

Honors Algebra II Summer Assignment

Pinkston 2023 -2024
Full Packet with notes



Possible online Resources if you don't remember or know how to do a problem.
www.purplemath.com or try <http://www.khanacademy.org/>

The first and second chapters of the textbook we will be using (up to section 2.5) contain a review of basic Algebra concepts. Instead of using class time to discuss these topics, I am assigning problems to you for the summer! ☺ I have compiled a packet of problems from various websites and combined those problems with my notes. **Your textbook: Holt McDougal (Algebra II) Larson**

This packet has **problems for you to complete.**

Be sure to read and follow all stated directions.

DIRECTIONS:

Complete the problems with quality. Do your best to review the material. Be prepared to ask questions the first week of school.

This packet will **NOT** be due on the first day of school, as it has been in years past. **You will be required to submit the Summer Assignment in three submissions: dates to be determined.** There will also be a Summative Summer Assignment test within the first two-three weeks of school.

It is in your best interest to complete the packet, by the start of school, with quality. It is to be considered a review of pre-requisite content.

Supplies:

- It is strongly suggested that you purchase a graphing calculator for the upcoming year. Check your local office supply store/on line. There are several on the market, however, the Texas Instruments: TI-84 and TI-84plus "family" of calculators are the preferred choice here at Brandywine. A few calculators that may NOT be used on tests and quizzes are the TI-Nspire CAS, TI-89, (non-remote -DESMOS graphing calculator), and the TI-92 (Or any Casio, Hewlett-Packard, etc. equivalent).
- There will be a classroom set of graphing calculators for your use IN SCHOOL.
- **Please purchase a three - ring binder, 2.5 to 3 inch.** A one - inch binder will not be large enough to last throughout the entire school year.

I may check my school email every 2-3 weeks during the summer in case you have any concerns:
mary.pinkston@bsd.k12.de.us

Have a wonderful summer and I will see you soon! Ms. Pinkston ☺

The Summer Assignment contains "sections." **In the full packet, there are hints, formulas, or notes at the beginning of each section. This edited packet contains problems only.**

Summer Assignment:

I. Order of Operations (PEMDAS)

- Parentheses and other grouping symbols.
- Exponential expressions.
- Multiplication, Division, (from left to right)
- Addition & Subtraction.

Simplify each numerical/algebraic expression. Show all work! Only use a calculator to check.

1) $37 - (2^3 + 5 \times 2 - 3)$

2) $\frac{15 - [8 - (2 + 5)]}{18 - 5^2}$

3) $4(x + 2) + 3x$

4) $4(-3x + 7) - (9 + 11x)$

II. Evaluating Algebraic Expressions

To evaluate an algebraic expression:

- Substitute the given value(s) of the variable(s).
- Use order of operations to find the value of the resulting numerical expression.

Evaluate.

1) $x \left(\frac{y}{2} + 3z^2 \right) - 2x$ if $x = \frac{1}{2}$, $y = 4$, $z = -2$

2) $12a - 4a^2 + 7a^3$ if $a = -10$

3) $\frac{-b + \sqrt{b^2 - 4ac}}{2a}$ if $a = 1$, $b = -4$, $c = -21$

4) $1.2(3)^x$ if $x = 5$

III. Simplifying Radicals (Notes)

An expression under a radical sign is in simplest radical form when:

- 1) there is no integer under the radical sign with a perfect square factor,
- 2) there are no fractions under the radical sign,

Express the following in simplest radical form.

1) $\sqrt{63}$ _____ 2) $\sqrt{72}$ _____ 3) $\sqrt{242}$ _____ 4) $\sqrt{256}$ _____ 5) $\sqrt{147}$ _____

Simplify each expression. Answers should be written using positive exponents.

