

LESSON

Reteach**5-6** *Slope-Intercept Form*

An equation is in **slope-intercept form** if it is written as:

$$y = mx + b.$$

m is the slope.
b is the *y*-intercept.

A line has a slope of -4 and a *y*-intercept of 3 . Write the equation in slope-intercept form.

$$y = mx + b$$

Substitute the given values for m and b .

$$y = -4x + 3$$

A line has a slope of 2 . The ordered pair $(3, 1)$ is on the line. Write the equation in slope-intercept form.

Step 1: Find the *y*-intercept.

$$y = mx + b$$

$$y = 2x + b$$

Substitute the given value for m .

$$1 = 2(3) + b$$

Substitute the given values for x and y .

$$1 = 6 + b$$

Solve for b .

$$\underline{-6} \quad \underline{-6}$$

$$-5 = b$$

Step 2: Write the equation.

$$y = mx + b$$

$$y = 2x - 5$$

Substitute the given value for m and the value you found for b .

Write the equation that describes each line in slope-intercept form.

1. slope = $\frac{1}{4}$, *y*-intercept = 3 _____

2. slope = -5 , *y*-intercept = 0 _____

3. slope = 7 , *y*-intercept = -2 _____

4. slope is 3 , $(4, 6)$ is on the line. _____

5. slope is $\frac{1}{2}$, $(-2, 8)$ is on the line. _____

6. slope is -1 , $(5, -2)$ is on the line. _____

LESSON

Reteach

5-6 Slope-Intercept Form (continued)

You can use the slope and y-intercept to graph a line.

Write $2x + 6y = 12$ in slope-intercept form. Then graph the line.

Step 1: Solve for y .

$$2x + 6y = 12$$

$$\frac{-2x}{-2x} \quad \frac{-2x}{-2x}$$

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

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

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

Subtract $2x$ from both sides.

Divide both sides by 6.

Simplify.

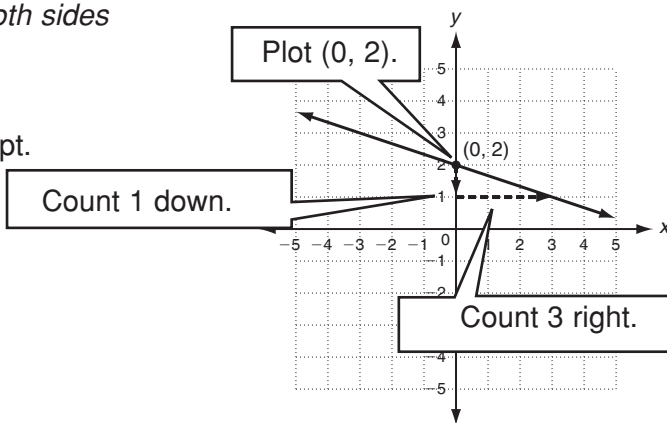
Step 2: Find the slope and y-intercept.

slope: $m = -\frac{1}{3} = \frac{-1}{3}$

y-intercept: $b = 2$

Step 3: Graph the line.

- Plot $(0, 2)$.
- Then count **1 down** (because the rise is **negative**) and **3 right** (because the run is **positive**) and plot another point.
- Draw a line connecting the points.



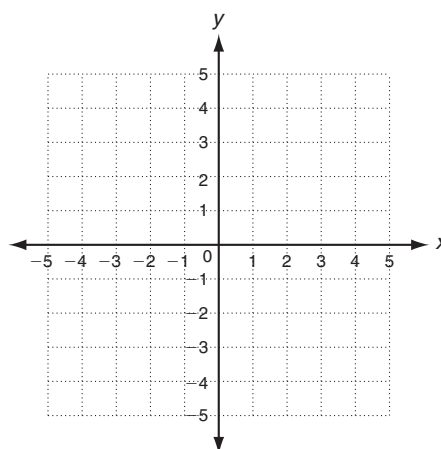
Write the following equations in slope-intercept form.

7. $5x + y = 30$

8. $x - y = 7$

9. $-4x + 3y = 12$

10. Write $2x - y = 3$ in slope-intercept form. Then graph the line.



LESSON 5-6 Practice A
Slope-Intercept Form

Write the equation that describes each line in slope-intercept form.

1. slope = $\frac{2}{3}$; y-intercept = 2

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

2. slope = -1; y-intercept = -8

$$y = -1x - 8$$

3. slope = -2, (3, 5) is on the line.

