Graph of a Line

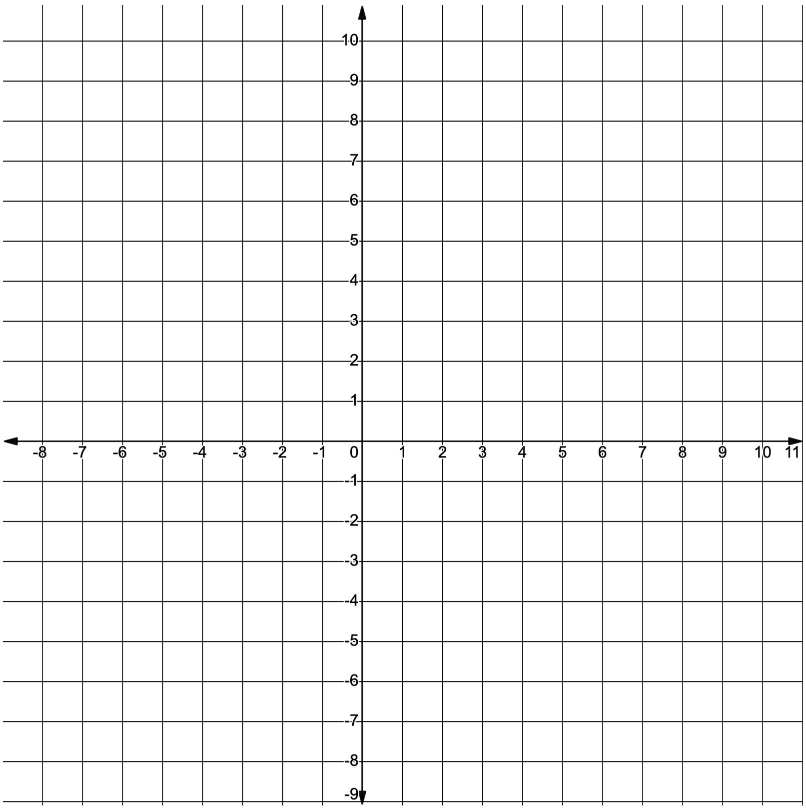
by Sophia

WHAT'S COVERED

In this lesson, you will learn how to identify coordinate points on a coordinate plane. Specifically, this lesson will cover:

1. The Coordinate Plane

Often, to get an idea of the behavior of an equation we will make a picture that represents the solutions to the equations. A graph is simply a picture of the solutions to an equation. Before we spend much time on making a visual representation of an equation, we first have to understand the basis of graphing. Following is an example of what is called the coordinate plane.



The plane is divided into four sections by a horizontal number line (x-axis) and a vertical number line (y-axis). Where the two lines meet in the center is called the origin. This center origin is where $x = 0$ and $y = 0$.

As we move to the right the numbers count up from zero, representing $x = 1, 2, 3...$ To the left, the numbers count down from zero, representing $x = -1, -2, -3, ...$ and as we move to the right count up from zero, representing $x = 1, 2, 3, ...$ Similarly, as we move up, the numbers count up from zero,$y = 1, 2, 3, ...$ and as we move down, the numbers count down from zero, $y = -1, -2, -3, ...$

We can put dots on the graph which we will call points. Each point has an “address” that defines its location. The first number will be the value on the x-axis or horizontal number line. This is the distance the point moves left/right from the origin. The second number will represent the value on the y-axis or vertical number line. This is the distance the point moves up/down from the origin. The points are given as an ordered pair (x, y).

HINT

The origin has an ordered pair of (0,0).