1) $m^5 \cdot m^{11}$ _____

2) $(b^6)^3$ _____

3) w^{-17} _____

4) $\frac{y^{12}}{y^8}$ _____

5) $(3x^7)(-5x^{-3})$ _____

6) $(-9z^3bcd^0)^5$ _____

7) $\frac{-15x^7y^{-2}}{25x^{-9}y^5}$ _____

8) $\left(\frac{4x^9}{12x^4}\right)^3$ _____

IV. Solving Linear Equations (Notes)

To solve linear equations, first simplify both sides of the equation. If the equation contains fractions, multiply the equation by the LCD to clear the equation of fractions. Use the addition and subtraction properties of equality to place variables on one side and constants on the other side of the equal sign. Use the multiplication and division properties of equality to solve for the variable. Express all answers as fractions in lowest terms or round decimals to the tenths place where appropriate.

Completed examples:

a) $3(x + 5) + 4(x + 2) = 21$
 $3x + 15 + 4x + 8 = 21$
 $7x + 23 = 21$
 $7x = -2$
 $x = -\frac{2}{7}$

b) $2(5x - 4) - 10x = 6x + 3(2x - 5)$
 $10x - 8 - 10x = 6x + 6x - 15$
 $-8 = 12x - 15$
 $7 = 12x$
 $\frac{7}{12} = x$

c) $\frac{2}{3}x + 5 = 6x - \frac{3}{4}$
 $12\left(\frac{2}{3}x + 5 = 6x - \frac{3}{4}\right)$
 $8x + 60 = 72x - 9$
 $69 = 64x$
 $\frac{69}{64} = x$

Solve for the indicated variable. Circle your answers.

1) $6n + 2 = 14n - 10$

2) $9(y + 2) - 12 = -51$

*3) $2x^2 = 100$

4) $5 + 2(k + 4) = 5(k - 3) + 10$

5) $\frac{1}{2}x - 8 = 3$

6) $-5 + \frac{b}{4} = 13$

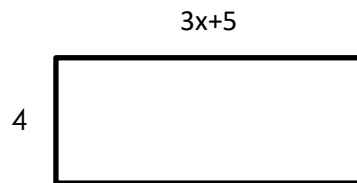
7) $8x - 24 = -6x + 18$

8) $4t + 7 + 6t = -33$

9) $4m + 2.3 = 9.7$

10) $\frac{1}{3} + \frac{4}{6}y = \frac{2}{3}$

- 11) Solve for x given the area = 215 sq. ft.



$x =$ _____

- 12) A taxicab company charges each person a flat fee of \$3.85 plus an additional \$.85 per quarter mile.

a. Write an equation that can be used to model the cost for each fare. _____

b. Use the equation to find the cost for one person to travel 8 mi. _____

V. Operations With Polynomials (Notes)

To add or subtract polynomials, just combine like terms.

To multiply polynomials, multiply the numerical coefficients and apply the rules for

Perform the indicated operations and simplify. Circle your answers.

1) $(2x - 3)(11x + 7)$

2) $(5x^2 - 4) - 2(3x^2 + 8x + 4)$

3) $-4x(6x + 11)$

4) $(8x - 7)^2$

5) $3x - 4 + 7x - 8 - 10x - 2$

6) $3x^3(4x + 5x^2 - 11x^4)$

7) $5x^3 + 2x^2 - 7x - x^3 + 5x^2 - 18$

8) $(5x^2 + x - 4) - (9x^2 - 4x - 11)$

VI. Linear Equations in Two Variables (Notes)

2.2 Slope (General information/Section 2.2 in the textbook)

How do you determine slope and rate of change?

- a. **Slope:** The slope of a non-vertical line is the ratio of the vertical change to the horizontal change. It can be described in many ways:

Rise, $\frac{\Delta y}{\Delta x}$, rate of change, average rate of change, (instantaneous r.o.c.),...

Run Δx

- b. In a rectangular coordinate system, the slope of the line that passes through two points: $P_1 (x_1, y_1)$ and $P_2 (x_2, y_2)$, is given by:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Problems: Calculate the slope of the line that contains each pair of points. Circle your answers.

1) $(-3, -4)$ $(-4, 6)$

2) $(-4, -6)$ $(-4, -8)$

3) $(-5, 3)$ $(-11, 3)$

Do the problem. Circle your answer.

- 4) Application: The number of U.S. cell phone subscribers increased from 16 million in 1993 to 44 million in 1996. Determine the average rate of change and use it to estimate the number of subscribers in 2010. (Use the formula for slope. Time is the *INDEPENDENT VARIABLE* (x).)

