



# Examples

## The Slope of a Line

Based on power point presentations by Pearson Education, Inc.  
Revised by Ingrid Stewart, Ph.D.

# Learning Objectives

1. Define and find the slope of a line.
2. Define the slope-intercept form of a linear equations in two variables.
3. Graph linear equations in slope-intercept form by hand in the rectangular coordinate system using the *Point-by-Point Plotting Method* and the *Intercept Method*.

## Example 1: Calculate the Slope of a Line

Find the slope of the line passing through the points determined by the ordered pairs  $(-1, 3)$  and  $(-4, -6)$ .

We will let  $(-1, 3)$  equal  $(x_1, y_1)$  and  $(-4, -6)$  equal  $(x_2, y_2)$ . However, you can also let  $(-4, -6)$  equal  $(x_1, y_1)$  and  $(-1, 3)$  equal  $(x_2, y_2)$ . In either case, you will get the same answer.

Let's say that  $(-4, -6)$  equals  $(x_1, y_1)$  and  $(-1, 3)$  equals  $(x_2, y_2)$ . Be sure not to get confused!

$$\text{Then } m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - (-6)}{-1 - (-4)} = \frac{3 + 6}{-1 + 4} = \frac{9}{3} = 3$$

## Example 2: Calculate the Slope of a Line

Find the slope of the line passing through the points determined by the ordered pairs (6, 3) and (6, 4).

Let's say that (6, 3) is  $(x_1, y_1)$  and (6, 4) is  $(x_2, y_2)$ . Be sure not to get confused!

$$\text{Then } m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 3}{6 - 6} = \frac{1}{0}$$

Since there is a 0 in the denominator, this particular slope is undefined.

## Example 3: Calculate the Slope of a Line

Find the slope of the line passing through the points determined by the ordered pairs (1, 5) and (-9, 5).

Let's say that (1, 5) is  $(x_1, y_1)$  and (-9, 5) is  $(x_2, y_2)$ . Be sure not to get confused! Then

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 5}{-9 - 1} = \frac{0}{-10} = 0$$

Since there is a 0 in the numerator, this particular slope equals 0. Please note the difference between Example 3 and Example 4!

## Example 4: Graph a Linear Equation in Two Variables (1 of 4)

Graph the linear equation  $y = 2x$  by hand.

The given linear equation is in *slope-intercept form*. However, this does not matter. We will still use either the *Point-by-Point Plotting Method* or the *Intercept Method*. Since we are not told which graphing method to use, let's try to use the *Intercept Method*.

Find the ordered pair associated with the  $y$ -intercept.

Let  $x = 0$  and solve for  $y$ .

$$y = 2(0) \text{ (this is a linear equation in one variable)}$$

$$y = 0$$

The  $y$ -intercept is 0, so the ordered pair associated with it is  $(0, 0)$  which is the origin (the point at which the two coordinate axes intersect).

## Example 4: Graph a Linear Equation in Two Variables (2 of 4)

Find the ordered pair associated with the  $x$ -intercept.

Let  $y = 0$  and solve for  $x$

$0 = 2x$  (this is a linear equation in one variable)

$x = 0$  (dividing both sides by 2!)

The  $x$ -intercept is 0, so the ordered pair associated with it is  $(0, 0)$ , but we already found this.

It should be obvious that we need at least two distinct points to graph a straight line. We note that the *Intercept Method* in the given equation did not produce two distinct ordered pairs.

## Example 4: Graph a Linear Equation in Two Variables (3 of 4)

When the *Intercept Method* only produces one ordered pair, we use the *Point-by-Point Plotting Method* to find one or more other ordered pairs.

We want to pick values for  $x$  that are far enough away from 0 to create an accurate graph. How about we let  $x$  equal  $-4$  and  $4$ ?

Then, given the equation  $y = 2x$ , we get the following linear equations in one variable:

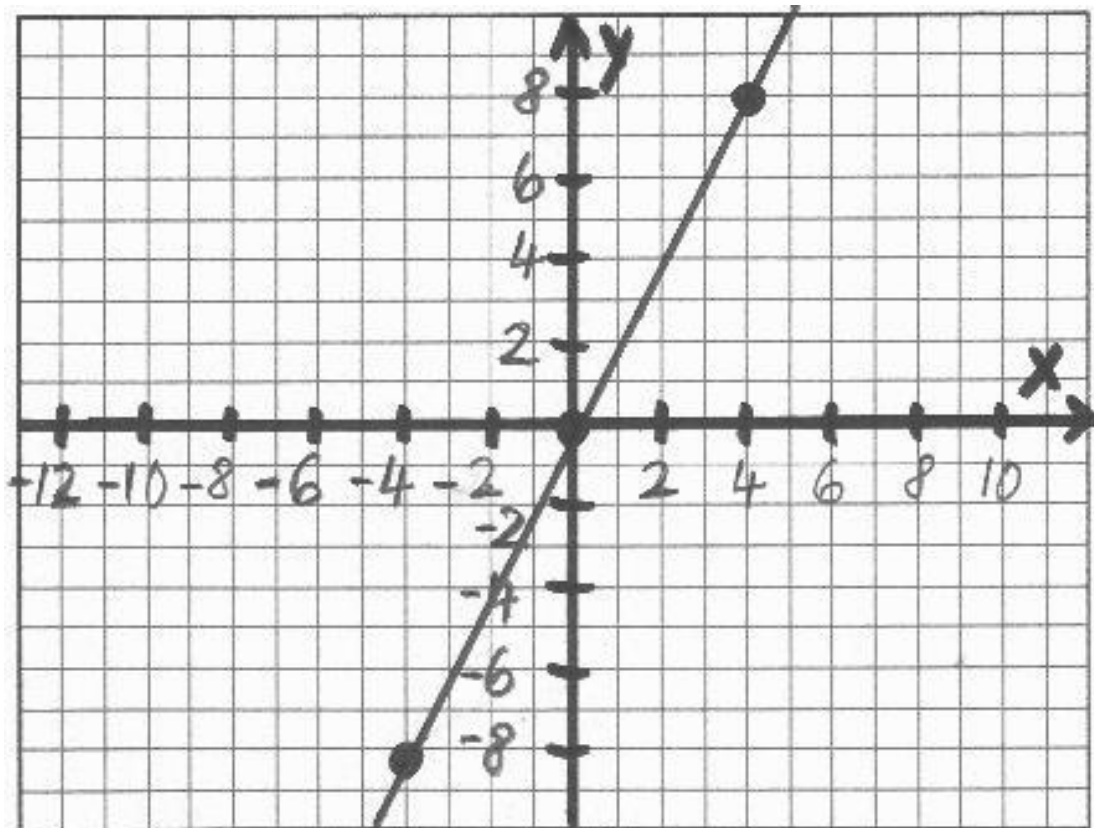
$$y = 2(-4) \text{ and } y = -8$$

$$y = 2(4) \text{ and } y = 8$$

Therefore, the coordinates of the additional ordered pairs are  $(-4, -8)$  and  $(4, 8)$ .

## Example 4: Graph a Linear Equation in Two Variables (4 of 4)

Graph the linear equation by drawing a line through the points created by the ordered pairs found in the previous steps.



Reminder:

We found the ordered pairs  $(-4, -8)$  and  $(4, 8)$ .