Name _____ Date _____ Class _____

Reteach
Graphing Linear Functions

Use intercepts to sketch the graph of the function $3x + 6y = 12$.

The *x*-intercept is where the graph crosses the *x*-axis. To find the *x*-intercept, set $y = 0$ and solve for *x*.

$$3x + 6y = 12$$
$$3x + 6(0) = 12$$
$$3x = 12$$
$$x = 4$$

The *x*-intercept occurs at the point $(4, 0)$.

The *y*-intercept is where the graph crosses the *y*-axis. To find the *y*-intercept, set $x = 0$ and solve for *y*.
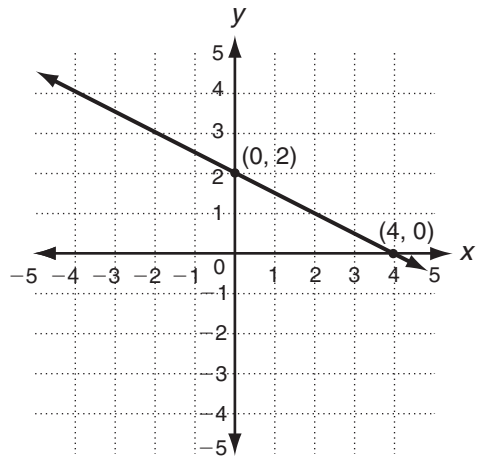
$$3x + 6y = 12$$
$$3(0) + 6y = 12$$
$$6y = 12$$
$$y = 2$$

The *y*-intercept occurs at the point $(0, 2)$.

Plot the points $(4, 0)$ and $(0, 2)$. Draw a line connecting the points.

Find the intercepts and graph each line.

1. $3x + 2y = 6$

a. $3x + 2(\underline{\quad}) = 6$

x-intercept = _____

b. $3(\underline{\quad}) + 2y = 6$
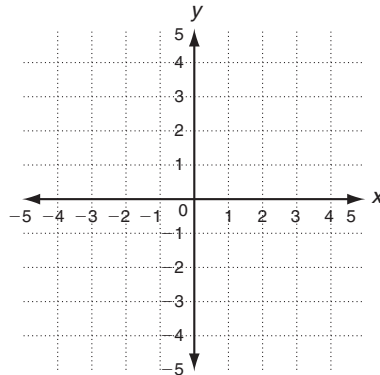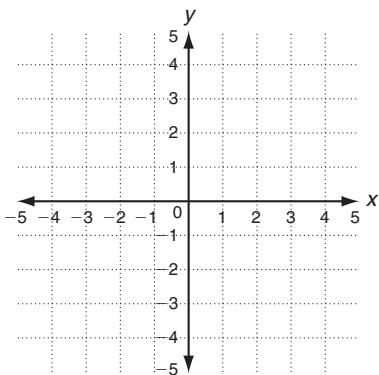
y-intercept = _____

2. $6x - 3y = -12$

a. $6x - 3(\underline{\quad}) = -12$

x-intercept = _____

b. $6(\underline{\quad}) - 3y = -12$

y-intercept = _____

Name _____ Date _____ Class _____

Reteach

Graphing Linear Functions (continued)

Use the slope and the *y*-intercept to graph a linear function.

To write $2y + x = 6$ in slope-intercept form, solve for *y*.

$$2y + x = 6$$

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

> $y = mx + b$ is the slope-intercept form. *m* represents the slope and *b* represents the *y*-intercept.

$$2y = -x + 6$$

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

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

Compare $y = -\frac{1}{2}x + 3$ to $y = mx + b$.

$m = -\frac{1}{2}$, so the slope is $-\frac{1}{2}$.

$b = 3$, so the *y*-intercept is 3.

Write each function in slope-intercept form. Use *m* and *b* to graph.

3. $2x - y = 1$

    a. $y =$ _____ $x -$ _____

    b. $m =$ _____

    c. $b =$ _____

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

    a. $y =$ _____

    b. $m =$ _____

    c. $b =$ _____

Holt Algebra 2

Practice A
Graphing Linear Functions

Determine if the rate of change, $\dfrac{\text{change in } f(x)}{\text{change in } x}$, is constant. Then tell whether each data set represents a linear or nonlinear function.

1.

	+2	+2	+2	
x	1	3	5	7
f(x)	5	10	15	20
	+5	+5	+5	

linear

2.

	+3	+3	+3	
x	0	3	6	9
f(x)	1	3	7	10
	+2	+4	+3	

nonlinear

Plot the given point. Use the slope to find a second point. Then graph the line.

