Finding x and y Intercepts

The $x$-intercept is the point at which a graph crosses the $x$-axis. As the $y$ value is zero anywhere along the $x$-axis, the $x$-intercept is an ordered pair of numbers where the $y$ value is always zero. The points $(-3, 0)$, $(1, 0)$, $(4, 0)$ are all examples of points on the $x$-axis.

The $y$-intercept is the point at which a graph crosses the $y$-axis. As the $x$ value is zero anywhere along the $y$-axis, the $y$-intercept is an ordered pair of numbers where the $x$ value is always zero. The points $(0, 1)$, $(0, -1)$, and $(0, 2)$ are all examples of points on the $y$-axis.

It is possible to graph the equation of a line by finding the $x$- and $y$-intercepts.

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EXAMPLE: We will graph the equation $3x + 2y = 12$ by finding the $x$- and $y$-intercepts.

1. To find the $x$-intercept, let $y = 0$ and solve for $x$.

   $3x + 2y = 12$
   $3x + 2(0) = 12$
   $3x = 12$
   $x = 4$

   The $x$-intercept is the ordered pair $(4, 0)$.

2. To find the $y$-intercept, let $x = 0$ and solve for $y$.

   $3x + 2y = 12$
   $3(0) + 2y = 12$
   $2y = 12$
   $y = 6$

   The $y$-intercept is the ordered pair $(0, 6)$.

3. Graph the ordered pairs and draw the line.

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EXAMPLE: Find the $x$- and $y$-intercepts of $y = 2x + 6$ and graph.

1. Find the $x$-intercept. ($y$ will be 0)

   $y = 2x + 6$
   $0 = 2x + 6$
   $-6 = 2x$
   $-3 = x$

   The $x$-intercept is $(-3, 0)$.

2. Find the $y$-intercept. ($x$ will be 0)

   $y = 2x + 6$
   $y = 2(0) + 6$
   $y = 6$

   The $y$-intercept is $(0, 6)$.

3. Graph the intercepts and draw the line.

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EXAMPLE: Find the \(x\)- and \(y\)-intercepts of \(3x + 4y = 0\) and graph.

1. Find the \(x\)-intercept (set \(y = 0\))
   
   \[
   3x + 4y = 0 \\
   3x + 4(0) = 0 \\
   3x = 0 \\
   x = 0
   \]

   The \(x\)-intercept is \((0, 0)\).

2. Find the \(y\)-intercept (set \(x = 0\))
   
   \[
   3x + 4y = 0 \\
   3(0) + 4y = 0 \\
   4y = 0 \\
   y = 0
   \]

   The \(y\)-intercept is \((0, 0)\).

**NOTE** that the \(x\)- and \(y\)-intercept are both at the point \((0, 0)\). This means that the line goes through the origin. We will need to find another point in order to graph. Pick a value for \(x\) and solve for \(y\).

Let's see what happens if we let \(x = 4\) after writing the equation in the \(y = mx + b\) form.
(See handout #43)

Solve for \(y\):

\[
3x + 4y = 0 \\
4y = -3x + 0 \\
\frac{4y}{4} = \frac{-3x}{4} \\
y = -\frac{3}{4}x
\]

Now let \(x = 4\):

\[
y = -\frac{3}{4}(4) \\
y = -3
\]

The point \((4, -3)\) is a solution of \(3x + 4y = 0\).

3. Graph the \(x\)- and \(y\)-intercept and the point \((4, -3)\), and then draw the line.

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EXERCISES: Find the $x$- and $y$-intercepts of the following equations and graph the line of each equation.

a. $y = 2x + 8$  
   $x$-intercept: (-4, 0)  
   $y$-intercept: (0, 8)

b. $y = 5x + 10$  
   $x$-intercept: (-2, 0)  
   $y$-intercept: (0, 10)

c. $x - 3y = 6$  
   $x$-intercept: (6, 0)  
   $y$-intercept: (0, -2)

d. $3x - 4y = 12$  
   $x$-intercept: (4, 0)  
   $y$-intercept: (0, -3)

e. $2x - 4y = 8$  
   $x$-intercept: (4, 0)  
   $y$-intercept: (0, -2)

f. $2x + 3y = 0$  
   $x$-intercept: (0, 0)  
   $y$-intercept: (0, 0)  
   You will need another point to complete the graph.

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