Find the y-intercept: $y = mx + b$

$$5 = (-2)(3) + b$$

$$5 = -6 + b$$

$$+ 6 \quad + 6$$

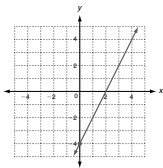
$$11 = b$$

Write the equation: $y = -2x + 11$

Write each equation in slope-intercept form. Then graph the line.

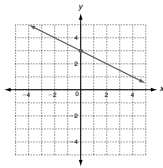
4. $y - 2x = -4$

$$y = 2x - 4$$



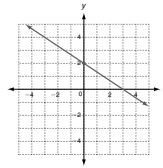
5. $y - 3 = -\frac{1}{2}x$

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



6. $2x + 3y = 6$

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



7. A school orders 25 desks for each classroom, plus 30 spare desks. The total number ordered as a function of the number of classrooms is shown in the graph.

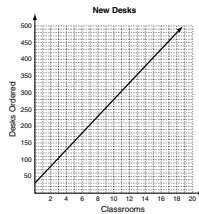
a. Write the equation represented by the graph.

$$y = 25x + 30$$

b. Identify the slope and y-intercept and describe their meanings. slope: 25; number of desks per classroom; y-int: 30; number of spare desks

c. Find the total number of desks ordered if there are 24 classrooms.

630



LESSON 5-6 Practice B
Slope-Intercept Form

Write the equation that describes each line in slope-intercept form.

1. slope = 4; y-intercept = -3

$$y = 4x - 3$$

2. slope = -2; y-intercept = 0

$$y = -2x$$

3. slope = $-\frac{1}{3}$; y-intercept = 6

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

4. slope = $\frac{2}{5}$; (10, 3) is on the line.

Find the y-intercept: $y = mx + b$

$$3 = (\frac{2}{5})(10) + b$$

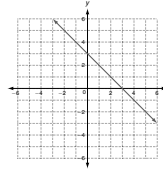
$$\frac{3}{-1} = \frac{4}{-1} + b$$

Write the equation: $y = \frac{2}{5}x - 1$

Write each equation in slope-intercept form. Then graph the line described by the equation.

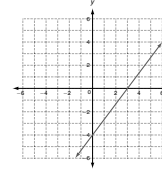
5. $y + x = 3$

$$y = -x + 3$$



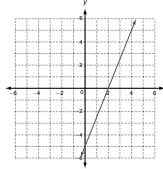
6. $y + 4 = \frac{4}{3}x$

$$y = \frac{4}{3}x - 4$$



7. $5x - 2y = 10$

$$y = \frac{5}{2}x - 5$$



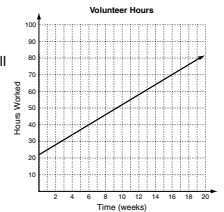
8. Daniel works as a volunteer in a homeless shelter. So far, he has worked 22 hours, and he plans to continue working 3 hours per week. His hours worked as a function of time is shown in the graph.

a. Write an equation that represents the hours Daniel will work as a function of time. $y = 3x + 22$

b. Identify the slope and y-intercept and describe their meanings. slope: 3; number of hours per week; y-int: 22; hours already worked

c. Find the number of hours worked after 16 weeks.

70 hours



LESSON 5-6 Practice C
Slope-Intercept Form

Write the equation that describes each line in slope-intercept form.

1. slope = $-\frac{3}{2}$; y-intercept = 1

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

2. slope = -3, (-3, 4) is on the line.

$$y = -3x - 5$$

3. slope = 0; y-intercept = -8

$$y = -8$$

4. slope = $-\frac{4}{7}$; (7, -8) is on the line.

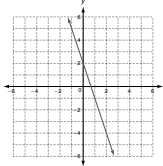
$$y = -\frac{4}{7}x - 4$$

5. The line that passes through (1, 5) and (4, -4). (Hint: Find the slope first.) $y = -3x + 8$

Write each equation in slope-intercept form. Then graph the line described by the equation.

