ST. JEAN DE BREBEUF
MATHEMATICS

CHAPTER 4.4

CONVERT LINEAR EQUATIONS FROM STANDARD FORM

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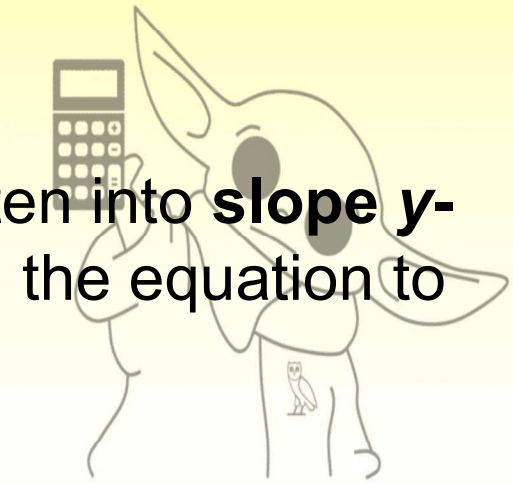
KEY CONCEPTS

A linear equation can be represented in different ways.

An equation in **standard form** is written in the form **Ax + By + C = 0**

A is a *whole number*
B and **C** are *integers*
A and **B** cannot both equal *zero*

An equation in *standard form* can be re-written into **slope *y*-intercept form**, **y = mx + b**, by re-arranging the equation to **isolate *y***.



CHAPTER 4.4 CONVERT LINEAR EQUATIONS FROM STANDARD FORM

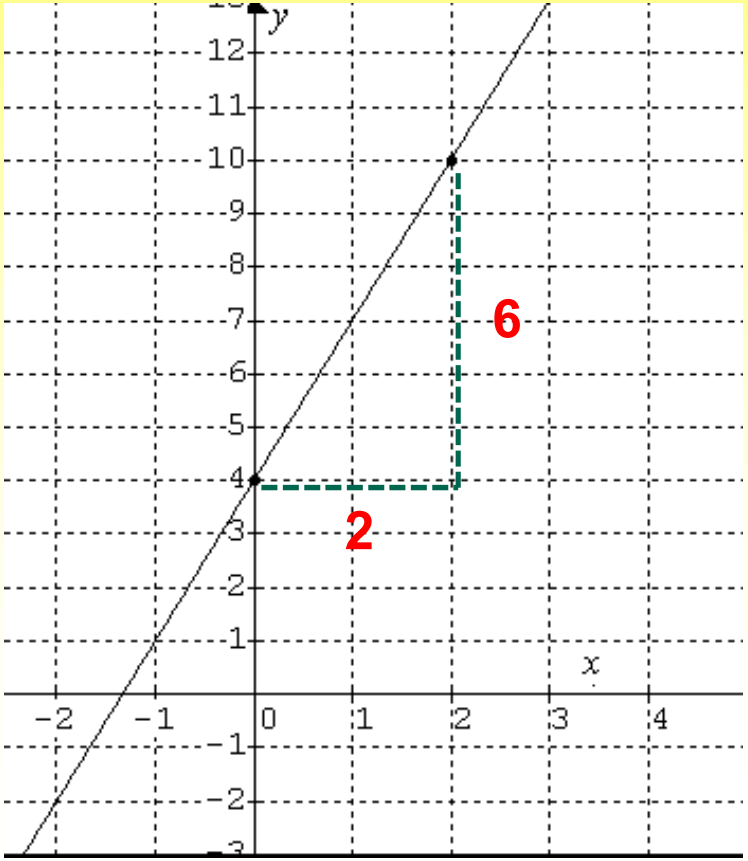
INVESTIGATE *Finding the Initial Value and Rate of Change*

The equation **6x – 2y + 8 = 0** is written in **standard** form. In this equation,

y represents the total cost of a school field trip

x represents the total number of students going on the trip.

1. Use the graph.



(a) Find the **slope** of the line. What does the slope represent in this situation?