Answer: _____

What influences could support or refute your estimate? _____

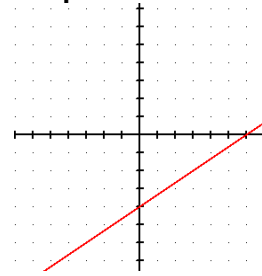
Completed examples(Notes)

a) Graph $y = \frac{2}{3}x - 4$.

Reminder: $y = mx + b$ is **slope-intercept form** where **m = slope** and **b = y-intercept**.

Therefore, slope is $\frac{2}{3}$ and the y-intercept is -4 .

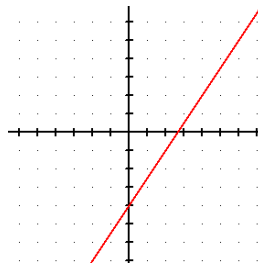
Graph accordingly. \longrightarrow



b) Graph $3x - 2y - 8 = 0$ using the slope and y-intercept.

Re-write in Slope-Intercept form: $y = \frac{3}{2}x - 4$

$m = 3/2$ $b = -4$



c) Write an equation of the line with a slope of 3 and passing through the point (2, -1)

$y = mx + b$

$-1 = 3(2) + b$

$-7 = b$

\longrightarrow

Equation: $y = 3x - 7$

Complete the following.

5. A hot air balloon is currently at an altitude of 10,000 feet. The pilot begins to **descend** the balloon at a rate of 36 feet per minute.

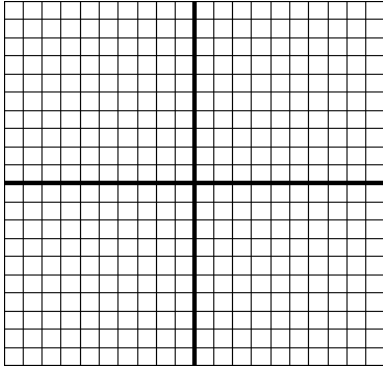
a) Write an equation for the altitude (A) of the balloon as a function of the time (t). _____

b) Find the altitude of the balloon after:

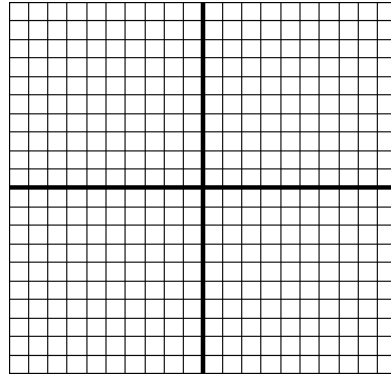
i. 10 minutes _____ ii. 30 minutes _____ iii. 1 hour _____

Sketch the graph of each line in the space provided.

