Summer 2019 Review
For
Students Entering

Geometry

Holy Name High School

Complete the following problems to the best of your ability.
Due Thursday, August 22, 2019.

(**NOTE:** Use www.khanacademy.org www.mathisfun.com or www.purplemath.com to find specific math related topics with accompanying videos and demonstrations)

NAME: ____________________

Holy Name Geometry Summer Assignment

Dear Student,

Welcome to Geometry! In order to have success in this class, you need to be competent in the following mathematical skills. This should be taken very seriously. Please work on this assignment throughout the summer using any and all resources available to you.

This is due the **first day** of class and will be recorded as your first grade in Geometry. It will be graded for **completion and accuracy**. You must **show work** to receive full credit.

Below are some websites that may be helpful to you:

www.khanacademy.org

www.mathisfun.com

www.purplemath.com

Good Luck and have a great summer!!

Proportions
I will be able to solve proportions.

Example 1: ***(Linear Equation)***		***Example 2:*** ***(Quadratic Equation)***	
$\frac{3a-5}{4} = \frac{a}{3}$	Original Problem	$\frac{x}{x+4} = \frac{2}{x}$	Original Problem
$3(3a-5) = 4a$	Cross-multiply	$x(x) = 2(x+4)$	Cross-multiply
$9a - 15 = 4a$	Distribute	$x^2 = 2x + 8$	Distribute
$5a = 15$	Combine like terms	$x^2 - 2x - 8 = 0$	Set the equation equal to zero
$a = 3$	Final Answer	$(x-4)(x+2) = 0$	Factor
		$x - 4 = 0 \text{ or } x + 2 = 0$	Zero Product Property
		$x = 4 \text{ or } x = -2$	Final Answer

Solve each proportion for the indicated variable. Show all work.

1. $\frac{x}{12} = \frac{2}{3}$

2. $\frac{n}{24} = \frac{n-3}{30}$

3. $\frac{x+6}{x-2} = \frac{2}{x}$

Solving Linear Equations involving fractions
I will be able to solve a linear equation with a fraction.

Example:

$\frac{2}{5}(x-3) = x-2$	Original Problem
$2(x - 3) = 5x - 10$	Multiply both sides by 5
$2x - 6 = 5x - 10$	Distribute the 2
$-6 = 3x - 10$	Subtract 2x from both sides of the equation
$4 = 3x$	Add 10 to both sides of the equation
$x = \frac{4}{3}$	Divide both sides of the equation by 3

Solve each equation. Show all work.

1. $\frac{2}{3}y - 8 = 0$
2. $15 - \frac{1}{6}x = -1$
3. $\frac{3}{4}(2-x) = x+1$

Slope of a Line
I will be able to find the slope of a line given two points and an equation of a line.

Examples:

Example 1

Find the slope of the line containing $(-3,4)$ and $(2,1)$

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

$m = \frac{1-4}{2-(-3)}$ Substitute values into the formula

$m = \frac{-3}{2+3}$ Simplify

$m = -\frac{3}{5}$ Simplify

Example 2

Find the slope of the line $2x - y = 1$

Solve the equation for y and put in slope-intercept form.

$y = mx + b$

$-y = -2x + 1$ Subtract $2x$ from each side

$y = 2x - 1$ Multiply both sides by -1

$m = 2$ Slope is 2

Find the slope of the line defined by the given two points. Show all work.

1. $(3,1)\ and\ (6,-4)$
2. $(-2,6)\ and\ (10,0)$
3. $(-4,1)\ and\ (-5,2)$

Find the slope of each line. Show all work.

4. $9x + 3y = 3$
5. $x + 2y = 4$
6. $-2x + 5y = 12$

Equations of Lines
I will be able to write an equation of a line in standard form when given the slope and one point.

Example:

Example

Write an equation of a line in standard form that passes through the point $(1, 2)$ and has a slope of $\frac{2}{3}$.

$y - y_1 = m(x - x_1)$	Use the ***point-slope form*** to find the equation
$y - 2 = \frac{2}{3}(x - 1)$	Substitute in for m, x_1, and y_1
$y - 2 = \frac{2}{3}x - \frac{2}{3}$	Distributive Property
$y = \frac{2}{3}x + \frac{4}{3}$	Add 2 to both sides
$3y = 2x + 4$	Multiply by 3 on both sides to clear the fractions
$-2x + 3y = 4$	Subtract $2x$ on both sides
$2x - 3y = -4$	Multiply equation by -1 to put equation in ***standard form***

Remember when adding fractions you must find a common denominator.

