10-03-25 MTH 111

2.3 Use a Problem Solving Strategy
2.3 Exercise Set, page 243 (225): 1, 6, 11, 15, 16, 19, 23, 25, 27, 32, 37
2.4 Solve a Formula for a Specific Variable
2.4 Exercise Set, page 263 (245): 1, 3, 4, 6, 21, 24, 30, 32

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3. Equations and their Graphs

3.1 Use the Rectangular Coordinate System
3.1 Exercise Set, page 312 (294): 1, 5, 7, 11, 15, 19, 25
3.2 Graph Linear Equations in Two Variables
3.2 Exercise Set, page 346 (328): 1, 3, 21, 25, 27, 33
3.3 Graphs with Intercepts-optional
3.3 Exercise Set, page 373 (355): 10,16

After class notes
2.1

In the following exercises, solve each equation using the Subtraction and Addition Properties of Equality.

$$\boxed{\text{If } a=b \text{ then } a+c=b+c}$$

9. $x - \frac{1}{3} = 2$

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

$$x + \left(-\frac{1}{3} + \frac{1}{3}\right) = 2\left(\frac{3}{3}\right) + \frac{1}{3}$$

$$x + 0 = \frac{6}{3} + \frac{1}{3}$$

$$x = \frac{6+1}{3}$$

$$\boxed{x = \frac{7}{3}}$$

more concise presentation

$$x - \frac{1}{3} = 2$$

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

$$\boxed{x = \frac{7}{3}}$$

Check

$$\frac{7}{3} - \frac{1}{3} \stackrel{?}{=} 2$$

$$\frac{7-1}{3} \stackrel{?}{=} 2$$

$$\frac{6}{3} \stackrel{?}{=} 2$$

$$2 = 2 \checkmark$$

2.1: 6

6. $p + 2.4 = -9.3$

$p + 2.4 - 2.4 = -9.3 - 2.4$

$\boxed{p = -11.7}$

2.1:

In the following exercises, solve each equation using the Division and Multiplication Properties of Equality and check the solution.

18. $-37p = -541$

$p = \frac{-541}{-37} = \boxed{\frac{541}{37}} \approx 14.6$ (rounded to the nearest tenth)

541/37=14.6216

check $(-37)\left(\frac{541}{37}\right) \stackrel{?}{=} -541$

$-541 = -541$ ✓

change $\frac{541}{37}$ to a mixed number

$14\frac{23}{37} = \frac{541}{37}$

$$\begin{array}{r} 14 \\ 37\overline{)541} \\ \underline{37} \\ 171 \\ \underline{148} \\ 23 \end{array}$$

Textbook answer

18. $p = \frac{541}{37}$ improper fraction

2.1

In the following exercises, solve the following equations with constants on both sides.

46. $11 - \frac{1}{5}a = \frac{4}{5}a + 4$ goal: a = some number

$11 - 4 - \left(\frac{1}{5}\right)a = \frac{4a}{5} + 4 - 4$

$7 - \frac{a}{5} = \frac{4a}{5}$

$$7 - \frac{a}{5} = \frac{4a}{5}$$

$$7 - \frac{a}{5} + \frac{a}{5} = \frac{4a}{5} + \frac{a}{5}$$

$$7 = \frac{4a+a}{5}$$

$$7 = \frac{5a}{5}$$

$$7 = a$$

$$\boxed{a = 7}$$

2.2

In the following exercises, solve each linear equation.

