WRITING THE EQUATION OF A LINE GIVEN TWO POINTS
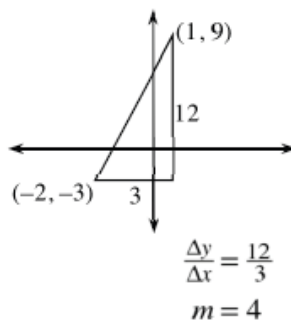
Example 1

Write the equation of the line that passes through the points $(1, 9)$ and $(-2, -3)$.

Position the two points approximately where they belong on coordinate axes—you do not need to be precise. Draw a generic slope triangle.

Calculate slope $= \frac{\Delta y}{\Delta x} = \frac{12}{3} = 4$ using the given values of the two points.

Write the general equation of a line. Substitute m and either one of the points into the equation. For example, use $(x, y) = (1, 9)$ and $m = 4$.

$$y = mx + b$$
$$9 = 4(1) + b$$

$$\frac{\Delta y}{\Delta x} = \frac{12}{3}$$
$$m = 4$$

Solve for b.   Write the complete equation.

$$5 = b \qquad\qquad y = 4x + 5$$

Example 2

Write the equation of the line that passes through the points $(8, 3)$ and $(4, 6)$.

Draw a generic slope triangle located approximately on coordinate axes. Approximate the locations of the given points.

Calculate $m = \frac{\Delta y}{\Delta x} = -\frac{3}{4}$. The slope is negative since the line goes down left to right.

Substitute m and either one of the points, for example $(8, 3)$, into the general equation for a line.
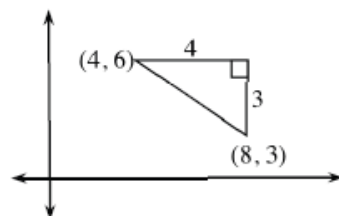
$$y = mx + b$$
$$3 = -\frac{3}{4}(8) + b$$

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

Solve for b.   Write the complete equation.

$$9 = b \qquad\qquad y = -\frac{3}{4}x + 9$$

Problems

Write the equation of the line containing each pair of points.

1. $(1, 1)$ and $(0, 4)$ 2. $(5, 4)$ and $(1, 1)$ 3. $(1, 3)$ and $(-5, -15)$

4. $(-2, 3)$ and $(3, 5)$ 5. $(2, -1)$ and $(3, -3)$ 6. $(4, 5)$ and $(-2, -4)$

7. $(1, -4)$ and $(-2, 5)$ 8. $(-3, -2)$ and $(5, -2)$ 9. $(-4, 1)$ and $(5, -2)$

Answers

1. $y = -3x + 4$ 2. $y = \frac{3}{4}x + \frac{1}{4}$ 3. $y = 3x$

4. $y = \frac{2}{5}x + 3\frac{4}{5}$ 5. $y = -2x + 3$ 6. $y = \frac{3}{2}x - 1$

7. $y = -3x - 1$ 8. $y = -2$ 9. $y = -\frac{1}{3}x - \frac{1}{3}$