Slope is positive since it goes **up**

$$slope = \frac{rise}{run}$$

$$slope = \frac{6}{2}$$

$$slope = 3$$

The slope represent the *rate of change* of the **total cost** in terms of **# of students**

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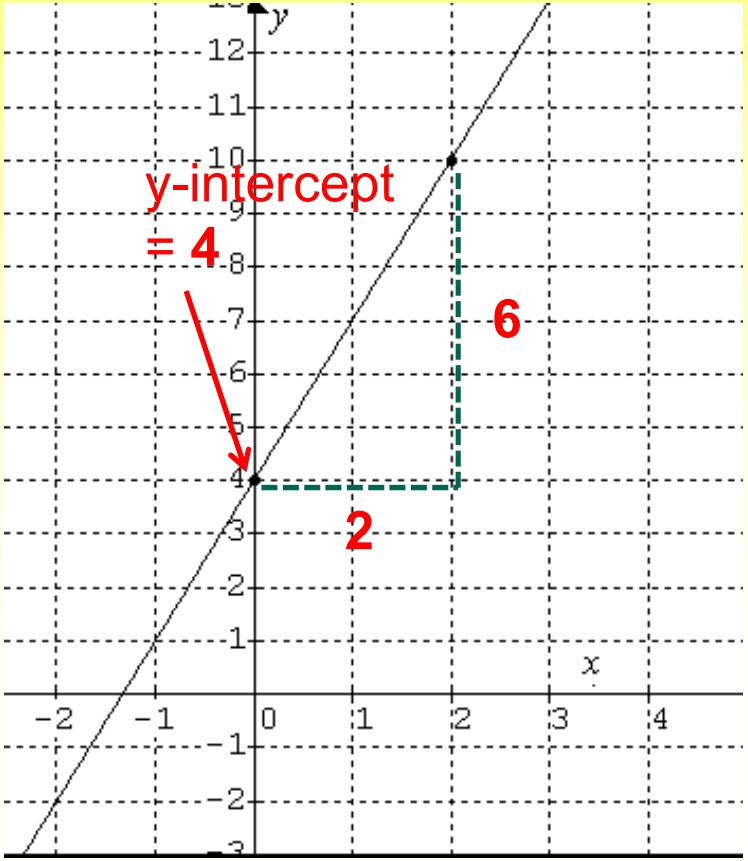
1. Use the graph.

(b) What is the ***y*-intercept**? What does this value represent?

The *y*-intercept is **4**

→This represents the cost if **no students / zero students** go on the trip

→Also known as **base fee** or **initial cost**



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INVESTIGATE *Finding the Initial Value and Rate of Change*

The equation **6x – 2y + 8 = 0** is written in **standard** form. In this equation,

y represents the total cost of a school field trip

x represents the total number of students going on the trip.

(c) Write the equation of the line in the form ***y = mx + b***.

$slope = 3$

$y = mx + b$

The *y*-intercept is **4**

$$y = 3x + 4$$

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INVESTIGATE *Finding the Initial Value and Rate of Change*

The equation **6x – 2y + 8 = 0** is written in **standard** form. In this equation,

y represents the total cost of a school field trip

x represents the total number of students going on the trip.

2.

(a) Rearrange the equation **6x – 2y + 8 = 0** to isolate *y*.

$$6x - 2y + 8 = 0$$

$$-2y + 8 = -6x$$

$$\frac{-2y}{-2} = \frac{-6x}{-2} + \frac{-8}{-2}$$

$$y = 3x + 4$$

* Isolate *y* (leave the term with *y* alone!)

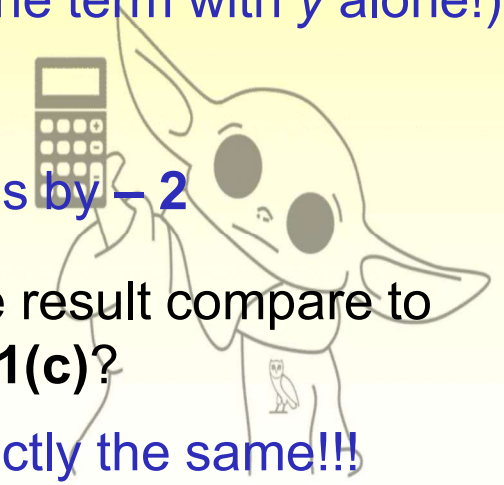
→Subtract **6x**

→Subtract **8**

→Divide both sides by **– 2**

(b) How does the result compare to your answer to **#1(c)**?

