

WRITING THE EQUATION OF A LINE GIVEN TWO POINTS

2.3.2

Students now have all the tools they need to find the equation of a line passing through two given points. Recall that the equation of a line requires a slope and a y-intercept in $y = mx + b$. Students can write the equation of a line from two points by creating a slope triangle and calculating $\frac{\Delta y}{\Delta x}$ as explained in Lessons 2.1.2 through 2.1.4.

For additional information, see the Math Notes box in Lesson 3.3.2. For additional examples and more practice, see the Checkpoint 5B materials.

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.

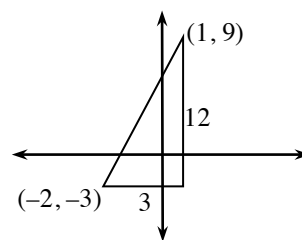
Write the general equation of a line. Substitute m and either one of the points into the equation. For example, use $(x, y) = (1, 9)$ and $m = 4$.

$$y = mx + b$$

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

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

$$m = 4$$



Solve for b .

$$5 = b$$

Write the complete equation.

$$y = 4x + 5$$

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.

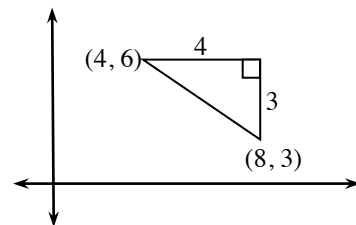
Substitute m and either one of the points, for example $(8, 3)$, into the general equation for a line.

$$y = mx + b$$

$$3 = -\frac{3}{4}(8) + b$$

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

$$m = -\frac{3}{4}$$



Solve for b .

$$9 = b$$

Write the complete equation.

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

Problems

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

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|------------------------|-------------------------|-------------------------|
| 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

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