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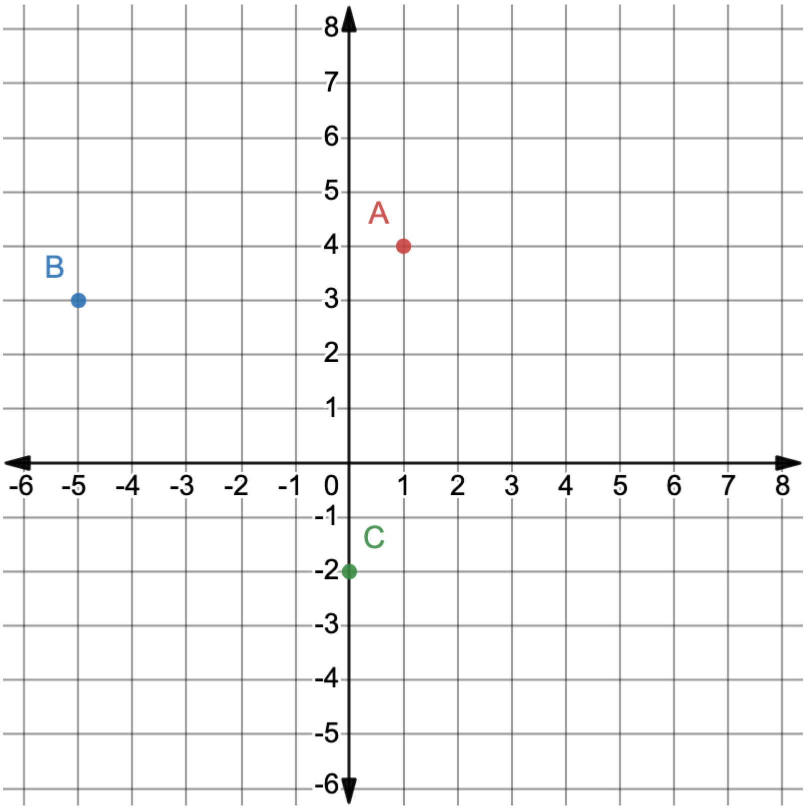
2. Plotting on a Graph

EXAMPLE Give the coordinates of each point in the following coordinate plane.



Start at the origin and find each point by:

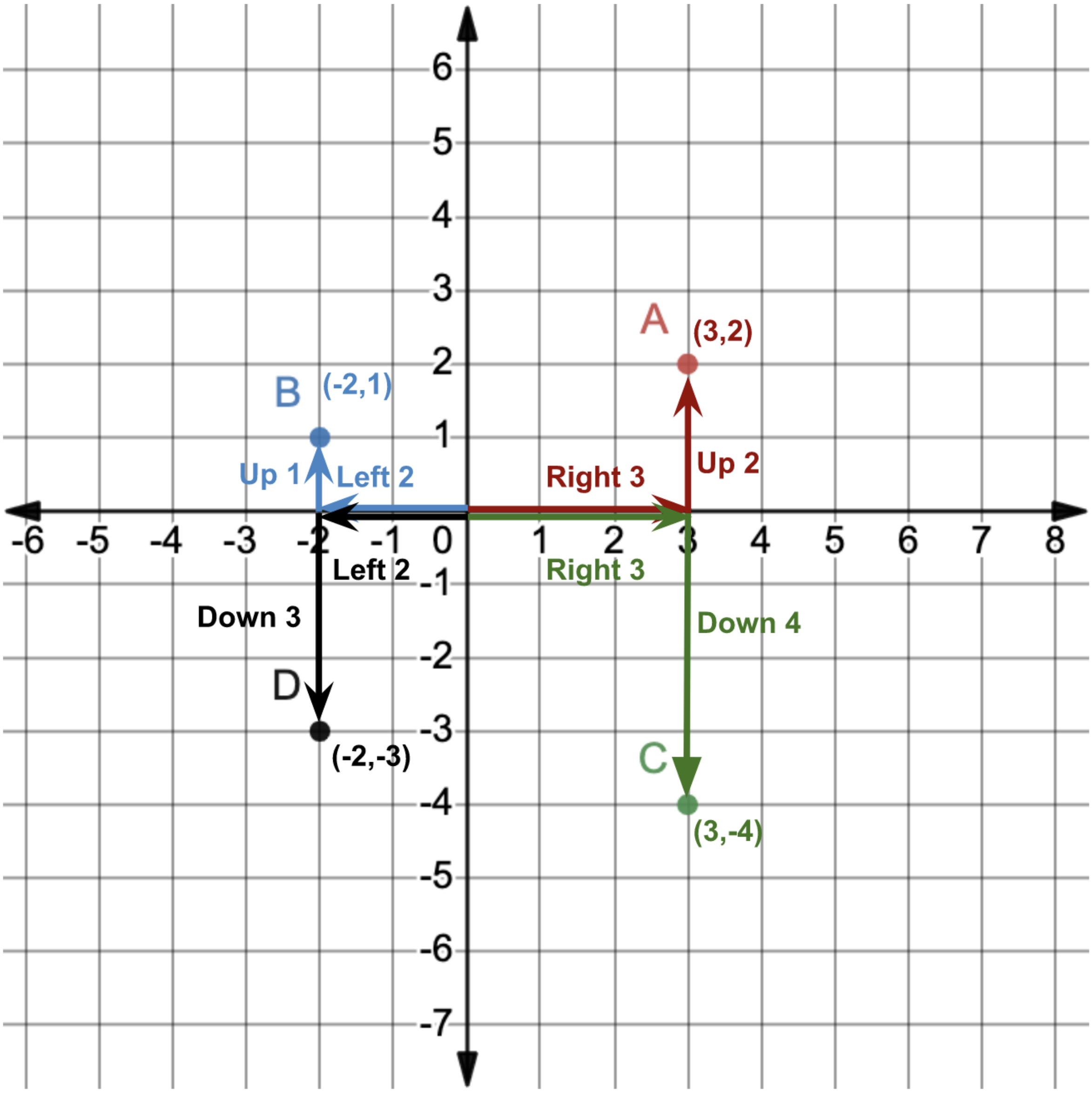
- Point A: Go to the right 1 unit and up 4 units. This becomes A (1,4).
- Point B: Go to the left 5 units and up 3 units. This becomes B (-5,3).
- Poing C: Go straight down 2 units. There is no left or right, so this means we go zero units in that direction. This becomes C (0,-2).

HINT

Going left and going down results in negative numbers.

Just as we can give the coordinates for a set of points, we can take a set of points and plot them on the plane.