10. $\frac{1}{4}(20d + 12) = d + 7$

$$\left(\frac{1}{4}\right)(20d) + \left(\frac{1}{4}\right)(12) = d + 7$$

$$5d + 3 = d + 7$$

$$4d = 4$$

$$\boxed{d = 1}$$

$$4\left(\frac{1}{4}\right)(20d + 12) = 4(d + 7)$$

$$20d + 12 = 4d + 28$$

$$16d = 16$$

$$\boxed{d = 1}$$

14. $35 - 5(2w + 8) = -10$

$$35 - 10w - 40 = -10$$

$$-10w - 5 = -10$$

$$-10w = -10 + 5$$

$$-10w = -5$$

$$w = \frac{-5}{-10} = \frac{-5}{-5 \cdot 2} = \frac{1}{2}$$

$$\boxed{w = \frac{1}{2}}$$

$$35 - 5(2w + 8) = -10$$

divide each term by -5

$$-7 + (2w + 8) = 2$$

$$2w + 1 = 2$$

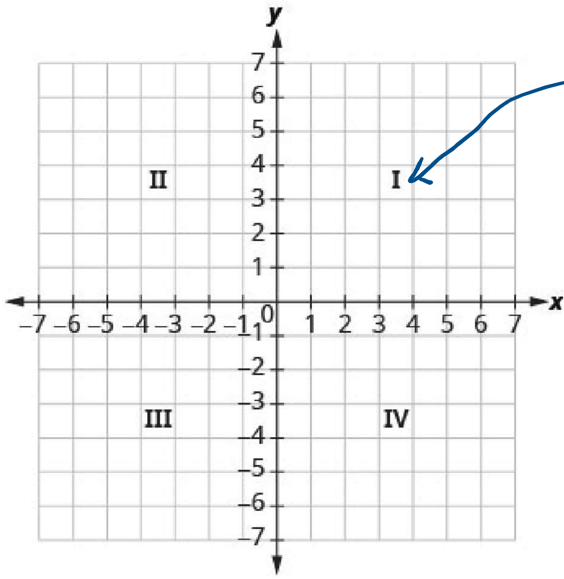
$$2w = 1$$

$$\boxed{w = \frac{1}{2}}$$

3.1

Memorize

3.1
Memorize

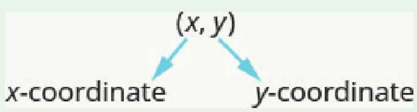


Quadrant I = Q I

Memorize

Ordered pair

An ordered pair, (x, y), gives the coordinates of a point in a rectangular coordinate system.



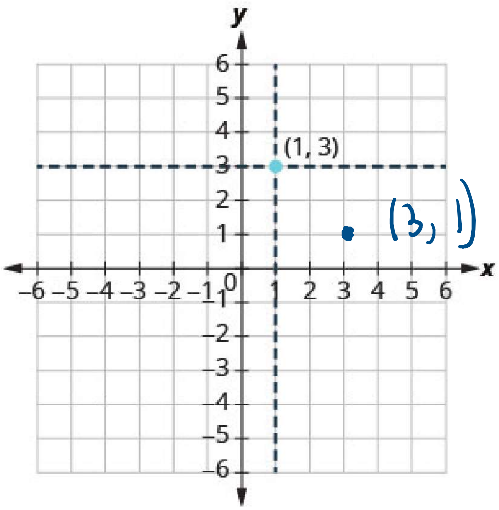
The first number is the x-coordinate.

The second number is the y-coordinate.

Memorize

The origin

The point $(0, 0)$ is called the origin. It is the point where the *x*-axis and *y*-axis intersect.

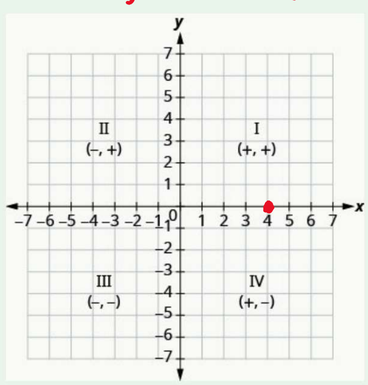


Memorize

Quadrants

We can summarize sign patterns of the quadrants in this way.

Quadrant I	Quadrant II	Quadrant III	Quadrant IV
(x, y)	(x, y)	(x, y)	(x, y)
$(+, +)$	$(, +)$	$(,)$	$(+,)$
	$(-, +)$	$(-, -)$	$(+, -)$



what quadrant is $(4,0)$ in?

$4 > 0$ ✓

$0 > 0$ No

$\therefore$ $(4,0)$ is not in any quadrant

Memorize

Linear equation

An equation of the form $Ax + By = C$, where A and B are not both zero, is called a linear equation **in two variables**.

A, B, C are constants

x and y are variables

Memorize

Standard Form of Linear Equation

A linear equation is in standard form when it is written $Ax + By = C$.

Memorize

Solution of a Linear Equation in Two Variables

An ordered pair (x, y) is a **solution** of the linear equation $Ax + By = C$, if the equation is a true statement when the *x*– and *y*-values of the ordered pair are substituted into the equation.

EXAMPLE 4

Determine which ordered pairs are solutions to the equation $x + 4y = 8$.

(0,2) A \left(0,2\right)\) B $(2, -4)$ C $(-4, 3)$

Solution

Substitute the x- and y-values from each ordered pair into the equation and determine if the result is a true statement.

(a)	(b)	(c)
(0, 2)	(2, –4)	(–4, 3)
$x = 0, y = 2$	$x = 2, y = -4$	$x = -4, y = 3$
$x + 4y = 8$	$x + 4y = 8$	$x + 4y = 8$
$0 + 4 \cdot 2 \stackrel{?}{=} 8$	$2 + 4(-4) \stackrel{?}{=} 8$	$-4 + 4 \cdot 3 \stackrel{?}{=} 8$
$0 + 8 \stackrel{?}{=} 8$	$2 + (-16) \stackrel{?}{=} 8$	$-4 + 12 \stackrel{?}{=} 8$
$8 = 8$ ✓	$-14 \neq 8$	$8 = 8$ ✓
(0, 2) is a solution.	(2, –4) is not a solution.	(–4, 3) is a solution.