Example: $-\frac{2}{3} + \frac{2}{1}$

$-\frac{2}{3} + \frac{6}{3}$

$\frac{4}{3}$

Find the equation of the line in both **point-slope form** and **standard form** for the given slope and point. Show all work.

1. $(3,1)\ m = -3$

2. $(0,-4)\ m = -\frac{1}{2}$

3. $(-3,4)\ m = \frac{2}{3}$

point-slope form:

slope-intercept form:

point-slope form:

slope-intercept form:

point-slope form:

slope-intercept form:

Identifying Parallel and Perpendicular Lines
I will be able to determine if two lines are parallel or perpendicular.

Example:

Example 1

Two lines are ***parallel*** if their slopes are the same but they have different y-intercepts.

Line 1 contains $(-2,5)$ and $(4,3)$

Line 2 contains $(-1,3)$ and $(2,2)$

The slope of Line 1 is $\frac{3-5}{4-(-2)} = -\frac{1}{3}$

The slope of Line 2 is $\frac{2-3}{2-(-1)} = -\frac{1}{3}$

same slope

Example 2

Two lines are ***perpendicular*** if their slopes are negative reciprocals of each other.

Line 1 contains $(1,4)$ and $(2,7)$
Line 2 contains $(-2,1)$ and $(1,0)$

The slope of Line 1 is $\frac{7-4}{2-1} = 3$

The slope of Line 2 is $\frac{0-1}{1-(-2)} = -\frac{1}{3}$

Negative reciprocal slope

Determine if the lines are parallel, perpendicular, or neither. Show all work.

1. Line 1 contains $(1,7)$ *and* $(-3,-5)$
   Line 2 contains $(-6,-20)$ *and* $(0,-2)$

2. Line 1 contains $(4,-4)$ *and* $(-16,1)$
   Line 2 contains $(1,5)$ *and* $(5,21)$

3. Line 1 contains $(3,-13)$ *and* $(22,4)$
   Line 2 contains $(6,2)$ *and* $(-8,9)$

Write each equation in slope-intercept form and find the slope of each line. Compare the slopes and determine if the lines are parallel, perpendicular, or neither. Show all work.

4. $y = 2x - 1$
   $2x - y = -3$

Graphs of Linear Equations
I will be able to use slope-intercept form of a line to sketch a quick graph of a line.

Example:

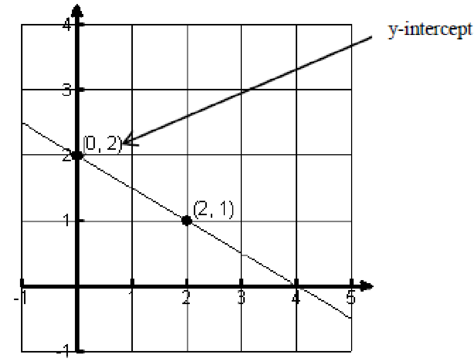
Example

Sketch the graph of the line $x+2y=4$.

Begin by solving the equation for y

$x+2y=4$	Original problem
$2y=-x+4$	Subtract x from both sides
$y=-\frac{1}{2}x+2$	Divide both sides by 2
$m=-\frac{1}{2},\ b=2$	List the slope(m) and the y-intercept(b)

To sketch the line, first plot the y-intercept (0, 2) then locate the second point by moving 1 unit down and 2 units to the right. Finally, draw the line through the two points.



Sketch the graph of each line using the slope and the y-intercept. Show all work.

