Solving linear systems graphically NAME:

This worksheet is designed to help you focus your thoughts on graphically solving systems of linear equations.

Remember the idea is to find the point that satisfies both equations. Graphically, this means we are looking for the point of intersection of the two lines. There may be one point, many points, or no points at all.

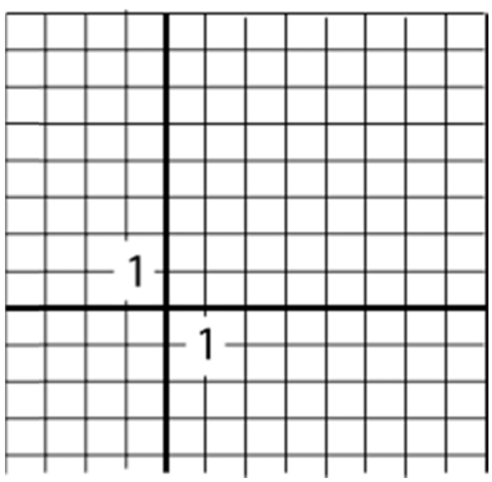
1. Graph both the lines in the system below.

Since they are set up in slope / *y*-intercept form ($y = mx + b$), I would graph each line by plotting the *y*-intercept and then using the slope to plot a second point.

To make a more accurate graph, continue the pattern of the slope to plot third and fourth points. Connect them to form the line.

$y = \frac{1}{2}x + 3$

$y = -1x + 6$



Each equation is in the form $y = mx + b$ where b is the *y*-intercept and m is the slope. Pick out the *y*-intercept and plot it. Then use the slope (think of as $^{rise}/_{run}$) to plot a second point. Continue the pattern to plot another couple of points. Connect with a straight edge.

Graph the first line completely before starting on the second line.

Where do the two lines intersect? This is the solution to the system. Write your answer in ordered pair notation.

Did you get (2, 4) as your only solution?

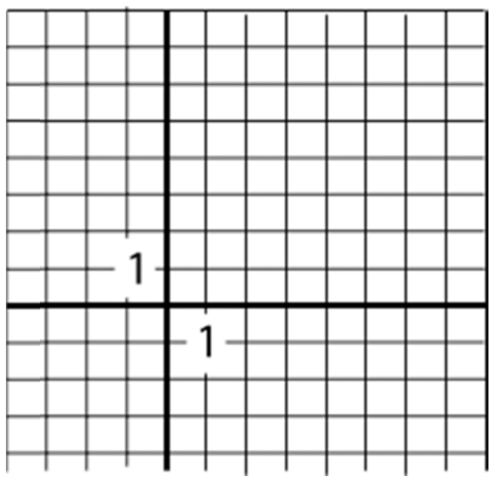
2. Graph both the lines in the system below.

Since they are set up in standard form ($Ax + By = C$), I would graph each line by plotting the *x*-intercept and *y*-intercept first. The reason for this is that it is relatively easy to substitute 0 in for a variable and solve for the other when the line is in this form.

To make a more accurate graph, continue the pattern of the slope (determined by the two points you start with) to plot third and fourth points. Connect them to form the line.

$4x + 2y = 8$

$-1x + y = 1$



Each equation is in the form $Ax + By = C$. Substitute 0 in for *x* and solve to get the *y*-intercept; plot it. Substitute 0 in for *y* and solve to get the *x*-intercept; plot it. Then use the slope (think of as $^{rise}/_{run}$) determined by your intercepts to plot third and fourth points. Connect with a straight edge.

Graph the first line completely before starting on the second line.

Where do the two lines intersect? This is the solution to the system. Write your answer in ordered pair notation.

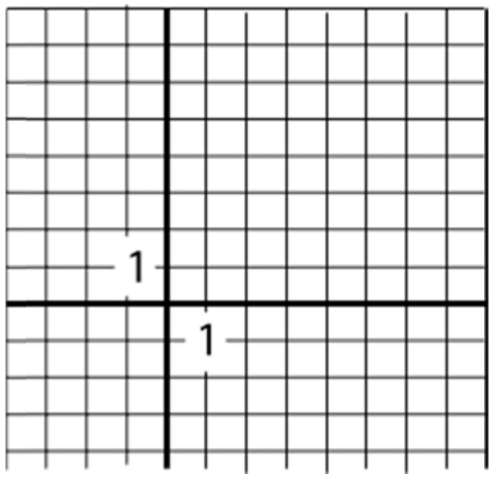
Did you get (1, 2) as your only solution?

3. Graph both the lines in the system below.

One is in slope / *y*-intercept form and the other is in the standard form. I would use different methods (as described above) to graph each line.

$y = -\frac{2}{3}x + 2$

$2x + 3y = 6$



It is easiest to use different methods to graph each line. Get used to both methods described in #1 and 2 above.

Graph the first line completely before starting on the second line.

What do you notice about the points of intersection? What is true about these two lines?

We see these two lines are actually the same line. To describe the points of intersection, you would need to list every point on the line, but there are an infinite number of such points.

We will write our solution in the set notation $\left\{(x, y) \;\middle|\; y = -\frac{2}{3}x + 2\right\}$ or using the second line in the system, $\{(x, y) \mid 2x + 3y = 6\}$. This first notation is read "the set of all points in the form (x, y) such that $y = -\frac{2}{3}x + 2$." This describes every single point on this line.

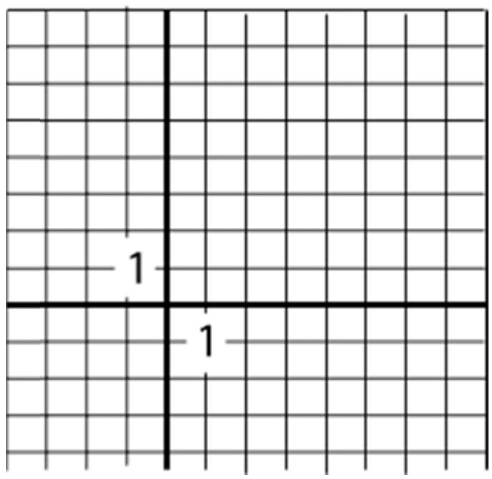
4. Graph both the lines in the system below.

Since they are set up in slope / *y*-intercept form ($y = mx + b$), I would graph each line by plotting the *y*-intercept and then using the slope to plot a second point.

To make a more accurate graph, continue the pattern of the slope to plot third and fourth points. Connect them to form the line.

$y = \frac{3}{2}x - 3$

$y = \frac{3}{2}x + 2$



Each equation is in the form $y = mx + b$ where *b* is the *y*-intercept and *m* is the slope. Pick out the *y*-intercept and plot it. Then use the slope (think of as $\frac{rise}{run}$) to plot a second point. Continue the pattern to plot another couple of points. Connect with a straight edge.

Graph the first line completely before starting on the second line.

What do you notice about the two lines and where they intersect? What about the equations could lead you to this conclusion without graphing?

The two lines do not intersect at all. They are parallel and will never intersect. So there are no points in the form (*x*, *y*) that make both equations true. We simply say that there are “no solutions” to this system.