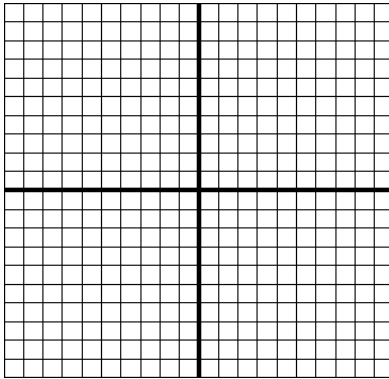
6. $y = 1x + 5$



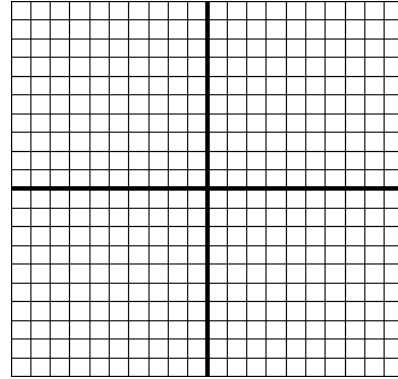
7. $y = -2x$



8. $y = \frac{5}{4}x - 8$

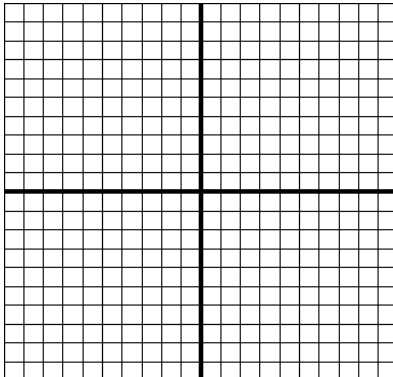


9. $y = -\frac{4}{3}x$

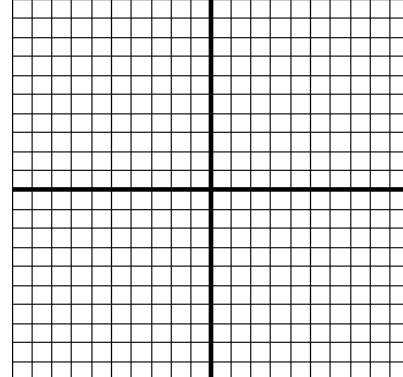


Sketch the graph of these "special" lines in the space provided. (Horizontal/Vertical)

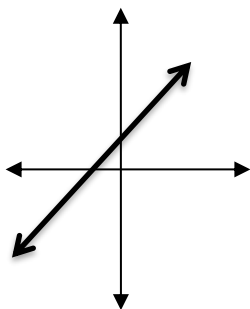
10. $y = 6$



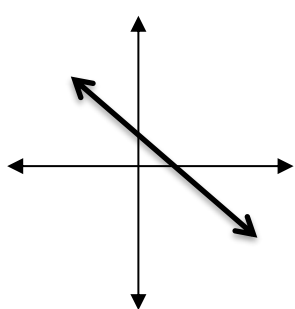
11. $x = -4$



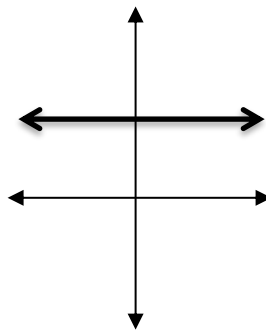
Notes/General information:

1) **Classifications:**

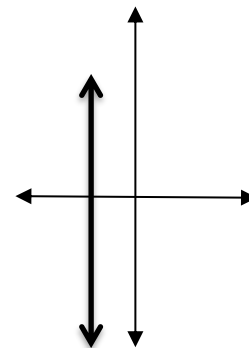
Line rises from left to right.
Slope is positive.



Line falls from left to right.
Slope is negative.



Line is horizontal.
Slope is ZERO.



Line is vertical.
Slope is undefined.
Or NO slope.

Do this problem.

Which line is steeper?

Line 1: $(1, 2)$ $(9, 12)$ or Line 2: $(-2, 7)$ $(-3, 15)$ Answer: Line _____ is steeper.

2) **Notes: Parallel and Perpendicular lines**

How do you determine if two non-vertical lines are parallel or perpendicular?

- Parallel lines are coplanar lines that do not intersect. (Geometry)
Parallel lines have the same slope.
- Perpendicular lines are coplanar lines that intersect to form four right angles. (Geometry)
- Perpendicular lines have slopes that are opposite (negative) reciprocals of each other.** (The product of their slopes is -1 .)

3) Equations of lines (graphs and equations)

- $y = mx + b$ **Slope Intercept Form** $Ax + By = C$ **Standard Form**
- $y - y_1 = m(x - x_1)$ **Point-Slope Form** $*y = b$ **horizontal line** $x = a$ **vertical line**
(“a” and “b” are constants)

4) How do I graph a line written in Standard Form?

Ex) The line: $2x - 4y = 8$ is in Standard Form. Do you remember how to graph this line?

Two ways: **Way # 1**, use the x and y intercepts. **Way # 2**, re-write in slope intercept form.)

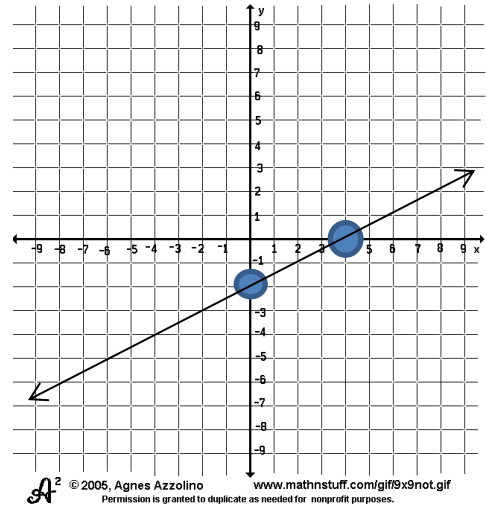
Finding the x and y intercepts of a line.

