

Graphing Linear Equations

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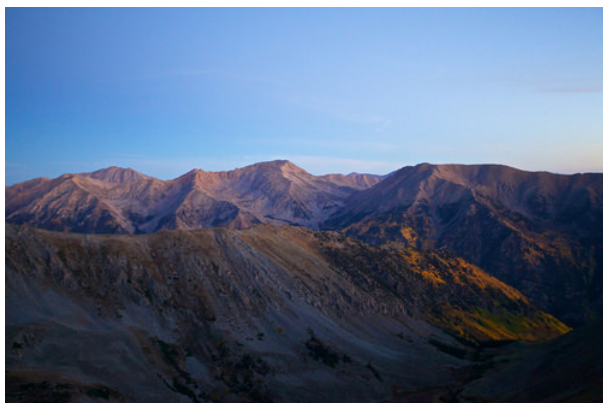
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6.7 Graphing Linear Equations

FlexBooks 2.0 > VUB Math > Graphing Linear Equations

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[Figure 1]

The local hiking club is finalizing its plans for a trip to the Rocky Mountains in Canada. The hikers are discussing the food they will have to carry with them to complete their climb up the mountains. The group decides to set out with 84 pounds of food and figures that, together, the hikers will eat 11 pounds each day. To make sure they will have enough food, the members of the club want to show how their food supply looks at the end of each day as well as at the end of their trip. What can they do to create a visual picture of their food supply?

In this Concept, you will learn to recognize functions

Graphing Linear Equations

When graphing a straight line, two points on the line must be plotted and joined. If an equation is written in standard form, the x - and y -intercepts can be calculated and plotted on the Cartesian grid. These plotted points can then be joined to graph the line represented by the equation.

Let's look at an example.

Plot the graph of the line represented by the following equation:

$$3x + 5y = 15$$

Look at the given equation. It is written in standard form.

$Ax + By = C$ such that $A = 3$, $B = 5$, and $C = 15$.

First, calculate the x -intercept using the formula:

$$x - \text{intercept} = \frac{C}{A}$$

Next, fill in the values for C and A .

$$\begin{aligned}x - \text{intercept} &= \frac{C}{A} \\x - \text{intercept} &= \frac{15}{3} \\x - \text{intercept} &= 5\end{aligned}$$

The answer is 5.

The x -intercept is $(5, 0)$.

Second, calculate the y -intercept using the formula:

$$y - \text{intercept} = \frac{C}{B}$$

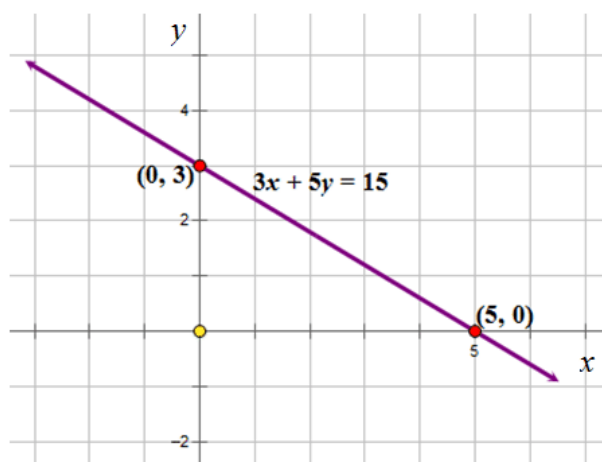
Next, fill in the values for C and B .

$$\begin{aligned}y - \text{intercept} &= \frac{C}{B} \\y - \text{intercept} &= \frac{15}{5} \\y - \text{intercept} &= 3\end{aligned}$$

The answer is 3.

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

Next, plot the points $(5, 0)$ and $(0, 3)$ on the Cartesian grid and join them with a straight line.



[Figure 2]

However, the equation of a line is not always written in standard form. The equation of a straight line is often written in **slope intercept form**. Remember, the **slope-intercept form** of an equation is written as $y = mx + b$, such that ' m ' is the slope of the line and ' b ' is the y -intercept of the line. These two values can be used to plot two points on the Cartesian grid. Remember the value of the slope should be expressed in **fraction form** for graphing. The denominator of the fraction (m) is $x_2 - x_1$ and should always be a positive value. A positive value **means** that the movement in a horizontal direction will always be to the right. The numerator of the fraction is $y_2 - y_1$ and can be either a negative or a positive value.

Let's look at an example.

