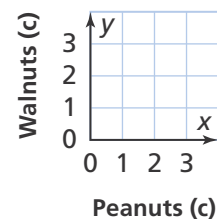


Practice

A mixture of nuts contains 1 cup of walnuts for every 3 cups of peanuts.

1. Write a linear equation that represents the relationship between peanuts, x , and walnuts, y .

2. Graph the line.



LESSON 4-3

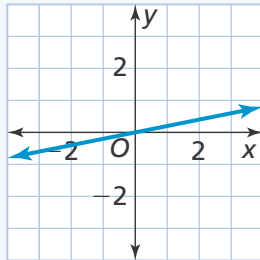
Understand the y -Intercept of a Line

Quick Review

The y -intercept is the y -coordinate of the point where a line crosses the y -axis. The y -intercept of a proportional relationship is 0.

Example

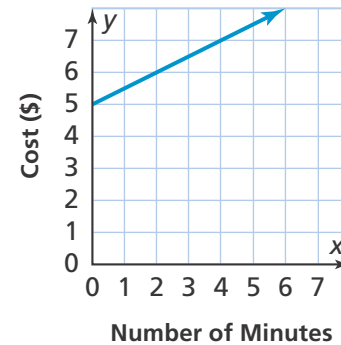
What is the y -intercept of the line?



The y -intercept is 0.

Practice

The equation $y = 5 + 0.5x$ represents the cost of getting a car wash and using the vacuum for x minutes.



1. What is the y -intercept?
2. What does the y -intercept represent?

LESSON 4-4

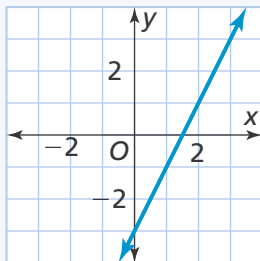
Represent Linear Equations: $y = mx + b$

Quick Review

An equation in the form $y = mx + b$, where $b \neq 0$, has a slope of m and a y -intercept of b . This form is called the **slope-intercept form**. There is not a proportional relationship between x and y in these cases.

Example

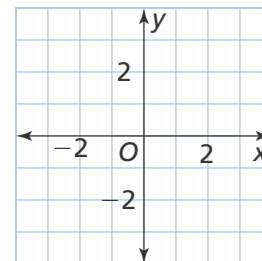
What is the equation of the line?



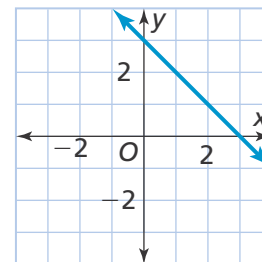
Since $m = 2$ and $b = -3$, the equation is $y = 2x - 3$.

Practice

1. Graph the line with the equation $y = \frac{1}{2}x - 1$.



2. What is the equation of the line?



Quick Review

The slope of a line of a linear relationship represents the rate of change between the two variables in the relationship. The y-intercept represents the initial value.

Example

The weight of a kitten, in ounces, is represented by the equation $w = 5x + 3.5$, where x represents the number of weeks since birth. Determine and interpret the slope and y-intercept of the line that represents the equation.

The slope is 5, it represents a weight gain of 5 oz per week.

The y-intercept is 3.5, it represents a birth weight of 3.5 oz.

Practice

Determine and interpret the slope and y-intercept of the line that represents the linear relationship.

1. An amusement park charges a \$10 entry fee and \$2.50 a ride.

2. Growth of Pea Plants

Day	Height (cm)
0	1.8
5	5.4
10	9.0

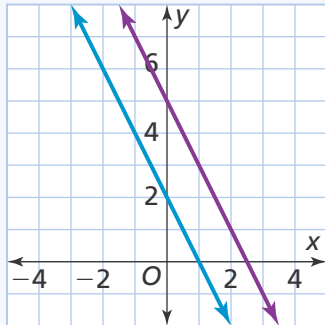
Quick Review

The slopes and y -intercepts of a graph of a system of equations can be used to determine the number of solutions.

	Same Slope?	Same y -intercept?
No Solution	Yes	No
One Solution	No	n/a
Infinitely Many Solutions	Yes	Yes

Example

How many solutions does the system of equations have? Explain.



For the line $y = -2x + 2$, the slope is -2 and the y -intercept is 2 .

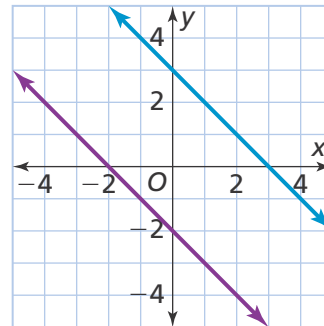
For the line $y = -2x + 5$, the slope is -2 and the y -intercept is 5 .

The lines have the same slope but different y -intercepts, so the system has no solution.

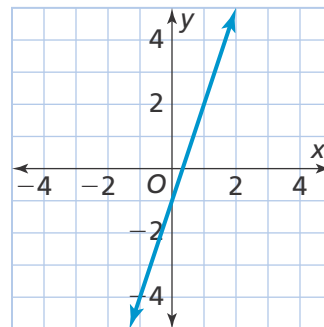
Practice

Determine whether the system of equations has one solution, no solution, or infinitely many solutions.

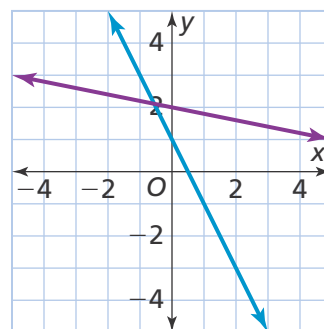
1.



2.



3.



Quick Review

Systems of equations can be solved by looking at their graphs. A system with one solution has one point of intersection. A system with infinitely many solutions has infinite points of intersection. A system with no solution has no points of intersection.

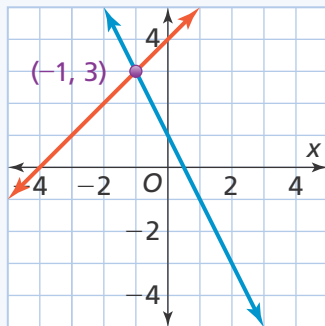
Example

Graph the system and determine its solution.

$$y = x + 4$$

$$y = -2x + 1$$

Graph each equation in the system on the same coordinate plane.



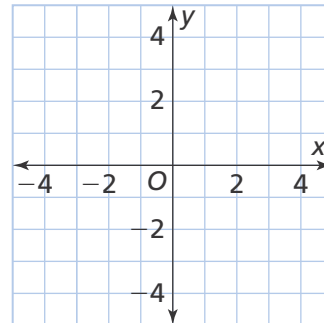
The point of intersection is $(-1, 3)$. This means the solution to the system is $(-1, 3)$.

Practice

Graph each system and find the solution(s).

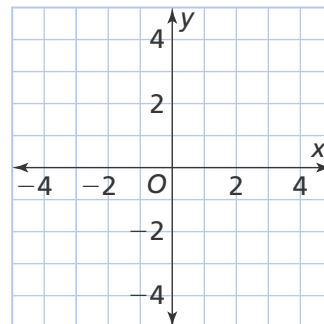
1. $y = 3x + 2$

$$y = -2x + 2$$



2. $y = -x - 3$

$$y = -x - 2$$



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

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