- The **x-intercept** is found by **setting $y = \text{zero}$** and solving for x . It is the value of x at which the graph intersects the x -axis.
- The **y-intercept** is found by setting **$x = \text{zero}$** and solving for y . It is the value of y at which the graph intersects the y -axis.

Worked out example:

Graph the linear function: $2x - 4y = 8$

Way #1.	$2x - 4y = 8$	
a) x-intercept	$2x - 4(0) = 8$	
	$2x = 8$	
	$x = 4$	x-int (4, 0)
b) y-intercept	$2(0) - 4y = 8$	
	$-4y = 8$	
	$y = -2$	y-int (0, -2)
Plot those two points.		



Fill in the blanks/complete the problems.

- How do I re-write a linear equation, written in Standard Form to an equation written in Slope-Intercept form? **Solve for y .**

Given $-4x + 6y = 12$, write in slope intercept form. _____

- How do I write an equation of a line using Point-Slope form?

Given a point on the line and the slope: $(-1, 5)$ $m = \frac{1}{4}$ _____

- How do I write the equations of vertical and horizontal lines?

A horizontal line has a slope of _____.

A vertical line has an **undefined** slope or has _____ slope.

You are to complete problems #4 - 14 on the following pages.

Completed example: Write an equation of the vertical line that passes through the point (2, 3).
 $x = 2$

- 4) Write an equation of the horizontal line that passes through the point (6, -5). _____
- 5) Write an equation of the line in slope-intercept form that contains the point (2, -6) and has slope $m = 5$.

- 6) Write an equation of the line in slope-intercept form that contains the points (1, -2) and (4, 7).

- 7) Line w is **perpendicular** to $y = 6x - 2$ and passes through the point (1, -2).
 What is the equation of line w ?

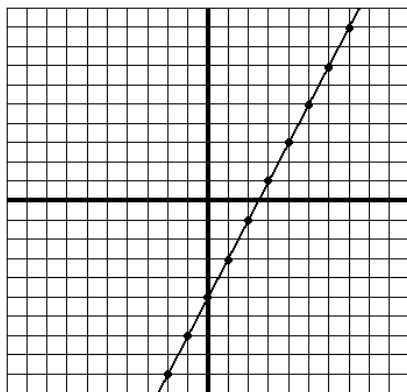
Write an equation of the line that:

- 8) passes through the point (-5,6) with a slope of 12. _____
- 9) passes through the points (4,1) and (7,-11) _____
- 10) passes through the points (5,13) and (7,13) _____

Find the slope and y-intercept and x-intercept of each line.

Then write the equation of each line in $y = mx + b$ form.

11.

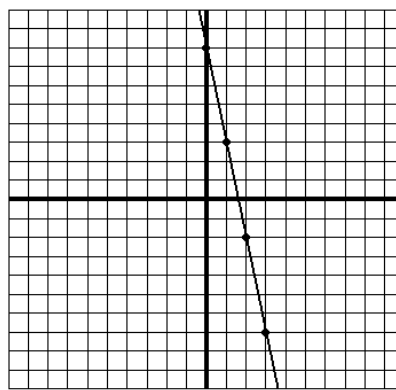


Slope = _____

y-intercept : _____

Equation: $y =$ _____

12.



