FREQUENTLY ASKED *Questions*

Q: **How can you determine the equation of a line?**

A1: If you know the slope and *y*-intercept of the line, you can write the equation in the form $y = mx + b$, where m is the slope and b is the *y*-intercept.

EXAMPLE

To determine the equation of the line that has a slope of $\dfrac{4}{3}$ and a

y-intercept of -3, substitute the values directly into the formula.

Solution

$y = mx + b$

$m = \dfrac{4}{3}$

$b = -3$

The equation is $y = \dfrac{4}{3}x - 3$.

A2: If you know two points on the line, determine the slope and then use either point to calculate the *y*-intercept.

EXAMPLE

To determine the equation of the line that passes through points $A(-3, 17)$ and $B(4, -11)$, first determine the slope.

$$m = \frac{(-11) - 17}{4 - (-3)}$$
$$= \frac{-28}{7}$$
$$= -4$$

Next, substitute the slope into the equation.

$$y = -4x + b$$

Then, use this equation and substitute the coordinates of the point $(-3, 17)$ for *x* and *y*.

$$17 = -4(-3) + b$$
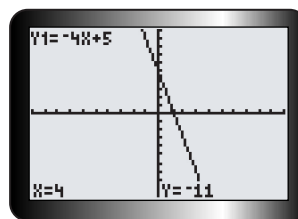
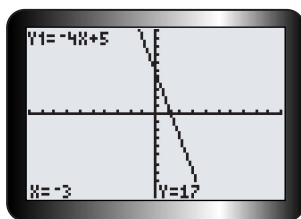Then, solve for b.

$$17 = 12 + b$$
$$b = 5$$

Substitute the values for m and b to create the equation.

The equation is $y = -4x + 5$.

To verify your work, use a graphing calculator.

Q: **How can you tell if two linear equations represent lines that are parallel or perpendicular without graphing them?**

A1: Two lines are parallel if they have the same slope.

EXAMPLE

Determine the slope of $3x + 2y + 24 = 0$.

Solution

$$3x + 2y + 24 = 0$$
$$3x - 3x + 2y + 24 - 24 = -3x - 24$$
$$2y = -3x - 24$$
$$\frac{2y}{2} = \frac{-3x - 24}{2}$$
$$y = \frac{-3x}{2} - \frac{24}{2}$$
$$y = -\frac{3}{2}x - 12$$
$$\text{Slope} = -\frac{3}{2}$$

Determine the slope of

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

$$\text{Slope} = -\frac{3}{2}$$

The lines $3x + 2y + 24 = 0$ and $y = -\frac{3}{2}x + 2$ are parallel because their slopes are equal.

A2: Two lines are perpendicular if the product of their slopes equals -1.

EXAMPLE

Given the lines $y = 2.5x - 3.2$ and $y = -0.4x + 8.1$.

$$m_{\text{line 1}} = 2.5 \qquad m_{\text{line 2}} = -0.4$$

These lines are perpendicular because $m_{\text{line 1}} \times m_{\text{line 2}} = 2.5 \times -0.4$
$$= -1$$

PRACTICE Questions

1. Identify the slope and y-intercept for each line.
   a) $y = 3x + 4$
   c) $y = -1.11 + 9.7x$
   b) $y = -\dfrac{2}{5}x - 6.8$
   d) $y = 3$

2. Order each set of lines from closest to horizontal to closest to vertical.

   a) $y = 2x - 4$

   $y = x + 8$

   $y = \dfrac{1}{3}x - 2$

   b) $y = -\dfrac{1}{3}x + 5$

   $y = -8x - 2$

   $y = -\dfrac{5}{2}x + 3$

3. Copy and complete the table to identify whether the lines will rise or fall to the right.

	Equation	Rises to the Right	Falls to the Right
a)	$y = 4x + 5$		
b)	$y = -\dfrac{2}{3}x - 8$		
c)	$y = -2.8x + 4$		
d)	$y = \dfrac{21}{8}x$		
e)	$y = 1.5x + 4.5$		

4. Determine the slope and y-intercept for each of these lines.
   a) $3x - 4y + 9 = 0$
   c) $2x + 6y = 32$
   b) $5x - y = 12$
   d) $8x + 2y - 4 = 0$

5. Evan and his sister Sarah shovel driveways during the winter. They charge $10 for a double driveway and $5 for a single driveway. This past winter, Evan earned $255 and Sarah earned $230.
   a) Write equations for both Evan and Sarah to represent the relationship between the amounts earned shovelling single and double driveways.
   b) Isolate the variable used for single driveways in both equations.
   c) If they both shovelled 10 double driveways, how many single driveways did each shovel?