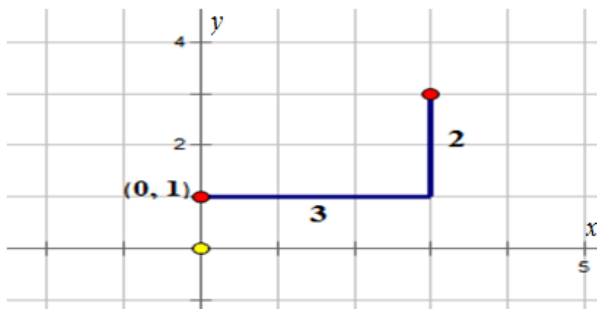
Plot the graph of the line represented by the following equation:

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

Look at the given equation. It is written in slope-intercept form.

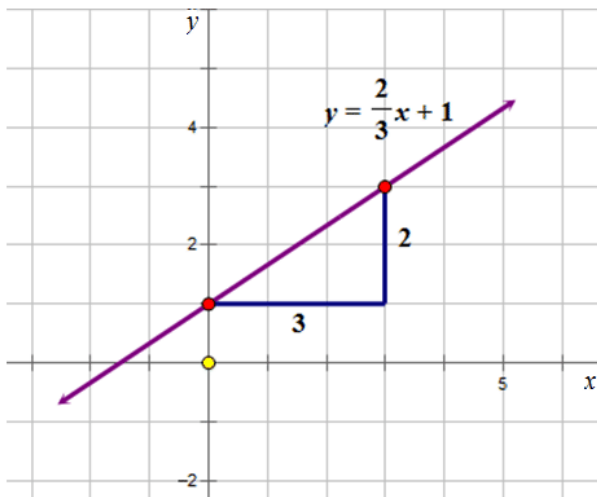
$y = mx + b$ such that $m = \frac{2}{3}$ and $b = 1$ or $(0, 1)$.

First, plot the y -intercept (b) on the Cartesian grid. From here, count to the right the number of units in the denominator of the slope fraction (3) and then up the number of units in the numerator of the slope fraction (2).



[Figure 3]

Then, join the two plotted points with a straight line.



[Figure 4]

Examples

Example 1

Earlier, you were given a problem about a hiking club and food. The hikers need to keep track of the 84 pounds of food they are carrying. If they eat 11 pounds of food a day, how can they create a visual display of the food they have left at the end of each day?

First, write down the given information

y = pounds of food left at the end of each day

m = pound of food eaten each day

x = number of days hiking

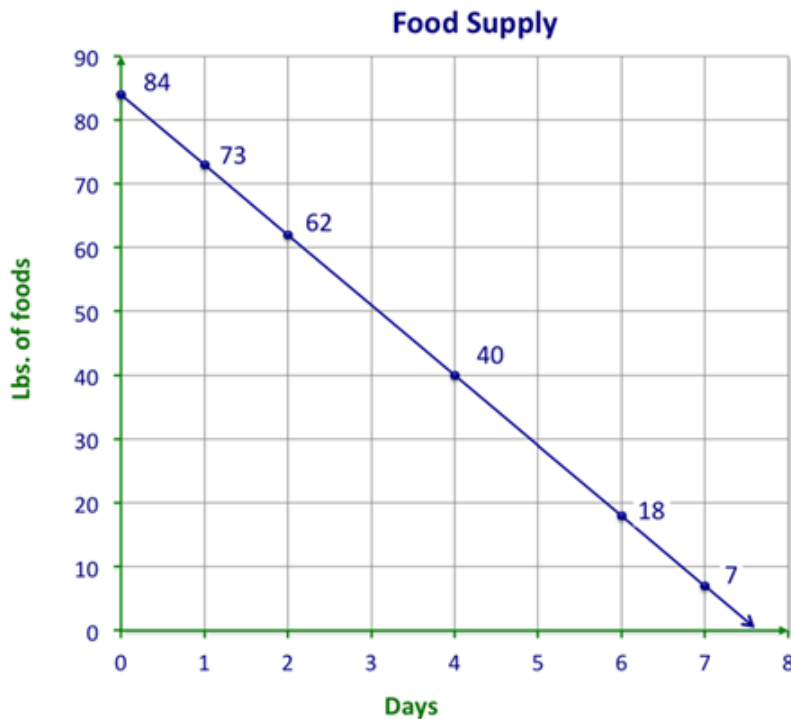
b = number of pounds of food being carried

Next, **substitute** the known values into the equation.

$$y = mx + b$$

$$y = -11d + 84$$

Then, graph the equation on the Cartesian grid.