Slope = _____

y-intercept: _____

Equation: $y =$ _____

13. $y = 4x - 7$

slope = _____

y-intercept (let $x = 0$) = _____x-intercept (let $y = 0$) = _____

14. $6x - 3y = 18$

slope = _____

y-intercept (let $x = 0$) = _____x-intercept (let $y = 0$) = _____**VII. Domain, Range, and function notation (notes/information)****1. A relation is a mapping or pairing of input and output values.**

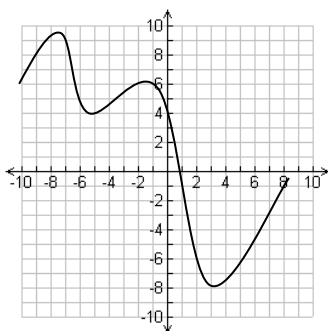
a) A relation can be written in many forms:

*Usually the set of all input values (x) is called the **domain** and the set of all output values (y) is called the **range**.Ex) $(1, 2)$ $(2, 3)$ $(6, 7)$ $(-4, 8)$ $(1, -4)$ $(-11.3, 9)$ Domain: $\{1, 2, 6, -4, -11\}$ *** Notice, you list the domain as "what you see" not "how many times you see it".Range: $\{2, 3, 7, 8, -4, 9\}$ **There are several ways to represent a relation:****Relations**a) Set of points: ex $\{(1,2), (-1, -3), (4,7)\}$

c) Table of values

2	1	-3	1.75	8	12	11
10	15.2	-11	5	6	12	4

b) Graph

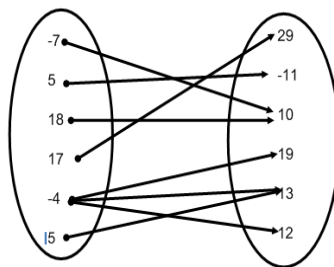


e) Verbal description:

The number of hours of sunlight and a specific day of the year in Delaware.

d) **Mapping Diagram***

Input Output

f) An equation: $y = 2x + 5$

2. **A function is a special type of relation. In a function, each input (x) value has only one output (y) value.** (In a list of points, all of the x's are different. A graph of a function must pass the vertical line test.)

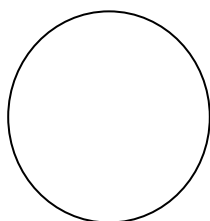
Example: $\{(1, 2), (-9, 100), (-23, 45), (2.1, 11), (5, 17)\}$

3. **The graph of a function must pass a VERTICAL LINE TEST.** What is the VLT you ask?

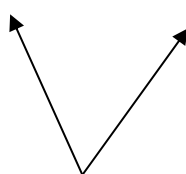
The vertical line test: For a *graph* to be called a **function** of x , **any vertical line** that is drawn may only **intersect** the graph **once**.

Given the following graphs, which ones are functions?

a) No



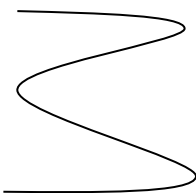
b) Yes



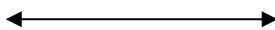
c) no (vertical line)



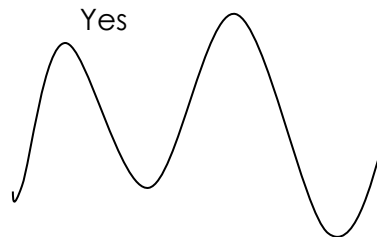
d) No



e) Yes



f) Yes



Problems:

1. Given the relation: $\{(-2, 3) (8, 7) (10, 4) (-12, 9) (10, 13) (-11, 15)\}$

Domain: { } Range: { }

Is it a function?

4. **Do you remember how to write an equation using function notation?**

In general, the symbol **f(x)** replaces **y**. It is read as "**f of x.**" It is the value of function "f" at x .

$f(x)$ can be used instead of y . We will use both.

$$f(x) = y$$

Whatever number is inside the parentheses, **SUBSTITUTE** the number in for the letter x , then **evaluate** to find the value for y .

Ex) Given $f(x) = 2x + 4$, find $f(2) = 2(2) + 4 = 4 + 4 = 8$, so $f(2) = 8$

$$f(3) = 2(3) + 4 = 6 + 4 = 10, \text{ so } f(3) = 10$$

Problems: Evaluate each function at the given value.