They are exactly the same!!!



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EXAMPLE 1 *Re-Write a Linear Equation in Slope y-Intercept Form*

Re-arrange the following equations into **slope y-intercept form, y = mx + b** and identify the **slope** and **y-intercept**.

(a) $-4x + y + 7 = 0$

$y + 7 = 4x$

$y = 4x - 7$

$y = mx + b$

m = **4**

b = **– 7**

* Isolate *y*
→Add **4x**
→Subtract **7**

(b) $5x - y - 9 = 0$

$-y - 9 = -5x$

$\frac{-1y}{-1} = \frac{-5x}{-1} + \frac{9}{-1}$

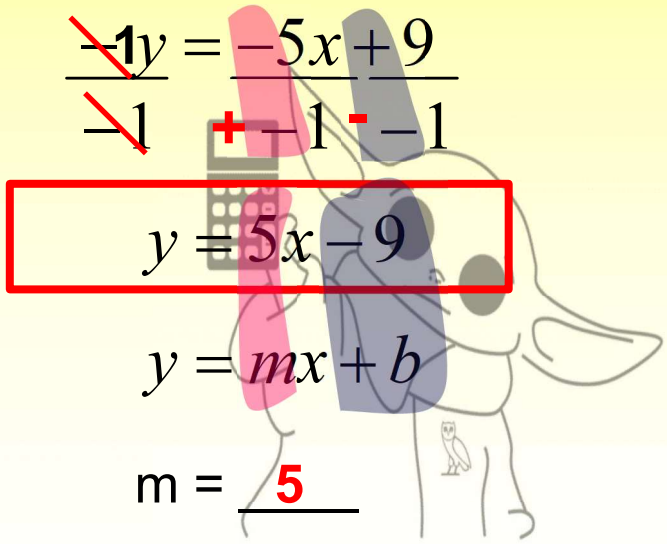
$y = 5x - 9$

$y = mx + b$

m = **5**

b = **– 9**

* Isolate *y*
→Subtract **5x**
→Add **9**
→Divide each term by **– 1**



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EXAMPLE 2 *Re-arrange a Linear Equation Involving Fractions*

Re-arrange the following equations into **slope y-intercept form, y = mx + b** and identify the **slope** and **y-intercept**.

(a) $2x + 5y - 15 = 0$

$5y - 15 = -2x$

$\frac{5y}{5} = \frac{-2x}{5} + \frac{15}{5}$

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

$y = mx + b$

* Isolate *y*
→Subtract **2x**
→Add **15**
→Divide each term by **5**

m = **– 2 / 5**

b = **3**

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EXAMPLE 2 *Re-arrange a Linear Equation Involving Fractions*

Re-arrange the following equations into **slope y-intercept form, y = mx + b** and identify the **slope** and **y-intercept**.

(b) $-3x - 7y + 14 = 0$

$-7y + 14 = 3x$

$\frac{-7y}{-7} = \frac{3x}{-7} + \frac{-14}{-7}$

$y = \frac{-3}{7}x + 2$

$y = mx + b$

* Isolate *y*

→Add **3x**

→Subtract **14**

→Divide each term by **– 7**

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m = **– 3 / 7**

b = **2**

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EXAMPLE 3 *Find the Number of Tickets Sold*

Tickets for a local theatre production are $20 per adult and $10 per child. The total revenue, the amount of money the theatre made, *R*, is

$$\mathbf{20}x + \mathbf{10}y = R$$

where *x* represents the number of *adult* tickets sold
y represents the number of *children's* tickets sold.

The theatre company wants to bring in revenue of **$7500** for each of the two shows. The number of *adult* tickets sold for these shows is **200** and **350** respectively.

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EXAMPLE 3 *Find the Number of Tickets Sold*

$20x + 10y = R$

where x represents the number of *adult* tickets sold
y represents the number of *children's* tickets sold.

The theatre company wants to bring in revenue of **$7500** for each of the two shows. The number of *adult* tickets sold for these shows is **200** and **350** respectively.

