

## Writing Equations of Lines

All we need are:

- slope
- y-intercept

If we are given two points, ( 5, 1 ) and ( 8, 10 )

1. Find the slope between the points:

$$+3 \left\langle \begin{matrix} 5, 1 \\ 8, 10 \end{matrix} \right\rangle +9 \quad \frac{\Delta y}{\Delta x} = \frac{9}{3} = 3 \quad \text{OR} \quad \frac{\Delta y}{\Delta x} = \frac{10-1}{8-5} = \frac{9}{3} = 3$$

$$\frac{\Delta y}{\Delta x} = \frac{3}{1} = 3$$

2. Substitute the slope into the Slope-Intercept equation:

$$y = \underline{3}x + b$$

3. We now need to find the value of "b". We know how to solve for a variable, but what makes this difficult is that we have 3 variables at the moment.

Fortunately we have 2 solutions for this equation and they are the two points on the line! Let's substitute in a point (x, y) and then solve for "b".

Let's try both!

Substitute ( 5, 1 ) in for x and y:

$$\begin{aligned} ( 1 ) &= 3( 5 ) + b \\ 1 &= 15 + b \\ -15 &\quad -15 \\ \hline -14 &= b \end{aligned}$$

Substitute ( 8, 10 ) in for x and y:

$$\begin{aligned} ( 10 ) &= 3( 8 ) + b \\ 10 &= 24 + b \\ -24 &\quad -24 \\ \hline -14 &= b \end{aligned}$$

$$b = -14$$

It doesn't matter which point you use!

4. Use your slope and y-intercept to write the equation.

$$y = 3x - 14$$