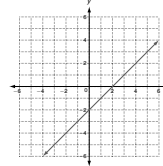
6. $y - 2 = -3x$

$$y = -3x + 2$$



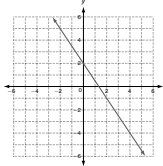
7. $x - y = 2$

$$y = x - 2$$



8. $-2y = 3x - 4$

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



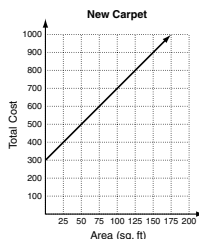
9. The Johnsons are putting new carpet in their home. Installation is \$300 and the carpeting costs \$4 per square foot. The total price of the job as a function of area is shown in the graph.

a. Write an equation that represents the total price as a function of area. $y = 4x + 300$

b. Identify the slope and y-intercept and describe their meanings. slope: 4; cost per square foot; y-int: 300; cost of installation

c. Find the total cost if the area is 375 square feet.

\$1800



LESSON 5-6 Reteach
Slope-Intercept Form

An equation is in slope-intercept form if it is written as:

$$y = mx + b.$$

m is the slope.
 b is the y-intercept.

A line has a slope of -4 and a y-intercept of 3. Write the equation in slope-intercept form.

$$y = mx + b$$

Substitute the given values for m and b .

$$y = -4x + 3$$

A line has a slope of 2. The ordered pair (3, 1) is on the line. Write the equation in slope-intercept form.

Step 1: Find the y-intercept.

$$y = mx + b$$

$$y = 2x + b$$

Substitute the given value for m .

$$1 = 2(3) + b$$

Substitute the given values for x and y .

$$1 = 6 + b$$

Solve for b .

$$-6 \quad -6$$

$$-5 = b$$

Step 2: Write the equation.

$$y = mx + b$$

$$y = 2x - 5$$

Substitute the given value for m and the value you found for b .

Write the equation that describes each line in slope-intercept form.

1. slope = $\frac{1}{4}$; y-intercept = 3

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

2. slope = -5, y-intercept = 0

$$y = -5x$$

3. slope = 7, y-intercept = -2

$$y = 7x - 2$$

4. slope is 3, (4, 6) is on the line.

$$y = 3x - 6$$

5. slope is $\frac{1}{2}$; (-2, 8) is on the line.

$$y = \frac{1}{2}x + 9$$

6. slope is -1, (5, -2) is on the line.

$$y = -x + 3$$

LESSON **Reteach**

5-6 Slope-Intercept Form (continued)

You can use the slope and y-intercept to graph a line.

Write $2x + 6y = 12$ in slope-intercept form. Then graph the line.

Step 1: Solve for y.

$$2x + 6y = 12$$

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

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

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

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

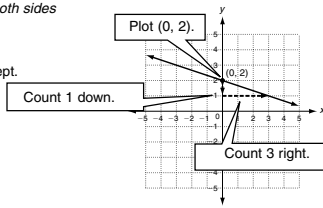
Subtract 2x from both sides.
Divide both sides by 6.
Simplify.

Step 2: Find the slope and y-intercept.

slope: $m = -\frac{1}{3} = -\frac{1}{3}$
y-intercept: $b = 2$

Step 3: Graph the line.

- Plot (0, 2).
- Then count 1 down (because the rise is negative) and 3 right (because the run is positive) and plot another point.
- Draw a line connecting the points.



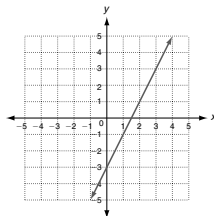
Write the following equations in slope-intercept form.

7. $5x + y = 30$ 8. $x - y = 7$ 9. $-4x + 3y = 12$

$y = -5x + 30$ $y = x - 7$ $y = \frac{4}{3}x + 4$

10. Write $2x - y = 3$ in slope-intercept form. Then graph the line.

$y = 2x - 3$



LESSON **Challenge**

5-6 Revisiting Arithmetic Sequences

In Lesson 4-6, you learned about arithmetic sequences. In this activity, you will see that arithmetic sequences and linear equations are closely related.

For 1–7, consider this arithmetic sequence: 3, 5, 7, 9, ...

- What is the first term a_1 of the sequence? $a_1 = 3$
- What is the common difference d of the sequence? $d = 2$
- Use what you learned in Lesson 4-6 to write a formula for the n th term of the sequence. $a_n = 3 + (n - 1)(2)$

4. Complete this table, where x is the term number and y is the term.

x	1	2	3	4	5	6	7
y	3	5	7	9	11	13	15

- Graph the ordered pairs from problem 4. Does it make sense to connect the points with a line? Explain.
No, because the domain of the sequence is restricted to natural numbers: {1, 2, 3, 4, ...}.