1) $f(x) = \frac{2x^2}{x-2}$ $f(3) = \underline{\hspace{2cm}}$ $f(0) = \underline{\hspace{2cm}}$ $f(-3) = \underline{\hspace{2cm}}$

2) $f(x) = |5x + 6|$ $f(-2) = \underline{\hspace{2cm}}$ $f(0) = \underline{\hspace{2cm}}$ $f(-3) = \underline{\hspace{2cm}}$

3) $g(x) = 3x + 8$ $g(3) = \underline{\hspace{2cm}}$ $g(0) = \underline{\hspace{2cm}}$ $g(-1) = \underline{\hspace{2cm}}$

4) $h(x) = \sqrt{2x-8}$ $h(12) = \underline{\hspace{2cm}}$ $h(15) = \underline{\hspace{2cm}}$ $h(4) = \underline{\hspace{2cm}}$

5) Bob's **average speed** during a trip is 57 miles per hour. Write a linear function that will model the distance he travels $f(x)$ as a function of the time (x) spent traveling. $\underline{\hspace{2cm}}$

6) Classify each as a Linear or Non-linear equation. **Circle the linear equations.**

a) $y = x^2 - 4x + 1$

b) $y = -2x + 3$

c) $y = 4^x$

d) $4x + 2y = 8$

e) $y = \frac{5+4x}{x-7}$

f) $y = \frac{4x+9}{3}$

VIII. Notes/Solving Systems of Equations

Solve for x and y:
 $x = 2y + 5$ $3x + 7y = 2$

Using **substitution** method:

$$\begin{aligned} 3(2y + 5) + 7y &= 2 \\ 6y + 15 + 7y &= 2 \\ 13y &= -13 \\ y &= -1 \end{aligned}$$

$$\begin{aligned} x &= 2(-1) + 5 \\ x &= 3 \end{aligned}$$

Solution: (3, -1)

Solve for x and y:
 $3x + 5y = 1$ $2x + 3y = 0$

Using **linear combination** (addition/subtraction, or elimination) method:

$$\begin{aligned} 3(3x + 5y) &= 3 \\ 3(3x + 5y) &= 3 \\ -5(2x + 3y) &= 0 \end{aligned}$$

$$\begin{aligned} 9x + 15y &= 3 \\ \underline{-10x - 15y} &= 0 \\ -1x &= 3 \\ x &= -3 \end{aligned}$$

$$\begin{aligned} 2(-3) + 3y &= 0 \\ y &= 2 \end{aligned}$$

Solution: (-3, 2)

Solve each system of equations by either the substitution method or the linear combination (addition/subtraction) method. Write your answer as an ordered pair.

$$1) \begin{cases} y = 2x + 4 \\ -3x + y = -9 \end{cases}$$

$$2) \begin{cases} 2x + 3y = 6 \\ -3x + 2y = 17 \end{cases}$$

$$3) \begin{cases} x - 2y = 5 \\ 3x - 5y = 8 \end{cases}$$

$$4) \begin{cases} 3x + 7y = -1 \\ 6x + 7y = 0 \end{cases}$$

IX. Do problems: Solving Linear Inequalities

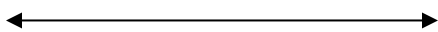
Solve each inequality. Then graph the solution set on a number line.

-Do the same steps that you would do if there were an equal sign. **Remember if you are multiplying or dividing by a negative number you need to reverse the inequality symbol.**

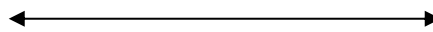
$$1. \quad 3(y - 7) < y + 5$$



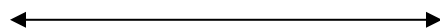
$$2. \quad -\left(\frac{3}{2}x + 18\right) \leq 6$$



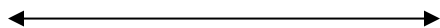
$$3. \quad 2x - 8 > 14$$



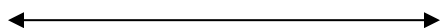
$$4. \quad -7 - 5z \geq -3(z + 1)$$



$$5. \quad 9 < \frac{m}{2} - 3 < 11$$



$$6. \quad \frac{2}{3}b - 2 > 10 \text{ or } \frac{3}{4}b + 5 < -4$$



*Be sure to perform the steps to **each** of the three parts of the inequality.

Ex) $-2 < 5 + x < 7$ $\frac{-5 \quad -5 \quad -5}{-7 < x < 2}$ $-7 \qquad \qquad \qquad 2$
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IX. Notes: Solving absolute value equations and inequalities

Solve each equation. Check your solutions.