3.2

Memorize

Graph of a linear equation

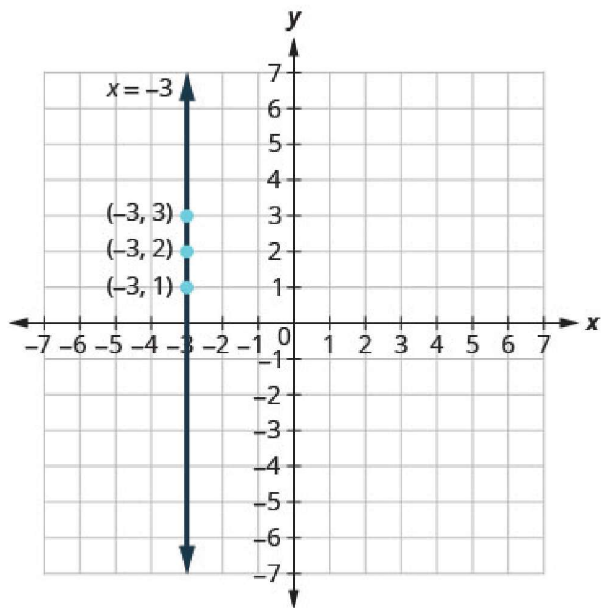
The graph of a linear equation $Ax + By = C$ is a line.

- Every point on the line is a solution of the equation.
- Every solution of this equation is a point on this line.

Memorize

Vertical line

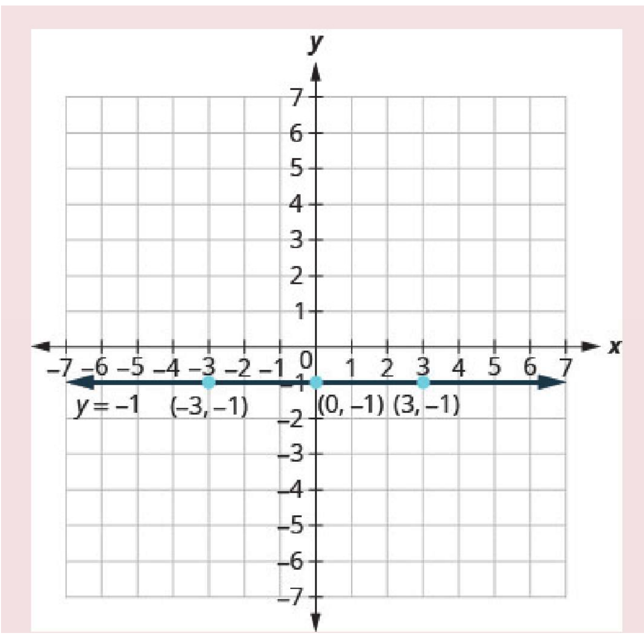
A vertical line is the graph of an equation of the form $x = a$.
The line passes through the *x*-axis at $(a, 0)$.



Memorize

Horizontal line

A horizontal line is the graph of an equation of the form $y = b$.
The line passes through the *y*-axis at $(0, b)$.



3.3

Memorize

Intercepts of a line

The points where a line crosses the *x*– axis and the *y*– axis are called the intercepts of a line.

Memorize

***x*– intercept and *y*– intercept of a line**

The *x*– intercept is the point $(a, 0)$ where the line crosses the *x*– axis.
The *y*– intercept is the point $(0, b)$ where the line crosses the *y*– axis.

Memorize

Find the *x*– and *y*– intercepts from the equation of a line

Use the equation of the line. To find:

- the *x*– intercept of the line, let $y = 0$ and solve for x.
- the *y*– intercept of the line, let $x = 0$ and solve for y.

$2x + y = 4$
Find x-intercept
$2x + 0 = 4$
solve for x
$2x = 4$
$x = 2$ or
the point $(2, 0)$

HOW TO: Graph a linear equation using the intercepts

The steps to graph a linear equation using the intercepts are summarized below.

1. Find the *x*– and *y*– intercepts of the line.
   - Let $y = 0$ and solve for x
   - Let $x = 0$ and solve for y.
2. Find a third solution to the equation.
3. Plot the three points and check that they line up.
4. Draw the line.

