This worksheet will be an introduction to graphing. Students will learn how to plot points, graph lines by plotting point and use slope-intercept form to identify slope and graph lines.

Plotting Points

Start by teaching students how to use graph paper. Most, if not all, the problems in this class will fit on a 10x10 graph. Teach students about the x and y axes, where the negative numbers, and quadrants. Make the connection that basically we are just creating two number lines, a "normal" one and one going up and down. Have students plot lots of points and have them identify what quadrant they are in. Make sure to choose some points that are on the axes These points are kind of special because they do not fall in a quadrant. Also, talk about (0,0) being extra special and called the origin.

Sample Problem:

- Graph and label each of the following points all on one graph and state the quadrant for each point: **do as many points as needed**

  A. (–2, 7) B. (4, –3) C. (2, 0) D. (–4, –1) E. (0, 4)

Graphing lines by plotting points

At first this seems easier for students because it uses more familiar skills. Students just need find two points—any (x, y) points—on the line and connect the dots. Although we really only need two points to make a line, finding a third one is often a good idea and often on this first graphing worksheet I have students find 5 points. If all points lie in a straight line, we can feel confident that we didn't make a mistake. If the third, fourth, and/or fifth point doesn't fit our line, we check our work and try again.

To find points, we pick any values we want for one letter, plug them into the equation, and then solve for the other letter. It's easiest to have students pick numbers for x and solve for y. This will give us a value for x and one for y, which we can plot as an (x, y) point!

Here's a tip: in the beginning, go easy on yourself and pick nice and simple values for *x*, like -1, 0, and 1.

Sample Problems:

- Graph the equation $3x - y = 6$ by plotting points.
- Graph the equation $x - 2y = 8$ by plotting points.
- Graph the equation $x - 3y = 12$ by plotting points.
- Graph the equation $2x - 3y = 1$ by plotting points.

Graphing lines using the equation of a line

If the equation of a line is in **slope-intercept form**, it looks like this:

$y = mx + b$

Here's what those extra letters mean:

- *m* is the **slope** of the line also called "rise over run."
- *b* is the **y-intercept**.

Let's look at a few examples:

The equation $y = 2x + 1$ is in slope-intercept form. The number in front of the *x* guy is 2, so the slope is 2. The plain number is 1, so the *y*-intercept is 1. That means the graph passes through the point (0, 1). Have students write out what m and b equal before starting to graph.

Make sure to cover some tricky situations like these:

In the equation $y = 4 - 8x$, the slope is -8 (the coefficient of the *x*-term) and the *y*-intercept is 4. Don't let the order of the terms trip you up: we can rearrange it so it looks like $y = -8x + 4$. In the equation $y = -9x$, the slope is -9 and the *y*-intercept is 0, since there's no constant.

Slope-intercept form of a line: y = mx + b

Let's examine how to graph an equation in slope-intercept form. What does the graph of $y = 2x + 1$ look like?

Our equation is in slope-intercept form, so we know that the number in front of *x* is the slope (2), and 1 is the *y*-intercept.

We start by plotting the *y*-intercept.

Next, since we know that the slope is 2, also known as $\frac{2}{1}$, we know that another point will be 2 units up and 1 unit over (in the positive direction of course).

Finally, we connect these points.

What if the equation isn't solved for *y* already? Well, we'll just have to solve it for *y*, won't we ?

Graph $2x + 3y = 18$.

$$\begin{aligned} 2x + 3y &= 18 \\ 2x + 3y - 2x &= 18 - 2x \\ 3y &= -2x + 18 \\ \frac{3y}{3} &= \frac{-2x}{3} + \frac{18}{3} \\ y &= \frac{-2}{3}x + 6 \end{aligned}$$

Now our equation is in slope-intercept form and we can graph it.

We put a point at 6 on the *y*-axis since 6 is the *y*-intercept. From there, we "rise" -2, which means we go *down* 2 units, but we don't put a point there yet. We still need to "run" 3 to the right. Then we put the point down.

When using slope-intercept form to graph lines, always make sure the equation is solved for y so that the equation is in the form y = mx + b.

The slope of an equation is also called the **constant of proportionality**. Big word, small little number. In a nutshell, the constant of proportionality is the number we multiply *x* by to get *y*. Sometimes it's called a **constant rate of change**, too. So slope, constant of proportionality, and constant rate of change: all the same thing.

Sample Problems:

- Graph the equation $4x + 2y = 10$ using the equation of a line, identify the constant of proportionality (the slope) from the equation, and show the constant of proportionality, or slope, on the graph.

- Graph the equation $x + 5y = 15$ using the equation of a line, identify the constant of proportionality (the slope) from the equation, and show the constant of proportionality, or slope, on the graph.

- Graph the equation $3x + 4y = 12$ using the equation of a line, identify the constant of proportionality (the slope) from the equation, and show the constant of proportionality, or slope, on the graph.

- Graph the equation $6x + 7y = 21$ using the equation of a line, identify the constant of proportionality (the slope) from the equation, and show the constant of proportionality, or slope, on the graph.