-Isolate the absolute value expression.

Ex) $|2x + 3| = 5$

-When $|a| = b$, then $a = b$ or $a = -b$, so set up both equations and solve each.

$$2x + 3 = 5 \quad \text{OR} \quad 2x + 3 = -5$$

$$x = 1 \qquad \text{or} \qquad x = -4$$

Solve and graph the solution.

$$1. \quad |-6 + 3m| = 6$$



X. Direct Variation (notes/information)

The equation $y = ax$ represents **direct** variation between x and y . Two variable quantities that have the same rate, or ratio regardless of the values of the variables, have direct variation.

For example, if Carin gets paid \$8.00 per hour, then her total pay *varies directly* with the number of hours she works. If Carin works 36 hours one week, what is her gross pay?

$$(\$8.00) \times (36 \text{ hours}) = \$288.00$$

- We say: y *varies directly* as x **or**
 y is *directly proportional* to x **or**
the variables x and y vary directly

- The nonzero constant a , is called the *constant of variation*.

Solve for a if $y = ax$. $a = \frac{y}{x}$

Complete the table below:

x	Y	$\frac{y}{x}$
1	4	4/1
2	8	8/2
3	12	12/3
4	16	16/4
5	20	20/5

- What do you notice? _____
- What is the constant of variation for this direct variation model? **4**
- What is the y-intercept of this problem and all direct variation problems? **0**

In Algebra I, you may have solved direct variation problems using the following equations:

$$\frac{y_1}{x_1} = \frac{y_2}{x_2}$$

or

$$\frac{x_1}{x_2} = \frac{y_1}{y_2}$$

- How can you look at a set of points and determine if it represents direct variation?

Look at the $\frac{y}{x}$ ratio of all the points. If the ratio is the **4** for each and every pair, then the entire set of points represents direct variation.

Guided Problem completed below...

The refund Mark received for recycling aluminum cans *varies directly* with the number of cans he recycles. If Mark was paid **\$3.75** for **75 cans**, how much money will he receive if he recycles **500 cans**? Hint: You can set it up as: $\frac{\text{dollars}}{\text{cans}} = \frac{\text{dollars}}{\text{cans}}$ or $\frac{\text{dollars}}{\text{dollars}} = \frac{\text{cans}}{\text{cans}}$ etc.

$$\frac{\$3.75}{75} = \frac{x}{500} \quad (\text{Cross multiply and solve for } x.) \quad 75 \cdot x = (3.75)(500) \quad x = 250$$

Do these problems.

- 2) The number of calories, c , a person burns in the time, t , (in minutes), the person spends performing an activity **vary directly**. A 150 pound person can burn off 75 calories (1 cup of low-fat milk) by sitting in class for 50 minutes. How long must a 150 pound person sit in class to burn off 545 calories (a chicken pot-pie)?

- 3) Which set represents direct variation? Circle it.

X	1	2	3	5
Y	2	4	6	7

X	6	9	12	15
Y	2	3	4	5

Direct Variation word problems:

1. If the sales tax on a \$60 purchase is \$3.90, what would the sales tax be on a \$280 purchase?
2. A real estate agent made a commission of \$11,000 on a house that sold at \$220,000. At this rate, what commission will the agent make on a house that sells for \$450,000?
3. The acceleration of an object varies directly as the force acting on it. If a force of 240 Newtons causes an acceleration of 150 m/s², what force will cause an acceleration of 100 m/s²?
4. On a certain map, a field 280ft long is represented by a 5in. by 8in (long) rectangle. How wide is the field?
5. The stretch in a loaded spring varies directly as the load it support. A load of 15kg stretches a certain spring 3.6cm. What load would stretch the spring 6 cm?
6. The speed of an object falling from rest in a vacuum is directly proportional to the time it has fallen. After an object has fallen for 1.5seconds, its speed is 14.7m/sec. What is its speed after it has fallen 5 seconds?
7. The speed of an object falling from rest is directly proportional to the square root of the distance the object has fallen. When an object has fallen 36 feet, its speed is 48 ft/sec. How much farther must it fall before its speed is 80 ft/sec?