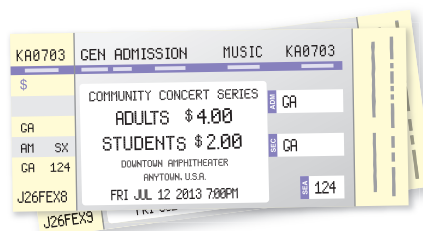


Essential Question

How can you describe the graph of the equation $ax + by = c$?

1 ACTIVITY: Using a Table to Plot Points

Work with a partner. You sold a total of \$16 worth of tickets to a school concert. You lost track of how many of each type of ticket you sold.

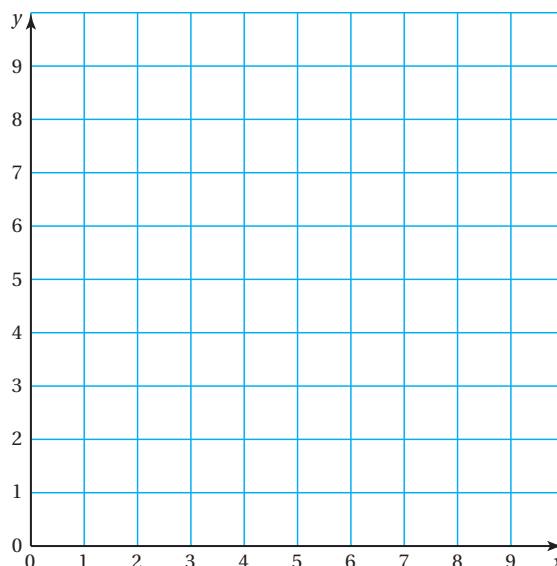


$$\frac{\text{[Yellow Box]}}{\text{adult}} \cdot \text{Number of adult tickets} + \frac{\text{[Yellow Box]}}{\text{student}} \cdot \text{Number of student tickets} = \text{[Yellow Box]}$$

- Let x represent the number of adult tickets.
Let y represent the number of student tickets.
Write an equation that relates x and y .
- Copy and complete the table showing the different combinations of tickets you might have sold.

Number of Adult Tickets, x					
Number of Student Tickets, y					

- Plot the points from the table. Describe the pattern formed by the points.
- If you remember how many adult tickets you sold, can you determine how many student tickets you sold? Explain your reasoning.



Graphing Equations

In this lesson, you will

- graph linear equations written in standard form.

2 ACTIVITY: Rewriting an Equation

Work with a partner. You sold a total of \$16 worth of cheese. You forgot how many pounds of each type of cheese you sold.



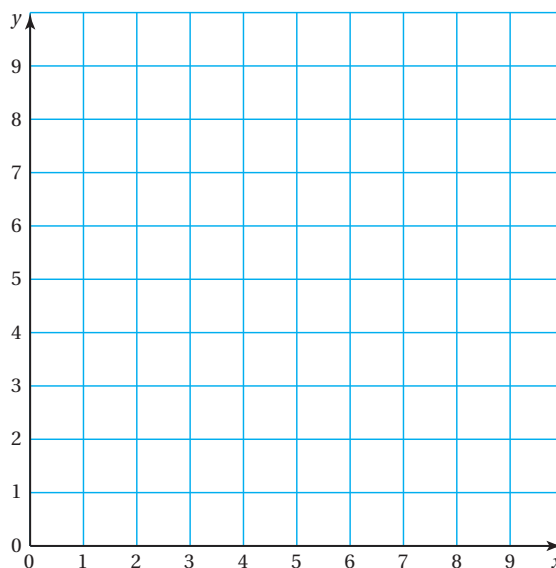
$$\frac{\text{[yellow box]}}{\text{pound}} \cdot \text{Pounds of swiss} + \frac{\text{[yellow box]}}{\text{pound}} \cdot \text{Pounds of cheddar} = \text{[yellow box]}$$

Actions and Processes

Understand Quantities

What do the equation and the graph represent? How can you use this information to solve the problem?

