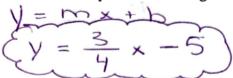# Writing a Linear Equation Given 2 Points

Aim: How can we write a linear equation when given information about the line?

Recall: Write an equation for the given slope and y-intercept: $m = \dfrac{3}{4}$ $b = (0, -5)$

$$y = mx + b$$

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

Steps for Writing the Equation of a Line:

1. Check if the slope if given. If it's not, compute the average rate of change (slope) using the slope formula and 2 coordinates
2. Identify the y-intercept
   a. If the y-intercept is not given, plug the coordinate into the equation and solve for "b"
3. Write the equation using the slope-intercept form (y = mx + b)

Example 1: Write the equation of a line that goes through $\overset{x\ \ y}{(2, 10)}$ and has a slope of $\boxed{\dfrac{1}{2}}$. $\rightarrow m$

$m = \dfrac{1}{2}$

$b = \boxed{(0, 9)}$

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

$$y = mx + b$$

$$10 = \frac{1}{2}(2) + b$$

$$10 = 1 + b$$

$$\underline{-1 \quad -1}$$

$$9 = b$$

Example 2: Write the equation of a line that goes through $(2, 2)$ and has a slope of $\boxed{-5}$. $\rightarrow m$

$m = -5$

$b = \boxed{(0, 12)}$

$$y = -5x + 12$$

$$y = mx + b$$

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

$$2 = -10 + b$$

$$\underline{+10 \quad +10}$$

$$12 = b$$

Example 3: Write the equation of a line that passes through the points $\overset{x_1\ y_1}{(5, 9)}$ and $\overset{x_2\ y_2}{(-1, 3)}$.

$m = \boxed{1}$

$b = \boxed{(0, 4)}$

$$y = x + 4$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 9}{-1 - 5} = \frac{-6}{-6} = 1$$

$$y = mx + b$$

$$9 = 1(5) + b$$

$$9 = 5 + b$$

$$\underline{-5 \quad -5}$$

$$4 = b$$

*can use either coord. for x and y *

Example 4: Write the linear equation for each table below.

	X₁	X₂			
x	?	3	4	5	6
y	−11	−14	−17	−20	−23

$m = \boxed{-3}$

$b = \boxed{(0, -5)}$

$\boxed{y = -3x - 5}$

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$

$\dfrac{-14 - (-11)}{3 - 2} = \dfrac{-3}{1}$

★ pick any 2 points for slope & (x, y)

$y = mx + b$

$-11 = -3(2) + b$

$\begin{array}{r} -11 = -6 + b \\ +6 \quad\ +6 \\ \hline -5 = b \end{array}$

Example 5: Write the equation of a line that passes through the points (0, 13) and (4, 5).

$m = \boxed{-2}$

$b = (0, 13)$

$\boxed{y = -2x + 13}$

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$

intercept!

$\dfrac{5 - 13}{4 - 0} = \dfrac{-8}{4} = \dfrac{-2}{1}$

Example 6: Write the linear equation for each table below.

	X₁	X₂			
x	1	2	3	4	5
y	1	3	5	7	9

$m = \boxed{2}$

$b = \boxed{(0, -1)}$

$\boxed{y = 2x - 1}$

$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{3 - 1}{2 - 1} = \dfrac{2}{1}$

$y = mx + b$

$1 = 2(1) + b$

$\begin{array}{r} 1 = 2 + b \\ -2 \ -2 \\ \hline -1 = b \end{array}$

On your own!