3. point: $(0, -3)$; slope: 2
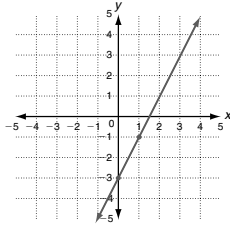
4. point: $(-3, 4)$; slope: $\dfrac{-1}{3}$
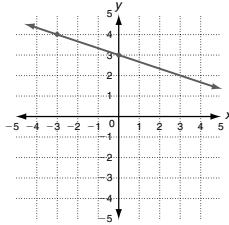
Identify the *x*-intercept and the *y*-intercept for each line.

5. $4x + y = 8$

$y = 0; x = $ __2__

$x = 0; y = $ __8__

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

$y = 0; x = $ __-2__

$x = 0; y = $ __-3__

7. $2x - 5y = 8$

$y = 0; x = $ __$\dfrac{4}{-8}{5}$__

$x = 0; y = $ __$\dfrac{-8}{5}$__

Write each function in slope-intercept form, $y = mx + b$.

8. $-5x + y = 7$

$-5x + y + 5x = 7 + 5x$

$y = $ __$5x + 7$__

9. $2y = 4x - 12$

__$y = 2x - 6$__

10. $4x - 3y = -1$

__$y = \dfrac{4x}{3} + \dfrac{1}{3}$__

Practice B
Graphing Linear Functions

Determine whether each data set could represent a linear function.

1.

x	9	7	5	3
f(x)	2	5	10	15

Nonlinear

2.

x	0.5	1	1.5	2
f(x)	9	6	3	0

Linear

Use the coordinate plane at right to graph and label each line.

3. Line a has a slope of -2 and passes through $(1, 4)$.

4. Line b has a slope of 1 and passes through $(-4, -2)$.

5. Line c has a slope of $\dfrac{2}{3}$ and passes through $(3, -2)$.

6. Line d has a slope of $\dfrac{-5}{4}$ and passes through $(-1, 0)$.
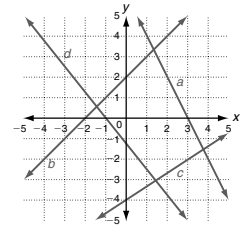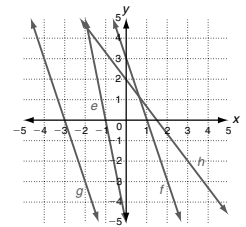

Find the intercepts of each line and graph and label the line.

7. line e: $5x + y = -5$

x-intercept = -1; *y*-intercept = -5

8. line f: $6x + 2y = 6$

x-intercept = 1; *y*-intercept = 3

Write each function in slope-intercept form. Then graph and label the function.

9. line g: $-3x - y = 9$

$y = -3x - 9$

10. line h: $4x + 3y = 6$

$y = \dfrac{-4x}{3} + 2$

Determine whether each line is vertical or horizontal.

11. $x = -5$

Vertical

12. $y = \dfrac{8}{3}$

Horizontal

13. $x = 4.6$

Vertical

Practice C
Graphing Linear Functions

1. Every time Imani buys gas for her car, she records the number of gallons required to fill the tank and the number of miles she has driven since the last fill-up.

Car Mileage Records				
Distance (mi)	250	137	238	356
Gas (gal)	10.2	5.5	9.8	14.2

a. Does the data set represent a linear function? Explain how you know.

No, the data set is nonlinear. Possible answer: The difference between the data items is not consistent or proportional.

b. What does it mean, in terms of the way a car uses gas, for the data to be linear or nonlinear?

Possible answer: It is appropriate for the data to be nonlinear since a car uses gas differently depending on where and how it is being driven.

2. Julian read in a book that he could predict the temperature based on the number of times a cricket chirps per minute. To test this theory, he records cricket chirps and the temperature for several nights.

Cricket Chirps vs. Temperature				
Chirps (per min)	218	198	204	212
Temperature (°F)	93.5	88.5	90	92

a. Does the data that Julian collects represent a linear function? Explain how you know.

Yes, the data set is linear. Possible answer: The difference between ordered pairs is proportional. $\dfrac{20}{5} = \dfrac{6}{1.5} = \dfrac{8}{2}$

b. Julian wrote the equation $T = \dfrac{c}{4} + 39$ to calculate the temperature (T) based on c chirps per minute. Graph the equation on a graphing calculator. Find the c- and T-intercepts.

c-intercept $= -156$; T-intercept $= 39$

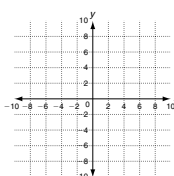**c.** About how many times per minute should a cricket chirp at 76°F?