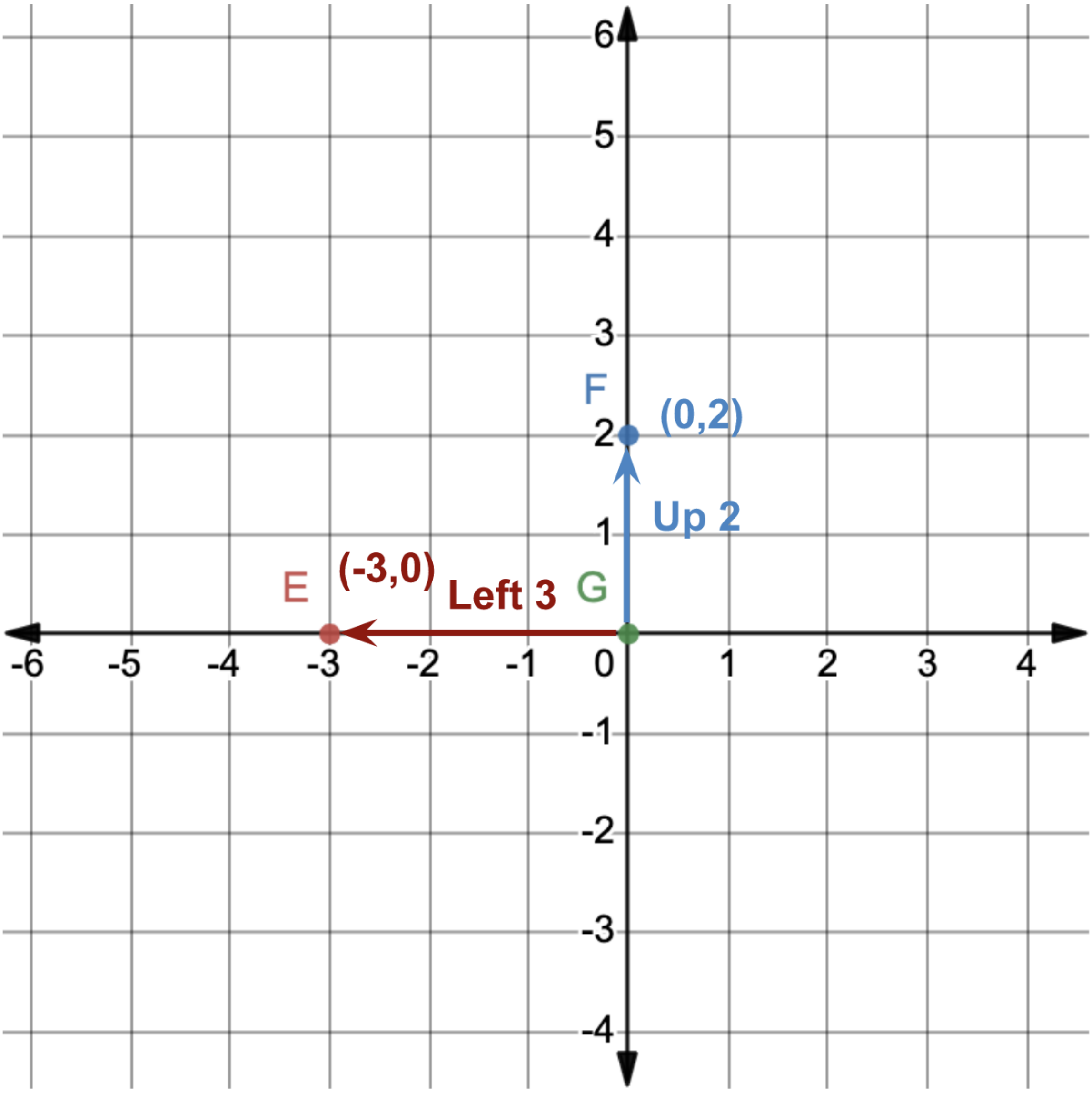
↱ EXAMPLE Graph the points A (3, 2), B (-2, 1), C (3, -4), and D (-2, -3).



- The first point, A, is at (3, 2). This means $x = 3$ (right 3) and $y = 2$ (up 2). Following these instructions, starting from the origin, we get our point.
- The second point, B, is at (-2, 1). This means we go left 2 (negative moves backwards), and up 1.
- The third point, C, is at (3, -4). This means we go right 3, down 4 (negative moves backwards).
- The fourth point, D, is at (-2, -3). This means we go left 2, down 3 (both negative, both move backwards).

↱ EXAMPLE Graph the points E (-3, 0), F (0, 2), G (0, 0).

The last three points have zeros in them. We still treat these points just like the other points. If there is a zero, there is just no movement.



- Point E is at (-3, 0). This is left 3 (negative is backwards), and up zero, right on the x-axis.
- Poing F is at (0, 2). This is right zero, and up two, right on the y-axis.
- Point G is at (0, 0). This point has no movement. Thus, the point is right on the origin.

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3. Graphing a Line from a Table

The main purpose is not to plot random points, but rather to give a picture of solutions to an equation. We may have an equation such as $y = 2x - 3$. We may be interested in what types of solutions are possible in this equation. We can visualize the solution by making a graph of possible x and y combinations that make this equation a true statement. We will have to start by finding possible x and y combinations. We will do this using a table of values.

↪ EXAMPLE Graph $y = 2x - 3$.

First, make a table of values. You can test any three values for x. Let's use -1, 0, and 1.