[Figure 5]

Example 2

Plot the graph of the following equation written in slope-intercept form.

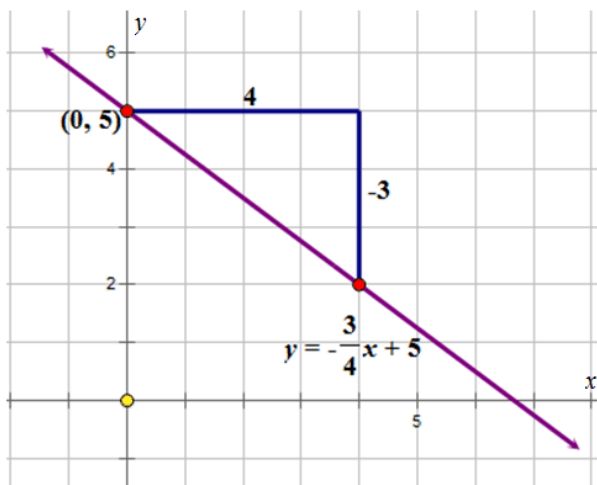
$$y = -\frac{3}{4}x + 5$$

First, write down the information given in the equation:

$$y = mx + b \text{ such that } m = -\frac{3}{4} \text{ and } b = 5 : (0, 5).$$

Next, plot the y -intercept $(0, 5)$ on the Cartesian grid. From the y -intercept move to the right 4 units, move downward 3 units, and plot the point.

Then, join the two plotted points with a straight line.



[Figure 6]

Example 3

Plot the graph of the line represented by the following equation:

$$4x - 6y = -24$$

Look at the given equation. It is written in standard form.

$$Ax + By = C \text{ such that } A = 4, B = -6, \text{ and } C = -24.$$

First, calculate the x -intercept using the formula:

$$x - \text{intercept} = \frac{C}{A}$$

Next, fill in the values for C and A .

$$\begin{aligned} x - \text{intercept} &= \frac{C}{A} \\ x - \text{intercept} &= \frac{-24}{4} \\ x - \text{intercept} &= -6 \end{aligned}$$

The answer is -6.

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

Second, calculate the y -intercept using the formula:

$$y - \text{intercept} = \frac{C}{B}$$

Next, fill in the values for C and B .

$$y - \text{intercept} = \frac{C}{B}$$

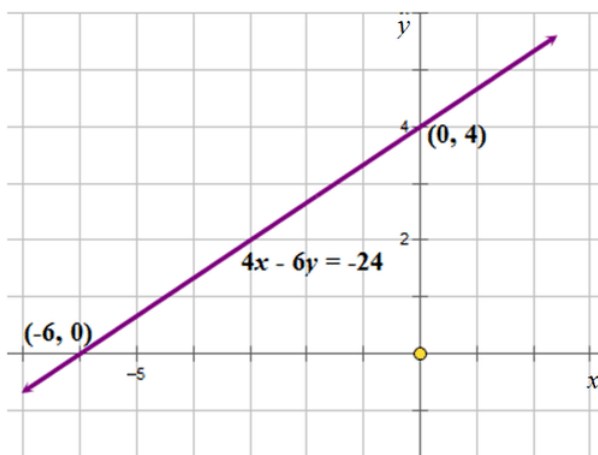
$$y - \text{intercept} = \frac{-24}{6}$$

$$y - \text{intercept} = 4$$

The answer is 4.

The y -intercept is $(0, 4)$.

Next, plot the points $(-6, 0)$ and $(0, 4)$ on the Cartesian grid and join them with a straight line.



[Figure 7]

Example 4

Plot the graph of the following equation written in slope-intercept form.

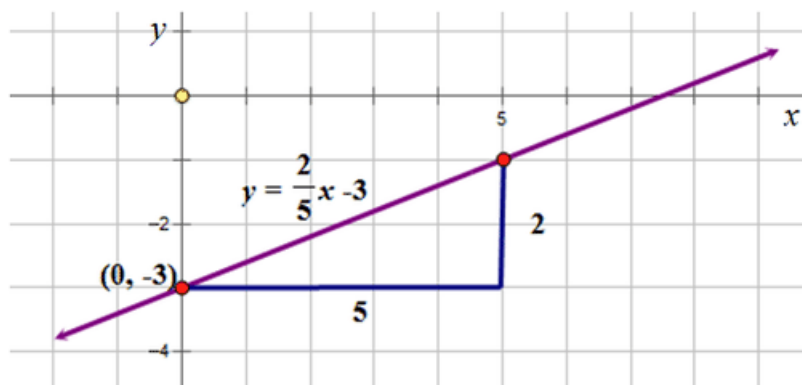
$$y = \frac{2}{5}x - 3$$

First, write down the information given in the equation:

$$y = mx + b \text{ such that } m = \frac{2}{5} \text{ and } b = -3 : (0, -3).$$

Next, plot the y -intercept $(0, -3)$ on the Cartesian grid. From the y -intercept move to the right 5 units, move upward 2 units, and plot the point.