148

3. Graph each equation. Identify the polygon formed by the intersecting lines. Give the coordinates of the vertices of the polygon.

$y = 4$ $-4x - 2y = -8$

$x + 2y = -4$ $24 + 3y + 6x = 0$

Trapezoid

$(-6, 4), (0, 4), (-4, 0), (4, -4)$

Reteach
Graphing Linear Functions

Use intercepts to sketch the graph of the function $3x + 6y = 12$.

The *x*-intercept is where the graph crosses the *x*-axis. To find the *x*-intercept, set $y = 0$ and solve for *x*.

$3x + 6y = 12$

$3x + 6(0) = 12$

$3x = 12$

$x = 4$

The x-intercept occurs at the point (4, 0).

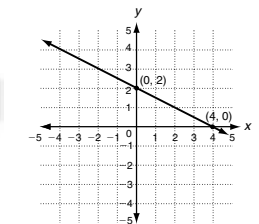The *y*-intercept is where the graph crosses the *y*-axis. To find the *y*-intercept, set $x = 0$ and solve for *y*.

$3x + 6y = 12$

$3(0) + 6y = 12$

$6y = 12$

$y = 2$

The y-intercept occurs at the point (0, 2).

Plot the points $(4, 0)$ and $(0, 2)$. Draw a line connecting the points.
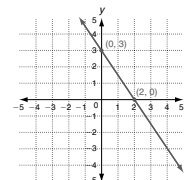
Find the intercepts and graph each line.

1. $3x + 2y = 6$

a. $3x + 2(\underline{0}) = 6$

x-intercept = __2__
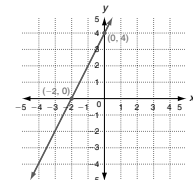
b. $3(\underline{0}) + 2y = 6$

y-intercept = __3__

2. $6x - 3y = -12$

a. $6x - 3(\underline{0}) = -12$

x-intercept = __-2__

b. $6(\underline{0}) - 3y = -12$

y-intercept = __4__

Reteach
Graphing Linear Functions (continued)

Use the slope and the y-intercept to graph a linear function.

To write $2y + x = 6$ in slope-intercept form, solve for y.

$$2y + x = 6$$
$$\underline{-x \quad -x}$$
$$2y = -x + 6$$
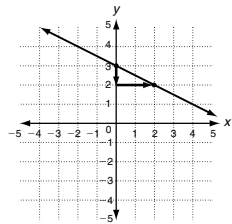$$\frac{2y}{2} = -\frac{x}{2} + \frac{6}{2}$$
$$y = -\frac{1}{2}x + 3$$

$y = mx + b$ is the slope-intercept form. m represents the slope and b represents the y-intercept.

Compare $y = -\frac{1}{2}x + 3$ to $y = mx + b$.

$m = -\frac{1}{2}$, so the slope is $-\frac{1}{2}$.
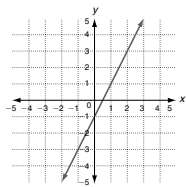
$b = 3$, so the y-intercept is 3.

Write each function in slope-intercept form. Use m and b to graph.
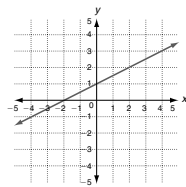
3. $2x - y = 1$
   a. $y = \underline{\ 2\ } x - \underline{\ 1\ }$
   b. $m = \underline{\ 2\ }$
   c. $b = \underline{\ -1\ }$

4. $y - \frac{x}{2} = 1$
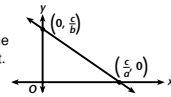   a. $y = \underline{\frac{1}{2}x + 1}$
   b. $m = \underline{\frac{1}{2}}$
   c. $b = \underline{\ 1\ }$

Challenge
Intercepts and Triangles

Every linear equation in x and y can be written in the form $ax + by = c$, where a and b cannot both be 0. If a, b, and c are not zero, then the graph is a line that crosses both the x-axis and the y-axis at points other than the origin, such as in the diagram at right.

You can use the equation of a line to find the area of a triangle.

1. a, b, and c are nonzero constants and $ax + by = c$. Show that the x-intercept of the graph is $\frac{c}{a}$ and that the equation y-intercept is $\frac{c}{b}$.

