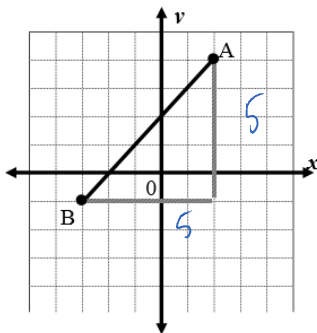# Review: Linear Relations

Finding Slope

Slope is the measure of steepness of a line. It is also referred to as rate of change.

USING A GRAPH

Slope is the comparison of vertical and horizontal lengths of the line.

The vertical length is known as **rise**.
The horizontal length is known as **run**.

The slope can be calculated with:

$$m = \frac{rise}{run}$$

$$m = \frac{5}{5}$$

$$m = 1$$

Note:
- If the line points **up** from left to right, the slope is **positive**.
- If the line points **down** from left to right, the slope is **negative**.

USING COORDINATES

$$m = \frac{\text{difference in } y\text{ - coordinates}}{\text{difference in } x\text{ - coordinates}}$$

$$m = \frac{\Delta y}{\Delta x}$$

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

Calculate the slope of the line between the points A(2, 4) and B(-3, -1).
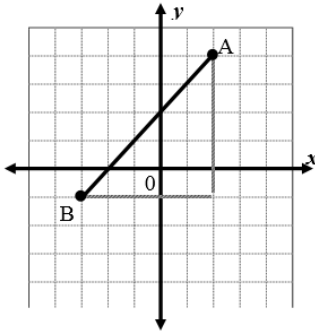
$$m = \frac{-1 - 4}{-3 - 2}$$

$$m = \frac{-5}{-5}$$

$$m = 1$$

Mr. Slope Guy

Finding the Y-Intercept

USING A GRAPH

The y-intercept is the point where the line crosses the y-axis.

Look at the y-axis and determine where the line crosses.

The point at the y-intercept is ___$(0,2)$___

The y-intercept is ___2___.

USING AN EQUATION

1. Put the equation in the form $y = mx + b$.
2. b is the y-intercept.

Calculate the y-intercept of $x - 2y + 8 = 0$

$$\frac{1x+8}{2} = \frac{2y}{2}$$

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

$$\therefore y\text{-int} = 4$$

USING 2 POINTS

1. Find slope.
2. Use $y = mx + b$ to solve for b.

Find the y-intercept of the line between (6, 3) and (4, 13).

$$m = \frac{13-3}{4-6}$$
$$= \frac{10}{-2}$$
$$= -5$$

$$y = mx + b$$
$$13 = (-5)(4) + b$$
$$13 = -20 + b$$
$$33 = b \quad \therefore y\text{-int} = 33$$

Finding the Equation of a Line

To determine the equation of a line the slope (rate of change) and (y-intercept) are required.
1. Find the slope (m) and y-intercept (b) using the methods outlined above.
2. Substitute the values of m and b into the generalization $y = mx + b$.
3. Rearrange the equation so it is in standard form ($ax + by + c = 0$).
   (a standard form equation must not have fractions and the x-value should be positive)

State the equation of a line if slope is $-1/3$ and the y-intercept is 6.

$$y = \frac{-1}{3}x + 6$$
$$\times 3 \quad \times 3 \quad \times 3$$

$$3y = -1x + 18$$

$$\boxed{1x + 3y - 18 = 0}$$

Graphing Lines Using Slope and y-Intercept

1. Find the y-intercept (b).and plot it in the y-axis.
2. Find the slope (m) and plot it using $^{rise}/_{run}$.
   (rise up or down and always run right)
3. Connect the points with a straight line

$$y = -{}^{3}/_{2}x + 5$$

start at y-int = 5

$$m = \frac{-3}{2} \text{ down right} \quad OR \quad m = \frac{3}{-2} \text{ up left.}$$