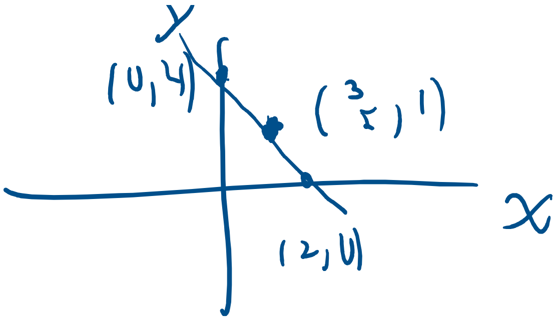
$2x + y = 4$

x-intercept
$2x + 0 = 4$
$2x = 4$
$x = 2$ or $(2, 0)$

y-intercept
$2(0) + y = 4$
$y = 4$ or $(0, 4)$

3rd point

y
(0,4)



3rd point

Let $y = 1$

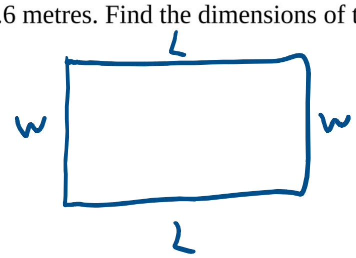
$2x + 1 = 4$

$2x = 3$

$\boxed{x = \frac{3}{2}}$

Your Name MTH 111 quiz 3 Write each problem. Calculator OK. Box around each answer.

1. The width of the rectangle is 0.7 metres less than the length. The perimeter of a rectangle is 52.6 metres. Find the dimensions of the rectangle.



Let L = length (m) of rectangle

Let W = width (m) " "

Find L, W

Let P = perimeter

$P = 2(L + W)$

$P = 52.6\text{ m}$

$\boxed{W = L - 0.7\text{ m}}$

$2(L + (L - 0.7\text{ m})) = 52.6\text{ m}$

$2(2L - 0.7\text{ m}) = 52.6\text{ m}$

$2L - 0.7\text{ m} = \frac{52.6}{2}\text{ m}$

$2L - 0.7\text{ m} = 26.3\text{ m}$

$2L = 26.3\text{ m} + 0.7\text{ m}$

$2L = 27.0\text{ m}$

$L = \frac{27.0\text{ m}}{2}$

$\boxed{L = 13.5\text{ m}}$

$W = L - 0.7\text{ m}$

$W = 13.5\text{ m} - 0.7\text{ m}$

$\boxed{W = 12.8\text{ m}}$

$2\overline{)52.6}$ = 26.3

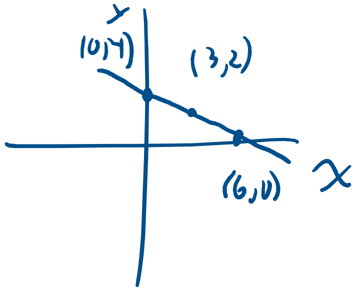
The dimensions of the rectangle are 13.5 meters by 12.8 meters.

2. Graph the line given by $2x + 3y = 12$ by finding and plotting the x-intercept, the y-intercept, and a convenient third point.

y

x-intercept | y-intercept

2. Graph the line given by $2x + 3y = 12$ by finding and plotting the x-intercept, the y-intercept, and a convenient third point.

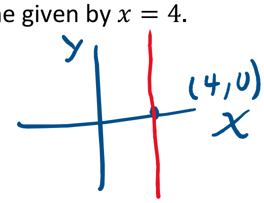


x-intercept
set $y = 0$
solve for x
$2x + (3)(0) = 12$
$2x = 12$
$\boxed{x = 6}$
or $(6,0)$

y-intercept
set $x = 0$
solve for y
$(2)(0) + 3y = 12$
$3y = 12$
$\boxed{y = 4}$ or
$(0,4)$

Let $x = 3$
$(2)(3) + 3y = 12$
$3y = 6$
$\boxed{y = 2}$

3. Plot the line given by $x = 4$.



4. Solve $P = 2L + 2W$ for L.

$2L = P - 2W$ $\longrightarrow$ $\boxed{L = \frac{P - 2W}{2}}$

$L = \frac{P}{2} - \frac{2W}{2}$

$\boxed{L = \frac{P}{2} - W}$

1. Simplify and write your answer in scientific notation, rounded to a single digit.
$\frac{(32)(0.67)}{0.003}$.

$\approx \frac{(3 \times 10^1)(7 \times 10^{-1})}{3 \times 10^{-3}} = \frac{7 \times 10^{1-1}}{10^{-3}} = 7 \times 10^{0-(-3)}$

$= \boxed{7 \times 10^3}$

32*0.67/0.003=7,146.6667

$\approx \boxed{7 \times 10^3}$

6. Explain <u>one</u> relation discussed in this class between algebra and geometry. Answer in one or two sentences.

The graph (geometry) of a linear equation (algebra) is a straight line.

Does your answer show understanding of what algebra is and what geometry is?