- Let x represent the number of pounds of swiss cheese. Let y represent the number of pounds of cheddar cheese. Write an equation that relates x and y .
- Rewrite the equation in slope-intercept form. Then graph the equation.
- You sold 2 pounds of cheddar cheese. How many pounds of swiss cheese did you sell?
- Does the value $x = 2.5$ make sense in the context of the problem? Explain.




What Is Your Answer?

- IN YOUR OWN WORDS** How can you describe the graph of the equation $ax + by = c$?
- Activities 1 and 2 show two different methods for graphing $ax + by = c$. Describe the two methods. Which method do you prefer? Explain.
- Write a real-life problem that is similar to those shown in Activities 1 and 2.
- Why do you think it might be easier to graph $x + y = 10$ without rewriting it in slope-intercept form and then graphing?

Practice

Use what you learned about graphing linear equations in standard form to complete Exercises 3 and 4 on page 112.

Key Vocabulary 
standard form, p. 110

Study Tip

Any linear equation can be written in standard form.

Key Idea

Standard Form of a Linear Equation

The **standard form** of a linear equation is

$$ax + by = c$$

where a and b are not both zero.

EXAMPLE 1 Graphing a Linear Equation in Standard Form

Graph $-2x + 3y = -6$.

Step 1: Write the equation in slope-intercept form.

$$-2x + 3y = -6 \quad \text{Write the equation.}$$

$$3y = 2x - 6 \quad \text{Add } 2x \text{ to each side.}$$

$$y = \frac{2}{3}x - 2 \quad \text{Divide each side by 3.}$$

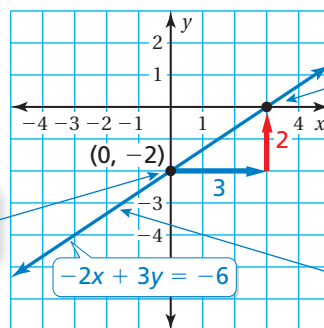
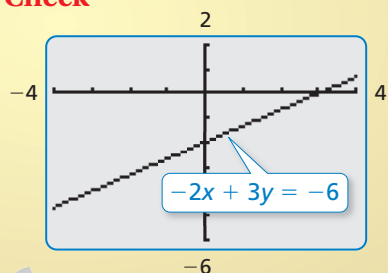
Step 2: Use the slope and the y -intercept to graph the equation.

$$y = \frac{2}{3}x + (-2)$$

slope

y -intercept

Check



Use the slope to plot another point, $(3, 0)$.

The y -intercept is -2 . So, plot $(0, -2)$.

Draw a line through the points.

On Your Own

 **Now You're Ready**
Exercises 5–10

Graph the linear equation. Use a graphing calculator to check your graph.

1. $x + y = -2$

2. $-\frac{1}{2}x + 2y = 6$

3. $-\frac{2}{3}x + y = 0$

4. $2x + y = 5$

EXAMPLE 2 Graphing a Linear Equation in Standard Form

Graph $x + 3y = -3$ using intercepts.

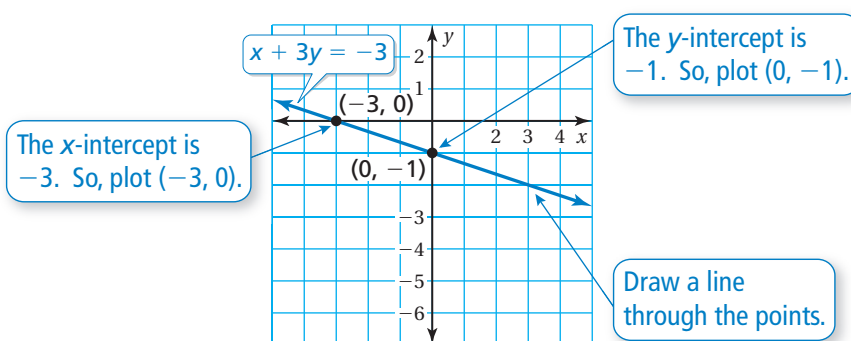
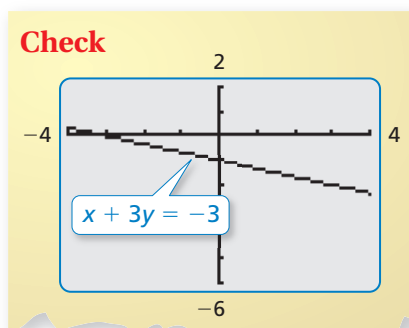
Step 1: To find the x -intercept, substitute 0 for y .

