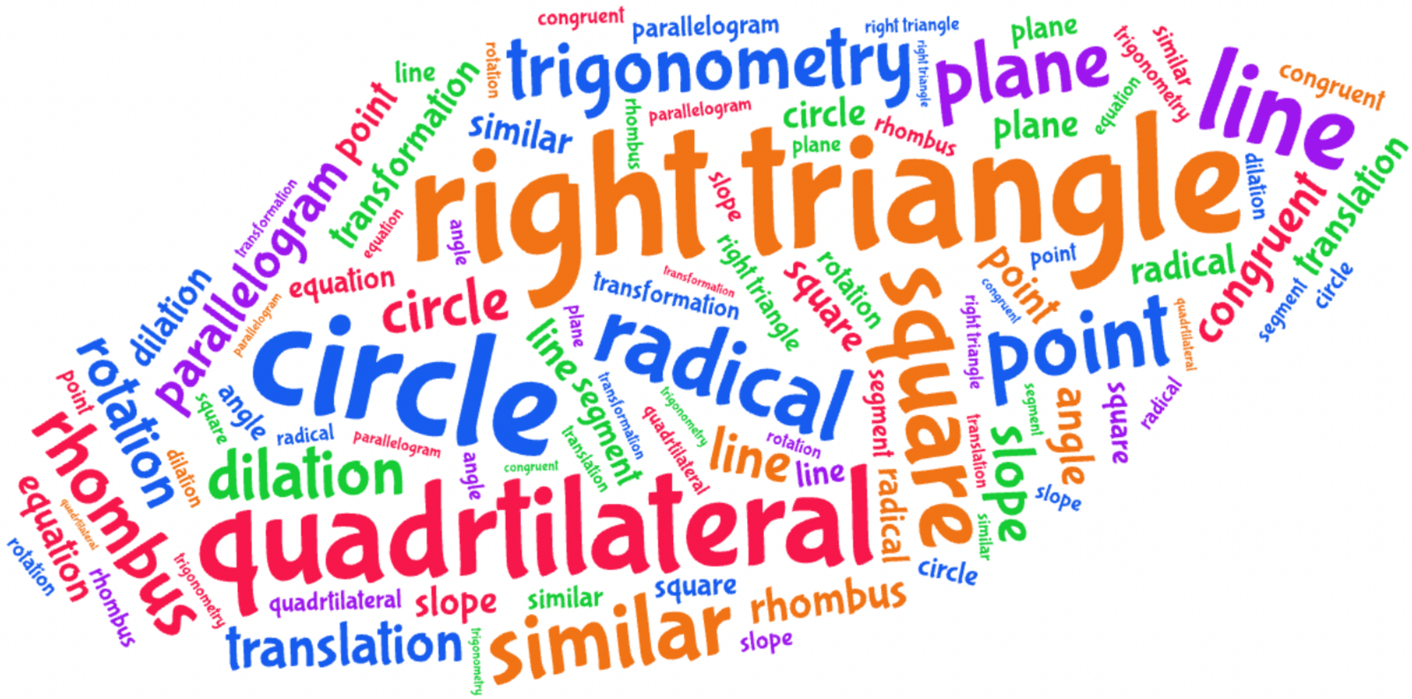


Honors Geometry Summer Packet

Honors Geometry is right around the corner and you need to make sure you are ready! Many of the concepts you learned in Algebra I will be used in Geometry and you will be expected to remember them. Please take some time this summer and work through this review packet. Refreshing your memory of the concepts learned in Algebra I will help you hit the ground running in Geometry in the fall.

Even though no one likes to do “homework” over summer vacation, putting in a little time up front will definitely help pay off next year. This packet is designed to take about a couple hours to do the entire thing so spread out the work. If you do a little each day, it will be done in no time! It will be collected next fall by your Honors Geometry teacher in preparation for our first test.

We highly recommend that you purchase a TI-84 graphing calculator prior to the start of the school year. Calculators will be used regularly in class; with some math topics being unable to be solved without a calculator. Graphing calculators are required for the NJSLA exam and NJGPA exam as well as used on the SATs and for future high school or college math classes. Regular use of your own calculator throughout high school encourages familiarity and comfort.