6. Calculate the slopes of the line segments shown below.
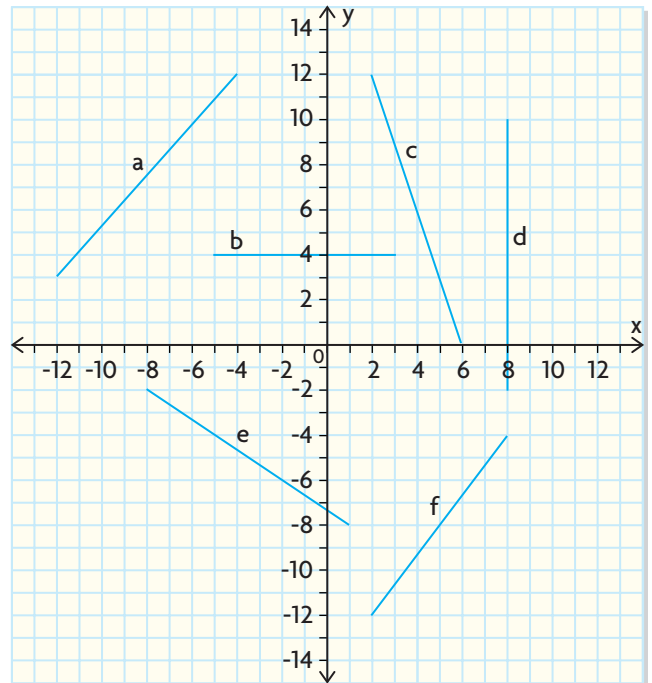
7. Calculate the slopes of the lines that pass through each of the following pairs of points.
   a) A(8, 2) and B(1, 9)
   b) E(−1, 5) and F(3, 2)
   c) C(−1, 2) and D(3, −8)
   d) G(−3, 2) and H(−9, −11)

8. The points $(-6, -3)$, $(k, 1)$, and $(8, 4)$ are collinear. Determine the value of k.

9. Three hours after beginning her long-distance bicycle trip, Cathy was 98 km from home. After seven hours, she was 182 km from home. Assuming she maintained the same speed throughout the trip, how fast was she cycling?

Lesson 5.4

10. Determine the equation of each line.
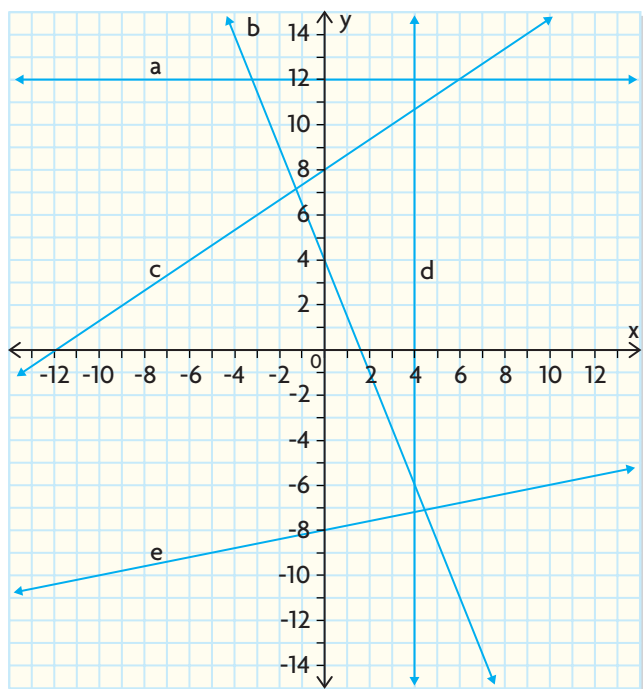
11. Determine the equations of the lines described below.
  a) passing through the point M(6, 9) with slope $= -\dfrac{3}{4}$
  b) passing through the points P(3, −11) and Q(0, 5)
  c) passing through the points D(2, 9) and E(1, 13)
  d) passing through the points A(5, 2) and B(5,−3)
  e) passing through the points X(8, 5) and Y(2, 3)

12. Determine whether the points A(2, −6) and B(−3, 10) lie on the line $y = -4x + 2$.

Lesson 5.5

13. For each pair of linear equations, determine if the lines are parallel, perpendicular, or neither. Justify your answers.
  a) $y = 3x - 5$
     $y = -3x - 5$
  b) $y = 0.25x - 2$
     $y = \dfrac{1}{4}x - 9$
  c) $y = \dfrac{1}{2}x + 4$
     $y = -2x - 8$
  d) $\quad 2x - 4y = 9$
     $x + 2y + 7 = 0$
  e) $y = 0.625x - 2$
     $y = -1.6x - 9$
  f) $3x - 5y - 10 = 0$
     $5x + 3y + 2 = 0$

14. Determine the equation for each line.
  a) passing through the point W(2, 9) and parallel to $y = \dfrac{7}{2}x + 3$
  b) passing through the point V(1, 6) and perpendicular to $y = -\dfrac{1}{4}x + 11$
  c) passing through the y-intercept of the line defined by $2x + 3y - 18 = 0$ and perpendicular to $4x - 9y = 27$

15. a) Do you think that the diagonals of a square are perpendicular to each other?
  b) Test your conjecture by plotting 4 points on grid paper that form a square. Draw the sides and diagonals of the square.
  c) Calculate the slopes of the diagonals. Does this support your conjecture? Explain.
  d) Repeat parts b) and c) using 4 different points. Is your result the same?