$$\begin{aligned}x + 3y &= -3 \\x + 3(0) &= -3 \\x &= -3\end{aligned}$$

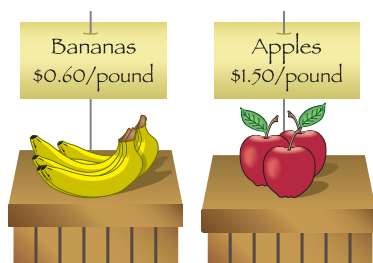
To find the y -intercept, substitute 0 for x .

$$\begin{aligned}x + 3y &= -3 \\0 + 3y &= -3 \\y &= -1\end{aligned}$$

Step 2: Graph the equation.



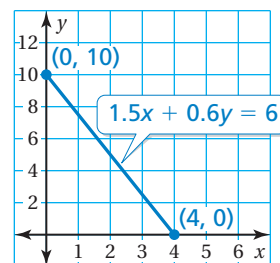
EXAMPLE 3 Real-Life Application



You have \$6 to spend on apples and bananas. (a) Graph the equation $1.5x + 0.6y = 6$, where x is the number of pounds of apples and y is the number of pounds of bananas. (b) Interpret the intercepts.

a. Find the intercepts and graph the equation.

x -intercept	y -intercept
$1.5x + 0.6y = 6$	$1.5x + 0.6y = 6$
$1.5x + 0.6(0) = 6$	$1.5(0) + 0.6y = 6$
$x = 4$	$y = 10$



b. The x -intercept shows that you can buy 4 pounds of apples when you do not buy any bananas. The y -intercept shows that you can buy 10 pounds of bananas when you do not buy any apples.

On Your Own

Now You're Ready
Exercises 16–18

Graph the linear equation using intercepts. Use a graphing calculator to check your graph.

5. $2x - y = 8$

6. $x + 3y = 6$

7. **WHAT IF?** In Example 3, you buy y pounds of oranges instead of bananas. Oranges cost \$1.20 per pound. Graph the equation $1.5x + 1.2y = 6$. Interpret the intercepts.

3.5 Exercises



Vocabulary and Concept Check

- VOCABULARY** Is the equation $y = -2x + 5$ in standard form? Explain.
- WRITING** Describe two ways to graph the equation $4x + 2y = 6$.



Practice and Problem Solving

Define two variables for the verbal model. Write an equation in slope-intercept form that relates the variables. Graph the equation.

3. $\frac{\$2.00}{\text{pound}} \cdot \text{Pounds of peaches} + \frac{\$1.50}{\text{pound}} \cdot \text{Pounds of apples} = \15

4. $\frac{16 \text{ miles}}{\text{hour}} \cdot \text{Hours biked} + \frac{2 \text{ miles}}{\text{hour}} \cdot \text{Hours walked} = 32 \text{ miles}$

Write the linear equation in slope-intercept form.

1 5. $2x + y = 17$

6. $5x - y = \frac{1}{4}$

7. $-\frac{1}{2}x + y = 10$

Graph the linear equation. Use a graphing calculator to check your graph.

