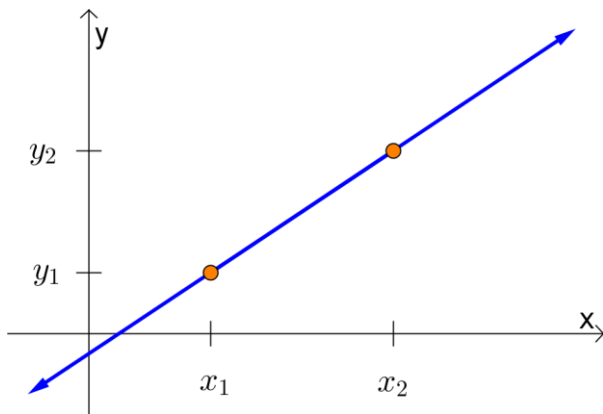


## The Slope of a Line

\_\_\_\_\_ is a measure of the \_\_\_\_\_ of a line.



The calculation to find the slope of a line is:

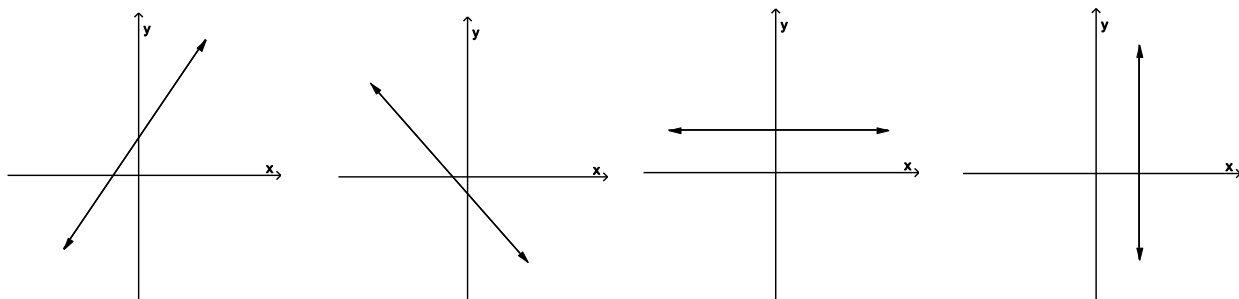
$m =$

(where  $(x_1, y_1)$  and  $(x_2, y_2)$  are two points on the line, and  $m$  represents slope).

**Ex 1.**

Find the slope of the line passing through  $(-3, 4)$  and  $(-4, -2)$ .

**Ex 2.**



The slope of the line  $y = 2x + 1$  is 2. Why? Try plugging in  $x = 0$  and then  $x = 1$ .

$$x = 0: y = 2(0) + 1 = 0 + 1 = 1$$

$$x = 1: y = 2(1) + 1 = 2 + 1 = 3$$

So, when  $x$  increases by 1 (run),  $y$  increases by 2 (rise). Thus, the slope is  $\frac{2}{1} = 2$ .

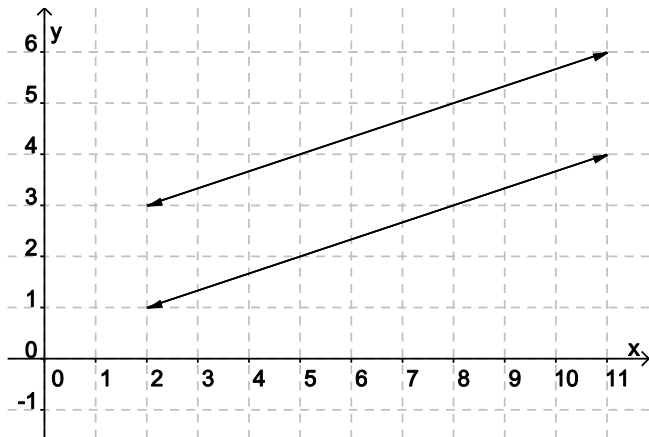
In general,  $y = mx + b$  is called \_\_\_\_\_ of a linear equation.

Note that  $m$  gives the slope, and  $b$  gives the  $y$ -intercept.

**Ex 3.**

Find the slope of the line:  $3x + 5y = -1$

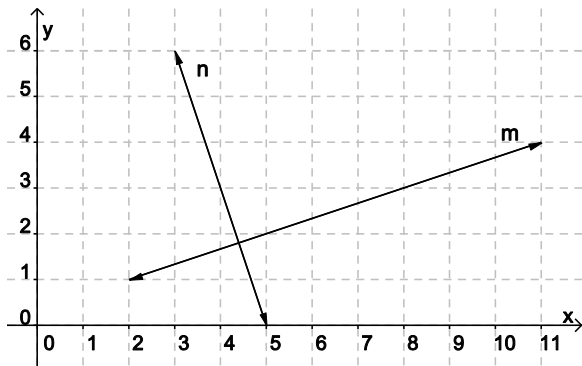
Nonintersecting lines that lie in the same plane are called \_\_\_\_\_.



What can you say about the slopes of parallel lines?

If two lines have the same slope, are they guaranteed to be parallel?

Lines that intersect at a right angle ( $90^\circ$ ) are called \_\_\_\_\_.



What is the slope of line  $m$ ?

What is the slope of line  $n$ ?

What happens when you multiply the slopes?

In general, product of slopes of two nonvertical perpendicular lines is \_\_\_\_\_.

In other words, slopes of two nonvertical perpendicular lines are \_\_\_\_\_.

For example, if a line has slope  $\frac{2}{5}$ , then any perpendicular line will have slope \_\_\_\_\_.

**Ex 4.**

Determine whether each pair of lines is parallel, perpendicular, or neither.

$$4x - y = 4$$

$$8x - 2y = -12$$

$$3x - y = 4$$

$$x + 3y = 9$$

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

$$y = 3x - 2$$

**Summary**

**Slope:**  $m = \frac{y_2 - y_1}{x_2 - x_1}$  (also, **horizontal**  $\leftrightarrow$  slope **0**; and **vertical**  $\leftrightarrow$  **undefined** slope)

**Slope-intercept form:**  $y = mx + b$

**parallel**  $\leftrightarrow$  **same slope** (also, two vertical lines are parallel)

**perpendicular**  $\leftrightarrow$  **slopes are negative reciprocals** (also, vertical & horizontal lines are perpendicular)

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**Practice**

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1. Find the slope of the line passing through  $(-3, -2)$  and  $(2, 5)$ .
2. Find the slope of the line passing through  $(-6, -3)$  and  $(4, -3)$ .
3. Find the slope of the line passing through  $(3, 1)$  and  $(3, -5)$ .
4. Find the slope of the line:  $5x + 2y = 7$
5. Determine whether the following pair of lines is parallel, perpendicular, or neither.  
 $3x - 5y = -1$   
 $5x + 3y = 2$
6. Determine whether the following pair of lines is parallel, perpendicular, or neither.  
 $y = -5x + 2$   
 $y = -5x - 3$

Q: The following number is the only one of its kind. 8,549,176,320 Can you figure out what is so special about it?