1. $x-2y=4$

   $m =$ ____________

   y-int: ____________

2. $2x+3y=9$

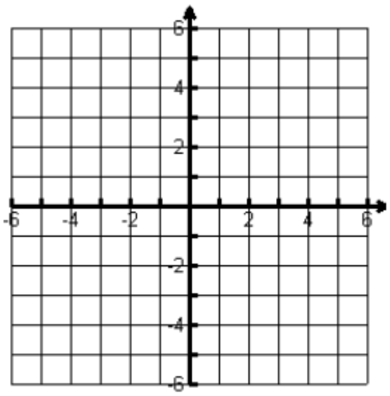
   $m =$ ____________

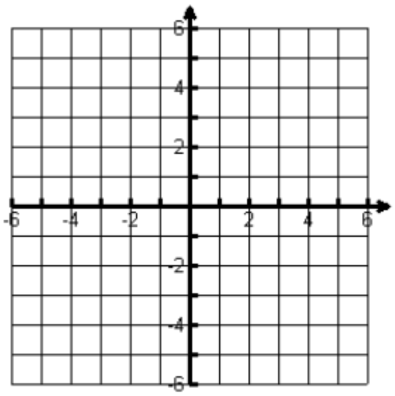
   y-int: ____________

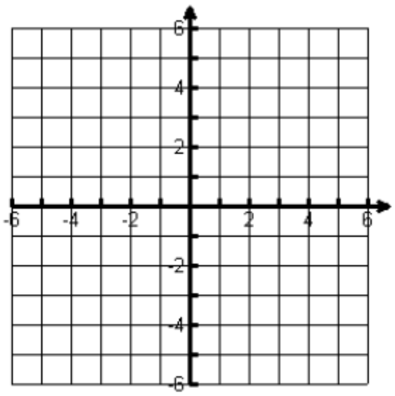
3. $-4x+2y=-1$

   $m =$ ____________

   y-int: ____________







Multiplying Polynomials
I will be able to multiply polynomials.

Example:

Example

$(x+2)(x^2+4x-3)$	Original problem
$=(x+2)(x^2+4x-3)$	Distribute the x
$=(x+2)(x^2+4x-3)$	Distribute the 2
$=x^3+4x^2-3x+2x^2+8x-6$	Perform multiplication
$=x^3+6x^2+5x-6$	Combine like terms

F L

$(5x-3)(4x+1)$

I O

$\mathbf{20x^2+5x-12x-3}$

F O I L

$\mathbf{20x^2-7x-3}$

Multiply the polynomials. Show all work.

1. $(x+2)(x-3)$
2. $(3x-1)(2x+3)$
3. $(x^2+1)(x-4)$
4. $(x-4)(2x^2+x-3)$

Factoring Polynomials
I will be able to factor the difference of two squares.

Examples:

In order for a polynomial to be a perfect square it must meet three conditions:
1. there are only two terms
2. each term is a perfect square
3. it must have a ***minus sign***

Example 1
Factor:
$x * x$ ← $x^2 - 25$ → $5 * 5$ Find the square root of each factor
$(x+5)(x-5)$ Follow the factoring pattern

Example 2
Factor:
$2x * 2x$ ← $4x^2 - 81$ → $9 * 9$ Find the square root of each factor
$(2x+9)(2x-9)$ Follow the factoring pattern

Factor the expression.

1. $x^2 - 36$
2. $x^2 - 81$
3. $x^2 - 49$
4. $9x^2 - 100$
5. $x^2 - 121$
6. $81x^2 - 4$

Factoring Polynomials
I will be able to factor trinomials

Example 1:

Example 1
Factor:

$x^2 - 10x + 16$ — 1×16, 2×8, 4×4 — Since the coefficient of the x^2 term is one, list all the factors of your last term

Next look at the last sign of the trinomial, since it is a ***plus*** sign pick the set of factors whose ***sum*** gives you the middle term 10.

$2 + 8 = 10$ therefore 2 and 8 are the correct factors. Since the middle term is -10 you would need -2 and -8.

$(x - \mathbf{2})(x - \mathbf{8})$ Solution

** *Hint*: To check your answer, simply use the foil method. If your answer is the same trinomial that you started with, you are correct!

Example 2: This is called "the ac method" used when there is a coefficient with the x^2 term

Factor $2x^2 + 15x + 18$.

In this example, $a = 2$, $b = 15$, and $c = 18$. You need to find two numbers that have a sum of 15 and a product of **$2 \cdot 18$ or 36**. Make a list of the factors of 36 and look for the pair of factors with a sum of 15.

