Examples
The Slope of a Line

Based on power point presentations by Pearson Education, Inc.
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Learning Objectives

1. Define and find the slope of a line.
2. Define the slope-intercept form of a linear equation 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!

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!

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

$$m = \frac{y_2 - y_1}{x_2 - y_{x1}} = \frac{5-5}{-9-1} = \frac{0}{-10} = 0$$

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: Identify the Slopes of Lines

Identify the slopes of the graphs of the following linear equations. State whether the lines are increasing, decreasing, horizontal, or vertical.

1. $y = 3x + 9$

   $m = 3$, the slope is positive, therefore, the line is an increasing

2. $y = -5x - 2$

   $m = -2$, the slope is negative, therefore, the line is an decreasing

3. $y = 6$

   horizontal line, $m = 0$

4. $x = -1$

   vertical line, m is undefined

Example 5: Identify the Slope and the *y*-Intercept

Identify the slope, the *y*-intercept, and the ordered pair associated with the *y*-intercept given the linear equation $5x + 4y - 9 = 0$.

The equation is in general form. We must change it to slope-intercept form $y = mx + b$.

We will move the *x*-term and the constant to the right side of the equation into its proper position next to the equal sign as follows

$4y = -5x + 9$

Next, we divide both sides of the equation by 4 to get the following:

$$y = -\frac{5}{4}x + \frac{9}{4}$$

We find that the slope is $-\frac{5}{4}$ and the *y*-intercept is $\frac{9}{4}$.

The ordered pair associated with the *y*-intercept is $\left(0, \frac{9}{4}\right)$.

Example 6: Graph a Linear Equation in Two Variables (1 of 3)

Graph the linear equation $y = -3x - 6$ by hand.

This 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.

$y = 3(0) - 6$ (this is a linear equation in one variable)

$y = -6$

The *y*-intercept is -6, so the ordered pair associated with it is $(0, -6)$.

Example 6: Graph a Linear Equation in Two Variables (2 of 3)

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

Let $y = 0$ and solve for x

$0 = -3x - 6$ (this is a linear equation in one variable)

$3x = -6$

$x = -2$

The *x*-intercept is -2, so the ordered pair associated with it is $(-2, 0)$.

Example 7: Graph a Linear Equation in Two Variables (3 of 3)

Graph the linear equation by drawing a line through the points created by the ordered pairs associated with the *y*- and *x*-intercepts.