Have a great summer, looking forward to meeting you in September!!

Topics Covered in Algebra I that you need to know for Geometry:

- Solving linear equations
- Solving systems of equations
- Factoring
- The quadratic formula
- Distance formula
- Midpoint formula
- Graphing lines
- Writing equations of lines

Plus more!!

Some links that might be helpful are:
https://www.mathhelp.com/
https://www.themathpage.com/Alg/algebra.htm
https://tutorial.math.lamar.edu/classes/alg/alg.aspx

Name: ________________________________

Show all work in the space provided. Highlight or circle your final answers.

SOLVING EQUATIONS

Show all work. Leave all answers as fractions in simplest form, no decimal answers.

1. $5x + 3 = 23$	2. $8 - 5w = -37$	3. $4x - 9 = 7x + 12$
4. $2(90 - x) + 180 - x = 45$	5. $\frac{2x-5}{7} = 4$	6. $\frac{1}{2}z - \frac{3}{4} = z - \frac{5}{8}$

SOLVING PROPORTIONS

Remember, solve proportions using cross-multiplication. Here is an example if you are stuck:

$$\frac{2+x}{5} = \frac{3x-1}{9}$$

$$9(2+x) = 5(3x+1)$$

$$18 + 9x = 15x + 5$$

$$18 = 6x - 5$$

$$23 = 6x$$

$$x = \frac{23}{6} \ or \ 3\frac{5}{6}$$

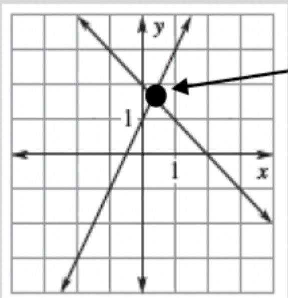
7. $\frac{a}{6} = \frac{-5}{2}$	8. $\frac{2k}{3} = \frac{k+1}{2}$	9. $\frac{j+3}{-5} = \frac{j-2}{3}$

SOLVING SYSTEMS OF EQUATIONS

A system of equations is two equations with two variables, usually x and y.
You can't solve each equation individually, but with 2 equations you can use either *substitution* or *elimination* to solve. The solution of the system is the **ordered pair** that works in both equations. If you remember that each equation represents a line, you are just trying to find the ordered pair where the two lines intersect.

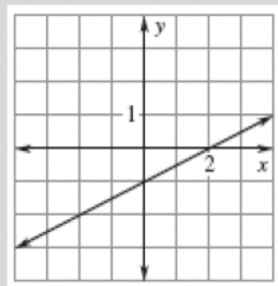
Possibilities:

One Solution



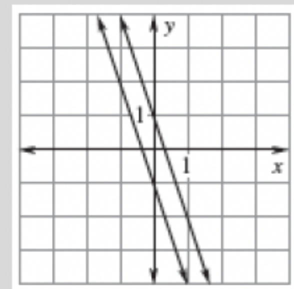
The lines intersect and the solution is the ordered pair where the two lines meet.

Infinite # of Solutions



The lines are exactly the same so lie right on top of each other. The solution is all real numbers or you can just write the equation of the line as the solution because every point on the line works.

No Solution



The lines don't intersect because they are parallel so no solution exists. Your answer would be no solution or Ø.

Solve using the **substitution** method. *Solutions must be written as an ordered pair, no solution or all real numbers.*
Here is an example if you are stuck:

$$y = x - 1 \qquad 2x - y = 1$$

Since y is the same as x-1, we can replace y with x – 1 in the second equation!

$$2x - (x - 1) = 1$$

$$2x - x + 1 = 1$$

$$x + 1 = 1$$

$$x = 0$$

Now that you know x, you can just plug x into either equation to find the value of y.

$$y = 0 - 1$$

$$y = -1$$

SOLUTION: (0, -1)

10. $y = x + 8$
    $2y + x = 1$

11. $y = -2x + 5$
    $3x - 2y = 4$

Solve using the **elimination** method. *Solutions must be written as an ordered pair, no solution or all real numbers.*

Here are two examples if you are stuck:

Try to eliminate one of the variables by adding or subtracting the equations. Sometimes examples are all set for you, like Example A, but then there are those like Example B when you will need to force one of the variables to eliminate by multiplying each equation by a number.