Then, join the two plotted points with a straight line.



[Figure 8]

Example 5

Rewrite the following equation written in standard form in slope-intercept form. State the slope and y -intercept of the line.

$$4x - 5y = 60$$

First, subtract $4x$ from both sides of the equation and simplify.

$$\begin{aligned} 4x - 5y &= 60 \\ 4x - 4x - 5y &= 60 - 4x \\ -5y &= 60 - 4x \end{aligned}$$

Next, divide both sides of the equation by -5 to solve for y .

$$\begin{aligned} -5y &= 60 - 4x \\ \frac{1}{\cancel{-5}} y &= \frac{-12}{\cancel{-5}} - \frac{4}{\cancel{-5}} x \\ y &= -12 + \frac{4}{5} x \end{aligned}$$

Then, write the equation in slope-intercept form.

$$y = mx + b$$

$$y = \frac{4}{5}x - 12$$

The slope of the line is $\frac{4}{5}$ and the y -intercept is -12 .

Review

Use what you have learned to complete each task.

$$2x + 2y = 8$$

1. Write this equation in slope-intercept form.
2. What is the slope?
3. What is the y -intercept?
4. Graph the equation.

$$3x + 6y = 2$$

5. Write the following equation in slope-intercept form.
6. What is the slope?
7. What is the y -intercept?
8. Graph the equation.

Use what you have learned to solve each problem.

Miguel wants to save money to buy a new video game. He received \$20 as a gift and gets \$4 per week for allowance.

9. Write an equation in slope-intercept form that represents this situation.
10. How long will it take him to save enough money to buy the game if it costs \$47.
11. What is the slope of this line: $y = 0.8x + 3$
12. Which form is the equation written in?


13. What is the y -intercept of this line?
14. What is the graph of this line?
15. Is this a linear graph? How can you tell?

Review (Answers)

To see the review answers, return to the [Table of Contents](#) and select 'Other Versions' or 'Resources'.

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|  | <p>Credit: Zach Dischner;Richard Allaway Source: https://www.flickr.com/photos/zachd1_618/8042036522/in/photolist-dfDxh7-cy6tUC-a9nq86-6TGSgJ-bgQ7AD-8tSwSX-8tSxS8-bywhTi-6t1SRk-tBzBKQ-9gzb95-4fs4BB-btpvcq-77sXEe-ciNhEU-4A7cw1-amsK7q-4zpMEQ-8gsWjq-69mgoQ-79YxUy-rkTLhr-fkKUHe-qmVcco-tnBYM9-KZt3M-8oWGEe-8vGnwi-btpts5-cbDLwu-bGjhhB-oYA9k3-qmPn9-srAss-7mWdSw-bN76En-pv7N6r-fFHppn-pq5SnD-qj4kzg-9CaMyE-7mSkfi-8pCtJx-5P4kXc-bUhy1v-9jH585-aPe6YF-7uv953-8pFCNE-z2Url; https://www.flickr.com/photos/geographyalltheway_photos/6658220667/in/photolist-b9n834-8pFCxU-8tVB49-4pdAgG-qrwp7X-8tVBkm-8tVBBh-jnuvMb-8pCu86-8pCsec-8pCuct-8pFDPL-btpw2N-FY7hZC-8tSxma-8tVBZw-eTd9Ry-eTd8Dm-7BXnV5-8z7kCi-6eNWuM-9CbXDs-6RP261-oJteiA-6CR2Xa-8tVB7j-eTJimp-eSwcxE-eTd9cs-eTITvn-eTILhr-eTd5WA-eTIV6H-eTIQcK-eTdbYY-dySqFo-2EPLZU-8wGPRW-e2E72o-5PuFPX-8tVB05-qxpk8E-io4t41-5gEVAN-eTISZT-eTILLx-eTIQGP-eTWbLd-eSiGuX-eSjfmV</p> |