Factors of 36	Sum of Factors
1, 36	37
2, 18	20
3, 12	15

Use the pattern $ax^2 + mx + px + c$, with $a = 2$, $m = 3$, $p = 12$, and $c = 18$.

$$\begin{aligned} 2x^2 + 15x + 18 &= 2x^2 + 3x + 12x + 18 \\ &= (2x^2 + 3x) + (12x + 18) \\ &= x(2x + 3) + 6(2x + 3) \\ &= (x + 6)(2x + 3) \end{aligned}$$

Therefore, $2x^2 + 15x + 18 = (x + 6)(2x + 3)$.

Factor completely.

1. $x^2 + 11x + 10$

2. $x^2 - 14x + 24$

3. $x^2 + 6x + 5$

4. $x^2 - 10x - 56$

5. $2x^2 - 3x - 2$

6. $16r^2 - 8r + 1$

7. $6x^2 + 5x - 6$

8. $3x^2 + 2x - 8$

9. $7x^2 - 31x - 20$

10. $2b^2 + 17b + 21$

Factoring to Solve a Quadratic Equation
I will be able to solve a quadratic equation by factoring and using the Zero-Product Property.

Examples:

Example 1

$x^2 - 7x + 10 = 0$		Original equation
$(x-5)(x-2) = 0$		Factor
$x - 5 = 0$	$x - 2 = 0$	Set each factor equal to zero
$x = 5$	$x = 2$	Solve each equation for x

Example 2

$x^2 = 5x + 24$		Original equation
$x^2 - 5x - 24 = 0$		Write equation in standard form by bringing all terms to one side
$(x-8)(x+3) = 0$		Factor
$x - 8 = 0$	$x + 3 = 0$	Set each factor equal to zero
$x = 8$	$x = -3$	Solve each equation for x

Solve the equation by factoring and then use the Zero-Product property. Show all work

1. $x^2 - 2x - 8 = 0$
2. $x^2 - 16x - 36 = 0$

3. $4x^2 + 27x - 7 = 0$

4. $3x^2 + 29x - 10 = 0$

5. $6x^2 - 5x - 4 = 0$

Holy Name Geometry Summer Assignment

Solve Systems of Linear Equations by Elimination or Substitution
I will be able to solve a system of equations algebraically using the elimination or substitution method.

1) ***Elimination Method-*** When solving a system of linear equations by the **elimination method** our first objective is to get similar terms to be opposites. Once we have opposites we can combine both equations and solve.

Example 1 **Solve the following system**

3x - 4y=-5
-3x+9y=-15 — Our first objective is accomplished because we have opposites with 3x and -3x, thus we can combine the two equations

Note, we eliminated one of the variables

5y=-20 — Divide both sides by 5
y=-4 — To calculate the x-value substitute -4 for y in either equation

3x–4(-4)=-5 — Simplify the left side
3x + 16 =-5 — Subtract 16 from both sides
3x=-21 — Divide both sides by 3
x=-7
Answer (-7, -4)

Note, I substituted the y-value,-4, into the first equation, however if I would substitute the y-value,-4, into the second equation it would still result in an x-value of -7.
-3x+9(-4)=-15   -3x-36=-15   -3x=21   x=-7

Example 2 **Solve the following system**

2x+5y=14
3x-2y=-36 — In order to get opposite terms I am going to multiply the first equation by -3 and the second equation by 2**.**

-6x-15y=-42
6x-4y=-72 — x terms are opposites thus I will now combine the two equations

-19y=-114 — Divide both sides by -19
y=6 — To calculate the x-value substitute 6 in for y in either equation

3x-2(6)=-36 — Simplify the left side
3x-12=-36 — Add 12 to both sides
3x=-24 — Divide both sides by 3
x=-8
The solution is (-8,6)

Note, in both examples I created opposites with the x term, but remember you can create opposites with either the x term or the y term.

2) When solving a system of linear equations by the **substitution method** our first objective is to get the x or y by itself.

The Substitution Method

Step 1: *Solve one of the equations for one of its variables.*
Step 2: *Substitute the expression from Step 1 into the other equation and solve for the other variable.*
Step 3: *Substitute the value from Step 2 into the revised equation from Step 1 and solve.*

Example 1 **Solve the following system**

2x +5y= -5
x+ 3y = 3 — Our first objective is solve equation 2 for x.

x+ 3y = 3 — Subtract 3y from both sides.

Equation 1: **x= -3y + 3** — Step 1 is complete.

