

Learning Goals

1. To understand that the same equation of a line can be written many different ways.
2. To understand that linear relations are of degree 1.
3. To understand what an x and y-intercept is.
4. To understand how to graph a line using the intercept method.
5. To be able to write a math equation when given a situation in words.

3.4 Equivalent Linear Relations

You can write an equation of a line in the form:

$$Ax + By + C = 0 \quad \text{or} \quad Ax + By = C \quad \text{or} \quad y = mx + b.$$

For example, $3x + 2y + 7 = 0$ could be written as

$$3x + 2y = -7 \quad \text{or} \quad y = -\frac{3}{2}x - \frac{7}{2}.$$

Note: If there are no visible exponents then the line is linear (straight) because of degree 1.

i.e. $y = 3x^1 - 2$ (degree 1)

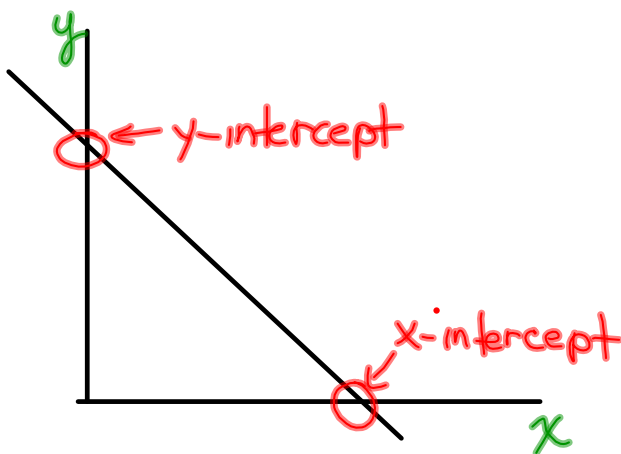
VS.

$$y = 2x^2 - 7x + 18 \quad (\text{degree } 2)$$

In this section we are going to learn how to graph a line using intercepts.

An x-intercept is the point at which the line crosses the x-axis.

A y-intercept is the point at which the line crosses the y-axis.



Graphing Using the Intercept Method

To graph using this method you need to solve for the x and y-intercepts.

Solving for the x-intercept

- In the given equation let $y = 0$ and isolate for x . Write your answer as $(x, 0)$.

Solving for the y-intercept

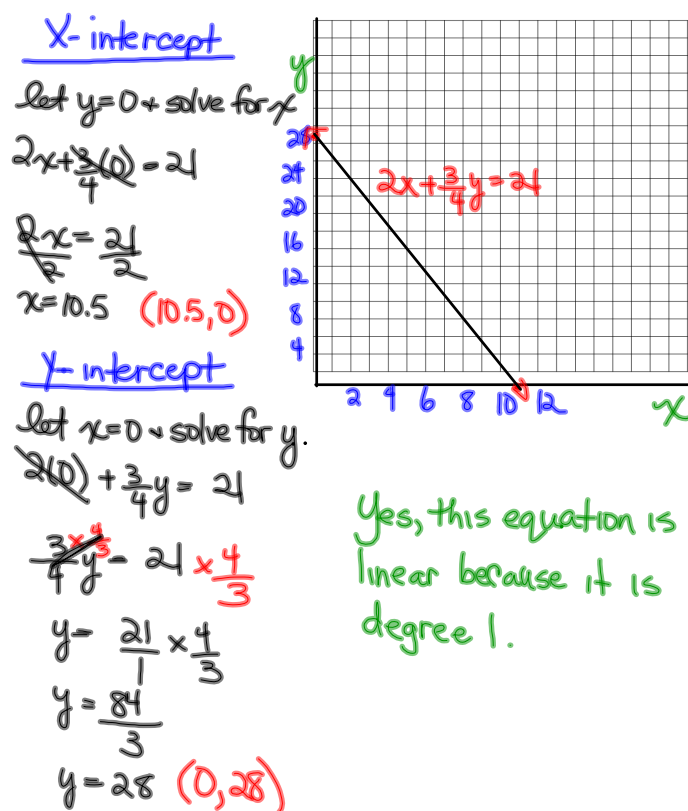
- In the given equation let $x = 0$ and isolate for y . Write your answer as $(0, y)$.

On graph paper plot the two coordinates calculated above and connect the dots to get your line.

Example One

Use the intercept method to graph the line $2x + \frac{3}{4}y = 21$.

Is this equation linear? How do you know?



Example Two

Determine the equation for each of the following. State what the variables represent.

- a) Brett has \$5 in nickels and dimes. What combinations of nickels and dimes can make \$5?

$$Ax + By + C = D$$

$$Ax + By = C$$

$$y = mx + b$$

$$0.05n + 0.10d = \$5.00$$

$n = \#$ of nickels
 $d = \#$ of dimes

- b) Jackie is going to buy juice and muffins. Juice costs \$0.27/box and muffins cost \$0.45 each. What combination can Jackie buy for \$50?

$$0.27b + 0.45m = 50$$

$m = \#$ of muffins
 $b = \#$ of boxes

Example Three

Sarah bikes and canoes to a campsite 52 km away. She bikes 13 km/hr and paddles her canoe 8 km/hr. Graph this relation using the intercept method. What do the intercepts mean?

$13b + 8c = 52$

$b = \#$ of hrs biking
 $c = \#$ of hrs canoeing

b-intercept
 let $c = 0 \Rightarrow$ solve for b .
 $13b + 8(0) = 52$
 $\frac{13b}{13} = \frac{52}{13}, b = 4$
 $(4, 0)$

c-intercept
 let $b = 0 \Rightarrow$ solve for c .
 $13(0) + 8c = 52$
 $\frac{8c}{8} = \frac{52}{8}$
 $c = 6.5$
 $(0, 6.5)$

b-intercept means if Sarah only biked it would take her 4 hrs to travel 52 km.

c-intercept means if Sarah only canoed it would take her 6.5 hrs to travel 52 km.

Complete: p. 169 - 171 #1a, 2, 4a, 5, 6, 11.