6. Write the equation that describes the line that would pass through the points in your graph. Use slope-intercept form.
 $y = 2x + 1$

7. Compare the formula in problem 3 with the equation in problem 6.

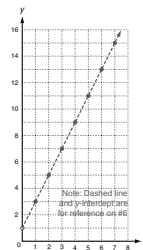
- What part of the equation relates to the common difference in the formula?
The slope is the same as the common difference ($m = d = 2$).
- What is the relationship between the first term in the formula and the y-intercept in the equation?
The y-intercept is the same as the first term less the common difference ($b = a_1 - d = 1$).

8. The n th term of an arithmetic sequence is given by the formula $a_n = 5 + (n - 1)(-3)$. If you were to graph ordered pairs where x is the term number and y is the term, what linear equation would describe the line that passes through the points?

$y = -3x + 8; m = d = -3$ and $b = a_1 - d = 5 - (-3) = 8$

9. An arithmetic sequence is graphed on a coordinate plane. The equation of the line that passes through the points is $y = 5x - 1$. What is the formula for the n th term?

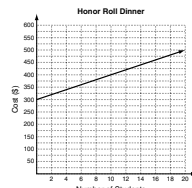
$a_n = 4 + (n - 1)(5); d = m = 5$ and $a_1 = b + d = -1 + 5 = 4$



LESSON **Problem Solving**

5-6 Slope-Intercept Form

The cost of food for an honor roll dinner is \$300 plus \$10 per student. The cost of the food as a function of the number of students is shown in the graph. Write the correct answer.



1. Write an equation that represents the cost as a function of the number of students.

$y = 10x + 300$

2. Identify the slope and y-intercept and describe their meanings.

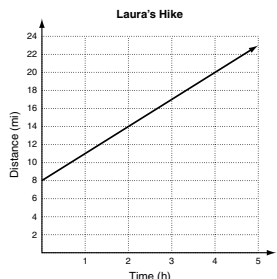
slope: 10, rate of change of the cost: \$10 per student

y-int: 300, the initial fee (the cost for 0 students)

3. Find the cost of the food for 50 students.

\$800

Laura is on a two-day hike in the Smoky Mountains. She hiked 8 miles on the first day and is hiking at a rate of 3 mi/h on the second day. Her total distance as a function of time is shown in the graph. Select the best answer.



4. Which equation represents Laura's total distance as a function of time?

- A $y = 3x$ C $y = 3x + 8$
B $y = 8x$ D $y = 8x + 3$

5. What does the slope represent?

- F Laura's total distance after one day
G Laura's total distance after two days
H the number of miles Laura hiked per hour on the first day
J the number of miles Laura hikes per hour on the second day

6. What does the y-intercept represent?

- A Laura's total distance after one day
B Laura's total distance after two days
C the number of miles Laura hiked per hour on the first day
D the number of miles Laura hikes per hour on the second day

7. What will be Laura's total distance if she hikes for 6 hours on the second day?

- F 14 miles H 26 miles
G 18 miles J 28 miles

LESSON **Reading Strategies**

5-6 Follow a Procedure

The procedure outlined below shows how to graph a line using slope-intercept form.

Graph the line described by $2x + y = 4$.

Step 1: Rewrite in slope-intercept form.
 $2x + y = 4$
 $-2x \quad -2x$
 $y = -2x + 4$

Step 2: Identify the slope and y-intercept.
 $y = mx + b$
 $m = -2 = \frac{-2}{1}$
 $b = 4$

Step 3: Plot the point (0, b).
Down 2
Right 1

Step 4: Plot a second point using the slope.

Step 5: Draw a line through the points.

Answer the following.

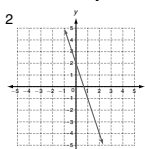
- What is the benefit of always writing slope as a fraction?
With a fraction, you have a "rise" and "run" for graphing.
- What point would you plot first if $b = -8$? $(0, -8)$

Identify the slope and y-intercept for each equation.

- $y = 5x + 12$ $m: 5$ $b: 12$
- $y = -3x$ $m: -3$ $b: 0$
- $y = x - 4$ $m: 1$ $b: -4$
- $3y = x + 9$ $m: \frac{1}{3}$ $b: 3$

Graph the line described by each equation.

7. $3x + y = 2$



8. $x - 2y = 6$