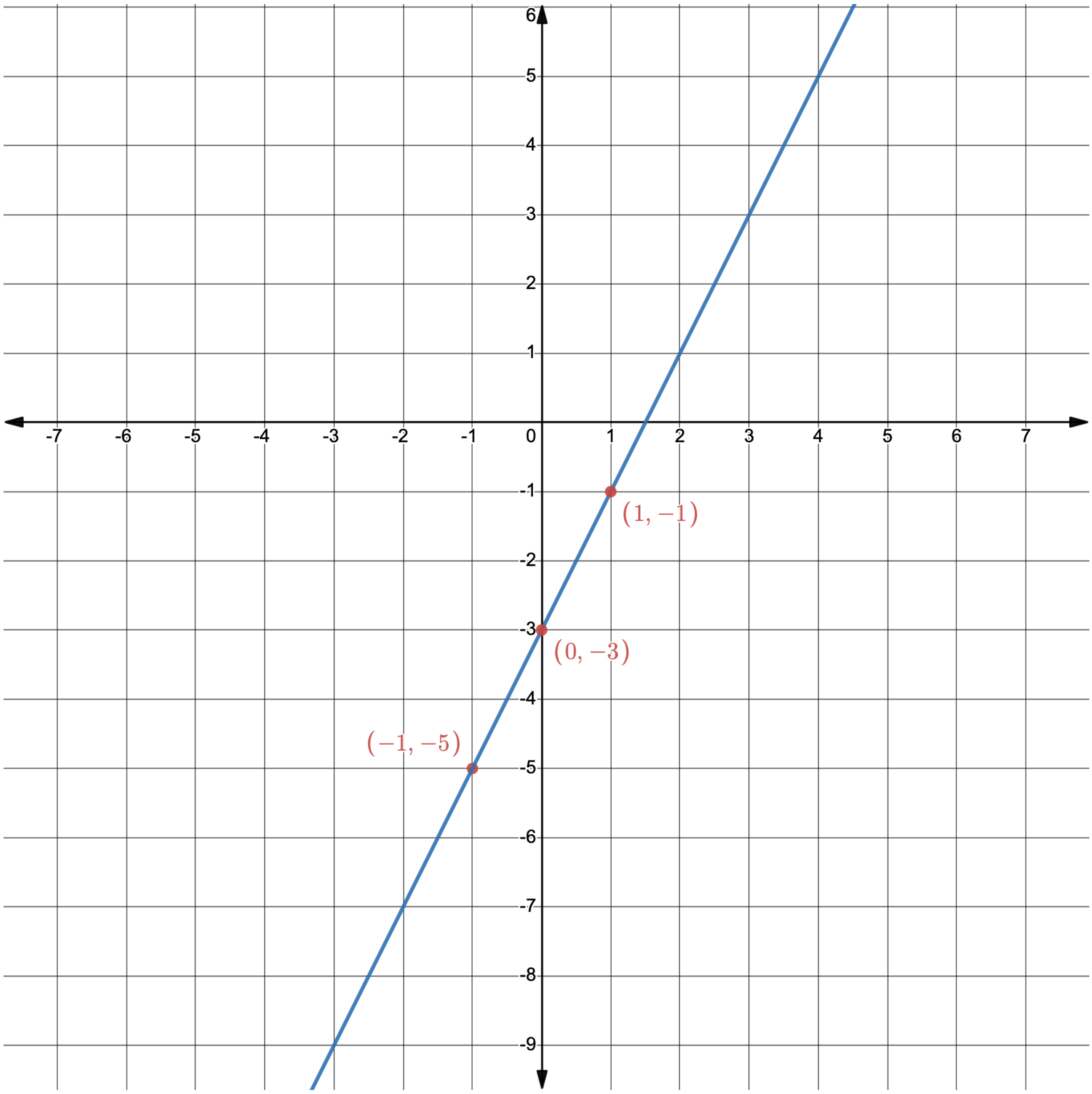
x	y

-1	
0	
1	

Evaluate by replacing *x* with each value.