   To find the x-intercept, let y = 0.
   $$ax + by = c$$
   $$ax + b(0) = c$$
   $$ax = c$$
   $$x = \frac{c}{a}$$

   To find the y-intercept, let x = 0.
   $$ax + by = c$$
   $$a(0) + by = c$$
   $$by = c$$
   $$y = \frac{c}{b}$$

2. Explain why a, b, and c must be nonzero in order to form a triangle whose sides are the line represented by the equation $ax + by = c$ and the coordinate axes.
   Possible answer: If any of a, b, or c are 0, then there is no triangle since the lengths of two of the sides are $\frac{c}{b}$ and $\frac{c}{a}$.

3. a. a, b, and c are positive numbers. Write a formula for the area of the triangle formed by the graph of $ax + by = c$ and the coordinate axes.
   $$A = \frac{c^2}{2ab}$$

   b. Find the area of the right triangle formed by the graph of $4x + 5y = 20$ and the coordinate axes.
   10 square units

4. A triangle whose sides are the graph of a line and the coordinate axes has an area of 100 square units. Write an equation of the form $ax + by = c$ for the hypotenuse of the triangle.
   Possible answer: $2x + y = 20$

Solve.

5. a. Draw the graph of a line with x-intercept 5 and y-intercept 8.

   b. Find the constants a, b, and c for the line.
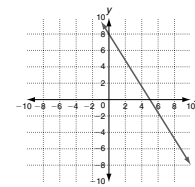 $$a = 8, b = 5, c = 40$$

   c. Write the equation for the line.
   $$8x + 5y = 40$$

   d. Write the equation in slope-intercept form. What is the slope of the line?
   $$y = \frac{-8}{5}x + 8; \frac{-8}{5}$$

   e. What is the area of the right triangle formed by the line and the coordinate axes?
   20 square units

Problem Solving
Graphing Linear Functions

Solve

1. Nathan made a table to record the balance in his savings account when he made a deposit every other month.

Savings Balance						
Month	2	4	6	8	10	12
Balance ($)	575	810	1025	1280	1545	1850

Is this data set linear? How do you know?
No; Possible answer: the rate of change is not constant.

2. Sally runs a landscape service business. The table shows her fee schedule.

Landscape Services						
Time (h)	1	2	3	4	5	6
Price ($)	8	14	20	26	32	38

a. Why is the data set linear?
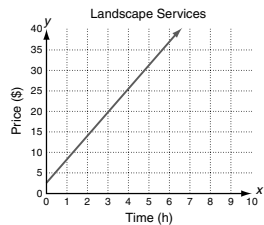**Because the rate of change is constant**

b. Find the slope of the line that passes through the points.
6

c. Graph these data.

d. Estimate the cost for 9 hours of landscape services.
$56

Choose the letter for the best answer.

3. Jan built a skateboard ramp from her back porch to the ground. The porch is 30 inches above the ground. The ramp extends 9 feet from the base of the porch. Find the slope of the ramp.
   A 3.6
   B 3.33
   C 0.3
   (D) 0.278

4. When Rafiq left home on a business trip he noted that the odometer on his car read 47,823. He drove 3 h 15 min and then noted that the odometer read 48,017. Find his average speed in miles per hour.
   A 55.6
   (B) 59.7
   C 61.6
   D 63.5

Reading Strategies
Graphic Organizer

Definition	Facts
A function with a constant rate of change is called a **linear function**. $$f(x) = mx + b$$ m is the slope. b is the y-intercept.	The graph of a linear function is always a straight line. You can use the equation of a linear function to find its slope and intercepts: $y = mx + b$.
Example	**Useful Hints**
Linear function: $2x + y = 4$ Slope-intercept form of the linear function: $y = -2x + 4$ Slope $= -2$ y-intercept $= 4$	You can use any two points on a line to draw its graph. The intercepts give you two points on the line. You can also graph a line using its slope and one point on the line.

Complete the table

	Linear Function	Slope-Intercept Form	Slope	y-intercept
1.	$4x + y = 7$	$y = -4x + 7$	-4	7
2.	$3y - 3x = -9$	$y = x - 3$	1	-3
3.	$-6x + 2y = 12$	$y = 3x + 6$	3	6

Use the function $x - 2y = 4$ for Exercises 4–6.

4. What do the terms x-intercept and y-intercept mean?
Possible answer: The x-intercept is the point where the line crosses the x-axis. The y-intercept is the point where the line crosses the y-axis.

5. The function passes through the point $(2, -1)$. Describe how to use the slope to find another point on the line.
Possible answer: Plot $(2, -1)$. The slope of the line is $\frac{1}{2}$, so move 1 unit up and 2 units to the right, to $(4, 0)$.

6. Describe how to graph the function using its intercepts.
Possible answer: Plot the points $(4, 0)$ and $(0, -2)$. Draw a line through both points.