8. $-18x + 9y = 72$

9. $16x - 4y = 2$

10. $\frac{1}{4}x + \frac{3}{4}y = 1$

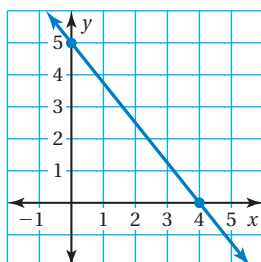
Match the equation with its graph.

11. $15x - 12y = 60$

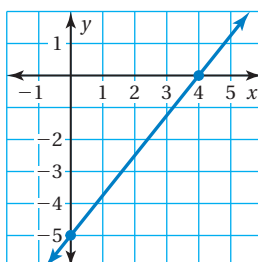
12. $5x + 4y = 20$

13. $10x + 8y = -40$

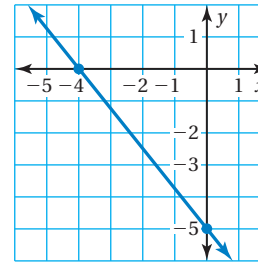
A.



B.



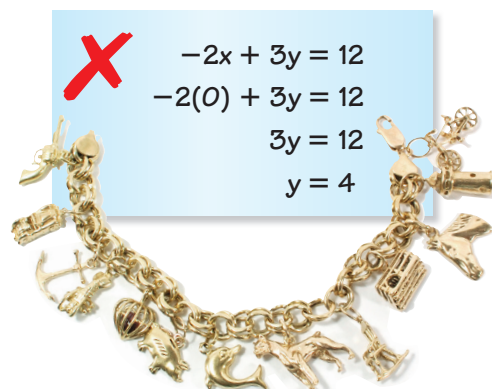
C.



14. **ERROR ANALYSIS** Describe and correct the error in finding the x -intercept.

15. **BRACELET** A charm bracelet costs \$65, plus \$25 for each charm. The equation $-25x + y = 65$ represents the cost y of the bracelet, where x is the number of charms.

- Graph the equation.
- How much does the bracelet shown cost?



Graph the linear equation using intercepts. Use a graphing calculator to check your graph.

2 16. $3x - 4y = -12$

17. $2x + y = 8$

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

19. **SHOPPING** The amount of money you spend on x CDs and y DVDs is given by the equation $14x + 18y = 126$. Find the intercepts and graph the equation.

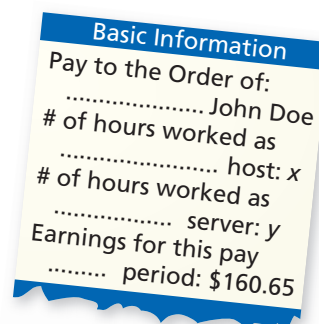


20. **SCUBA** Five friends go scuba diving. They rent a boat for x days and scuba gear for y days. The total spent is \$1000.

- Write an equation in standard form that represents the situation.
- Graph the equation and interpret the intercepts.

21. **MODELING** You work at a restaurant as a host and a server. You earn \$9.45 for each hour you work as a host and \$7.65 for each hour you work as a server.

- Write an equation in standard form that models your earnings.
- Graph the equation.



22. **LOGIC** Does the graph of every linear equation have an x -intercept? Explain your reasoning. Include an example.

23. **Critical Thinking** For a house call, a veterinarian charges \$70, plus \$40 an hour.

- Write an equation that represents the total fee y (in dollars) the veterinarian charges for a visit lasting x hours.
- Find the x -intercept. Does this value make sense in this context? Explain your reasoning.
- Graph the equation.



Fair Game Review What you learned in previous grades & lessons

The points in the table lie on a line. Find the slope of the line.

24.

x	-2	-1	0	1
y	-10	-6	-2	2

25.

x	2	4	6	8
y	2	3	4	5

26. **MULTIPLE CHOICE** Which value of x makes the equation $4x - 12 = 3x - 9$ true?

(A) -1

(B) 0

(C) 1

(D) 3