x	y	$y = 2x - 3$
-1	-5	$y = 2(-1) - 3$ $y = -2 - 3$ $y = -5$
0	-3	$y = 2(0) - 3$ $y = 0 - 3$ $y = -3$
1	-1	$y = 2(1) - 3$ $y = 2 - 3$ $y = -1$

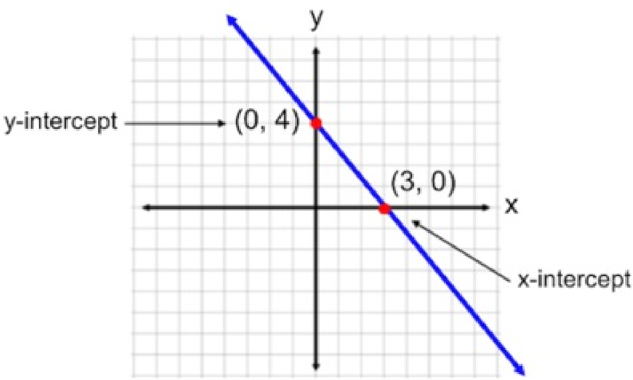
The points (-1, -5), (0, -3), and (1, -1) then become the points to graph for our equation. Once the points are plotted, connect them with a line.



4. Intercepts

Most lines have two kinds of intercepts: **x-intercepts**, and **y-intercepts**. These are the locations where the line crosses, or intercepts, one of the axes on the coordinate plane.

↪ EXAMPLE The graph below shows a line's x-intercept and y-intercept:



TERMS TO KNOW

x-intercept

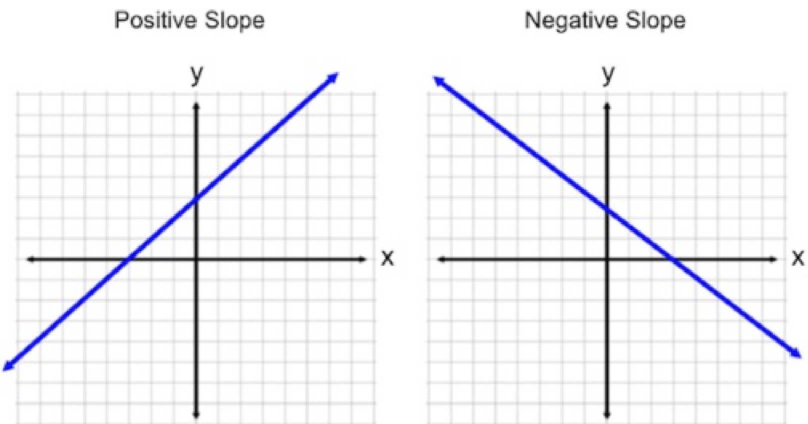
The location on a graph where a line or curve intersects the x-axis: (x, 0)

y-intercept

The location on a graph where a line or curve intersects the y-axis: (0, y)

5. Slope

The slope of a line describes its steepness. Slope can be positive, negative, or zero. For now, we will focus on positive and negative slopes. To determine if the slope of a line is positive or negative, "read" the graph left to right. If the line increases, or goes up, then the slope is positive. If the line decreases, or goes down, the slope is negative.



SUMMARY

On the **coordinate plane**, a coordinate point *x*, *y* defines a location on the two-dimensional coordinate plane. When **plotting on a graph**, coordinate points can be connected with a line. You can also **graph a line from a table**.

Most lines have two kinds of **intercepts**: x-intercept and y-intercept. The x-intercept is the location where a line or a curve intersects with the x-axis. The y-intercept is the location where a line or a curve intersects with the y-axis. When you're reading a graph from left to right, you can determine the steepness, or **slope**, of a line. A line with a positive slope heads towards positive infinity on the y-direction and a line with a negative slope heads towards negative infinity in the y-direction.

TERMS TO KNOW

x-intercept
The location on a graph where a line or curve intersects the x-axis: (x, 0)

y-intercept
The location on a graph where a line or curve intersects the y-axis: (0, y)