Key Concepts

Graphing Linear Equations

Objective Teach students to graph linear equations.

Note to the Teacher *The main idea of this lesson is that you can draw the graph of a linear equation once you know two points on the graph, by simply placing a ruler along the two points. It is typically easy to find two points on a graph when it is in one of the standard forms.*

First, introduce the following key idea.

Key Idea	If two points on a line are known, then the line can be drawn using a ruler.

Illustrate this idea on the chalkboard by using a straightedge to draw the line going through the two points at (1, 2) and (4, −2). Ask students, "How do we graph a line that is given to us in the form of an equation?" **Find two points on the line.**

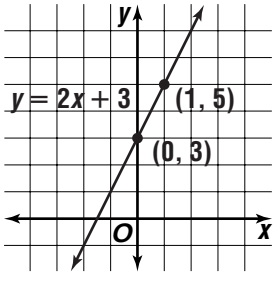
Graphing Lines in Slope-Intercept Form

Example 1 **Graph $y = 2x + 3$.**

Solution Two points are needed to graph this equation, which is given in slope-intercept form. Since the y-intercept is 3, one point is (0, 3). To find a second point, choose any other x value and compute the corresponding y value. For instance, choose $x = 1$.

$$y = 2x + 3$$
$$y = 2(1) + 3 \quad \textit{Replace } x \textit{ with } 1.$$
$$y = 5$$

So the point at (1, 5) is also on the line. Now graph the line as shown at the right.



This works for all lines in slope-intercept form. The y-intercept is always given and another point can be generated by substituting any other value for x.

Graphing Lines in Point-Slope Form

Example 2 **Graph $y - 4 = 3(x - 2)$.**

Solution One point on the line is easily found when an equation is in point-slope form. In this case, it is the point at (2, 4). To find a second point, choose an x value different from 2, say 4, and substitute it into the equation.

$y - 4 = 3(x - 2)$

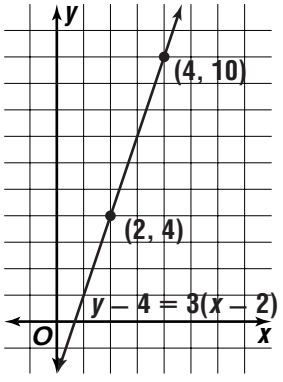
$y - 4 = 3(4 - 2)$ *Replace x with 4.*

$y - 4 = 3(2)$

$y - 4 = 6$

$y = 10$ *Add 4 to each side.*

So the point at (4, 10) is also on the line. Draw a line going through (2, 4) and (4, 10).



Equations in point-slope form can be graphed by first choosing the given point. Then generate a second point by substituting a different x value, and solving for y.

Graphing Other Linear Equations

Often equations are neither in slope-intercept form nor point-slope form. In this case, we can substitute any two different x values, and solve to find the corresponding y values.

Example 3 **Graph $4x + 3y = 24$.**

Solution Choose two x values, say $x = 0$ and $x = 2$. (We could have chosen any two different x values.) Use substitution to find the corresponding y values.

$4x + 3y = 24$

$4(0) + 3y = 24$ *Replace x with 0.*

$3y = 24$

$y = 8$ *Divide each side by 3.*

The point at (0, 8) is on the line.

$$4x + 3y = 24$$

$4(2) + 3y = 24$ *Replace x with 2.*

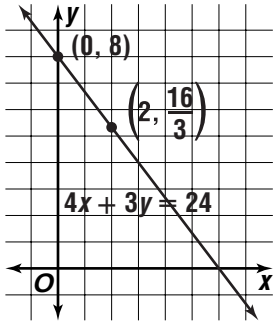
$$8 + 3y = 24$$

$3y = 16$ *Subtract 8 from each side.*

$y = \frac{16}{3}$ *Divide each side by 3.*

The point at $\left(2, \frac{16}{3}\right)$ is also on the line.

Graph the line as shown.



End of Lesson