2**x** +5y= -5

2(**-3y + 3) +5y=-5** — Step 2: Substitute the expression for x into Equation 1 and solve for y.
-6y **+ 6 +5y = -5** — Solve for y.
-y=-11
y=11

x= -3**y** + 3 — Step 3: Substitute the value of y into revised Equation 2 and solve for x.
x= -3(**11**) + 3
x=-30 — Step 4: Write the solution as an ordered pair (-30, 11)
The solution is (-30, 11)

Directions: Solve the system of equations by using either the substitution method or the linear combination method. Write your answer as an ordered pair.

1. $y = 3x$
   $2x + 3y = 22$

2. $3x - y = -2$
   $5x + 2y = 15$

3. $4x-10y = 18$
   $-2x+5y = -9$

4. $3x + 4y = 27$
   $5x - 3y = 16$

5. $2x - 4y = -22$
   $3x + 3y = 30$

6. $2y = 3x - 15$
   $2x - 4y = 26$

7. $-5x - 7y = 11$
   $x - 2y = -9$

8. $y = -3x - 4$
   $-9x - 3y = -2$

Simplifying Radical Expressions and Solving Radical Equations
I will be able to simplify expressions containing radicals and solve equations with radicals

Example 1: Simplify $\sqrt{180}$.

$\sqrt{180} = \sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 5}$ Prime factorization of 180

$= \sqrt{2^2} \cdot \sqrt{3^2} \cdot \sqrt{5}$ Product Property of Square Roots

$= 2 \cdot 3 \cdot \sqrt{5}$ Simplify.

$= 6\sqrt{5}$ Simplify.

Example 2: Simplify $\sqrt{120a^2 \cdot b^5 \cdot c^4}$.

$\sqrt{120a^2 \cdot b^5 \cdot c^4}$

$= \sqrt{2^3 \cdot 3 \cdot 5 \cdot a^2 \cdot b^5 \cdot c^4}$

$= \sqrt{2^2} \cdot \sqrt{2} \cdot \sqrt{3} \cdot \sqrt{5} \cdot \sqrt{a^2} \cdot \sqrt{b^4 \cdot b} \cdot \sqrt{c^4}$

$= 2 \cdot \sqrt{2} \cdot \sqrt{3} \cdot \sqrt{5} \cdot |a| \cdot b^2 \cdot \sqrt{b} \cdot c^2$

$= 2|a|b^2c^2\sqrt{30b}$

Example 3: Simplify $\sqrt{\frac{56}{45}}$.

$\sqrt{\frac{56}{45}} = \sqrt{\frac{4 \cdot 14}{9 \cdot 5}}$ Factor 56 and 45.

$= \frac{2 \cdot \sqrt{14}}{3 \cdot \sqrt{5}}$ Simplify the numerator and denominator.

$= \frac{2\sqrt{14}}{3\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$ Multiply by $\frac{\sqrt{5}}{\sqrt{5}}$ to rationalize the denominator.

$= \frac{2\sqrt{70}}{15}$ Product Property of Square Roots

If the denominator is a binomial with a radical, you must use the conjugate to rationalize the denominator

Example 4: **Simplify $\frac{3}{5+\sqrt{2}}$.**

$\frac{3}{5+\sqrt{2}} = \frac{3}{5+\sqrt{2}} \cdot \frac{5-\sqrt{2}}{5-\sqrt{2}}$ The conjugate of $5+\sqrt{2}$ is $5-\sqrt{2}$.

$= \frac{3(5-\sqrt{2})}{5^2-(\sqrt{2})^2}$ $(a-b)(a+b) = a^2 - b^2$

$= \frac{15-3\sqrt{2}}{25-2}$ or $\frac{15-3\sqrt{2}}{23}$ $(\sqrt{2})^2 = 2$

Simplify the radical expressions.

1. $\sqrt{28}$ **2.** $\sqrt{68}$ **3.** $\sqrt{60}$ **4.** $\sqrt{75}$

5. $\sqrt{162}$ **6.** $\sqrt{3} \cdot \sqrt{6}$ **7.** $\sqrt{2} \cdot \sqrt{5}$ **8.** $\sqrt{5} \cdot \sqrt{10}$

9. $\frac{\sqrt{4}}{3-\sqrt{5}}$ **10.** $\frac{\sqrt{8}}{2+\sqrt{3}}$