(a) Write the revenue equation in *slope y-intercept form*

$$20x + 10y = R$$

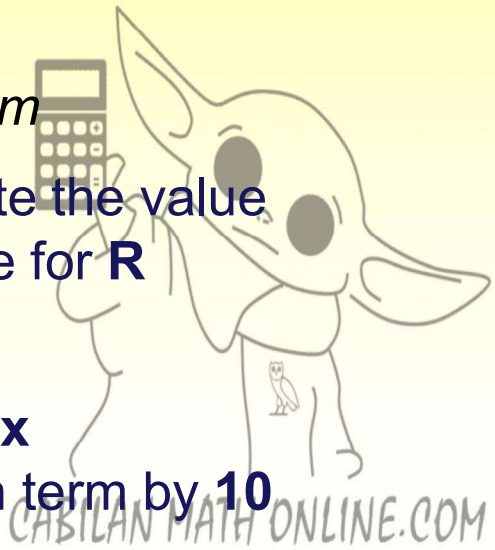
$$20x + 10y = 7500$$

$$\frac{10y}{10} = \frac{-20x}{10} + \frac{7500}{10}$$

$$y = -2x + 750$$

First, substitute the value of the revenue for **R**

* Isolate y
→Subtract **20x**
→Divide each term by **10**



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EXAMPLE 3 *Find the Number of Tickets Sold*

$20x + 10y = R$

where x represents the number of *adult* tickets sold
y represents the number of *children's* tickets sold.

$$y = -2x + 750$$

(b) Using the equation from (a), calculate how many **children's tickets** are sold if:

(i) **200** adult tickets are sold?

Substitute **x = 200**

$y = -2x + 750$
$= -2(200) + 750$
$= \mathbf{350}$

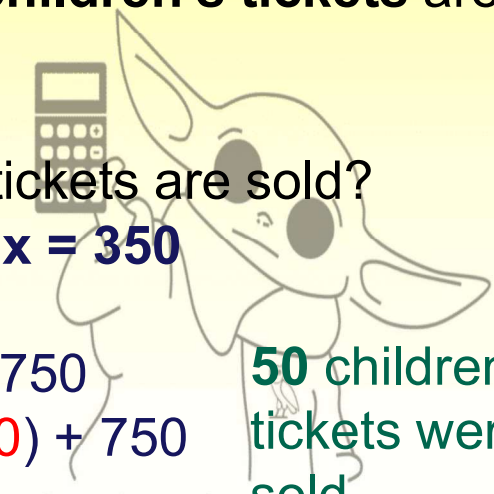
350 childrens tickets were sold

ii) **350** adult tickets are sold?

Substitute **x = 350**

$y = -2x + 750$
$= -2(350) + 750$
$= \mathbf{50}$

50 childrens tickets were sold



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EXAMPLE 3 *Find the Number of Tickets Sold*

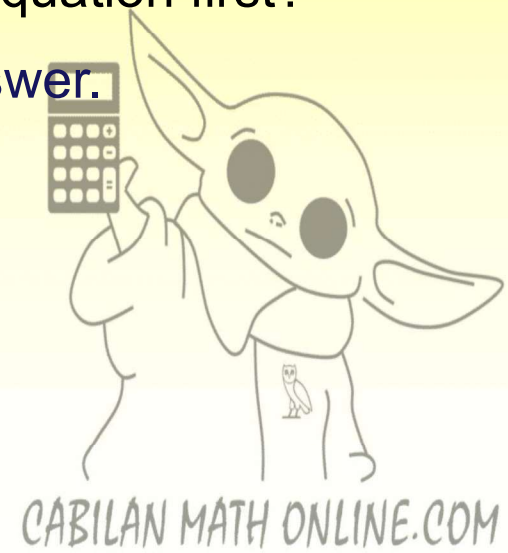
$20x + 10y = R$

where x represents the number of *adult* tickets sold
y represents the number of *children's* tickets sold.

$$y = -2x + 750$$

(c) Why might it be advantageous to re-arrange the equation first?

Fewer steps to come up with the final answer.



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EXAMPLE 4 *Problems Involving the Standard Form*

The line **6x + 8y + C = 0** passes through the point **(3, – 4)**.
x y

Determine the value of **C**.

6x + 8y + C = 0

6(3) + 8(– 4) + C = 0

18 – 32 + C = 0

– 14 + C = 0

C = **14**

Substitute the point into the equation for *x* and *y*

Simplify and solve for **C**

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Homework:

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