A.

$$x + y = 5$$
$$\underline{+\,x - y = 1}$$
$$2x = 6$$
$$x = 3$$

Now that you know x, you can just plug x into either equation to find the value of y.

$$3 + y = 5$$
$$y = 2$$

SOLUTION: (3, 2)

B.

$$2x + 4y = -18$$
$$-3x + y = -1$$

➡

$$2x + 4y = -18$$
$$-4(-3x + y = -1)$$

$$2x + 4y = -18$$
$$\underline{+\,12x - 4y = 4}$$
$$14x = -14$$
$$x = -1$$

Now that you know x, you can just plug x into either equation to find the value of y

$$2(-1) + 4y = -18$$
$$-2 + 4y = -18$$
$$4y = -16$$
$$y = -4$$

SOLUTION: (-1, -4)

12. $2x + y = 1$
$3x - y = 14$

13. $x + 2y = 8$
$2x - 3y = -19$

THE QUADRATIC FORMULA

Steps for solving a quadratic equation, $ax^2 + bx + c = 0$, using the quadratic formula:

1. Get the equation equal to zero
2. Determine a, b and c
3. Plug a, b and c, into the formula
4. Solve algebraically to get the two solutions

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Here is an example if you are stuck:

$2x^2 - 5x - 12 = 0$ a = 2 b = -5 c = -12	After making sure that one side is equal to 0, identify a, b and c. Be sure to include the signs on a, b and c!
$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-12)}}{2(2)}$	Substitute the values of a, b and c into the formula.
$x = \frac{5 \pm \sqrt{25 + 96}}{4}$ $x = \frac{5 \pm \sqrt{121}}{4}$ $x = \frac{5 \pm 11}{4}$	Start simplifying under the root and follow the order of operations!
$x = \frac{5 + 11}{4}$ *and* $\frac{5 - 11}{4}$ $x = \frac{16}{4}$ *and* $\frac{-6}{4}$	Once the root is simplified, split the problem into two and solve.
$x = 4$ *and* $x = -1.5$ $(or\ -\frac{3}{2})$	If possible, simplify.

14. $2x^2 - 4x - 30 = 0$	15. $5p^2 - 125 = 0$	16. $n^2 + 9n + 11 = 0$

17. $2x^2 - 3x - 15 = 5$	18. $7n^2 - 16 = 6$	19. $2v^2 - 36 - 4v = -3v$

FACTORING

When factoring, you break up a polynomial into factors or parts.
Make sure one side of the equation is zero before factoring.
Always check for a GCF (greatest common factor) first when factoring. To check your answers after factoring, multiply the binomials together using FOIL (first, outer, inner, last).

There are many types of factoring.

Here is an example of each scenario if you are stuck:

GCF (Greatest Common Factor)

$$3x^2 - 12x = 3x(x-4)$$

Check:

$$3x(x-4)$$
$$3x(x) - 3x(4)$$
$$3x^2 - 12x \checkmark$$

DOTS (Difference of Two Squares)

$$x^2 - 36 = (x+6)(x-6)$$

Check:

$$(x+6)(x-6)$$
$$x(x) + x(-6) + 6(x) + 6(-6)$$
$$x^2 - 6x + 6x - 36$$
$$x^2 - 36 \checkmark$$

Trinomials

No leading coefficient
(no number in front of the squared term)

$$c^2 + 8x + 12 = (c+6)(c+2)$$

Check:

$$(c+6)(c+2)$$
$$c(c) + c(2) + 6(c) + 6(2)$$
$$c^2 + 2c + 6c + 12$$
$$c^2 + 8c + 12 \checkmark$$

With leading coefficient
(number in front of squared term)

$$3x^2 + 4x - 7 = (3x+7)(x-1)$$

Check:

$$(3x+7)(x-1)$$
$$3x(x) + 3x(-1) + 7(x) + 7(-1)$$
$$3x^2 - 3x + 7x - 7$$
$$3x^2 + 4x - 7 \checkmark$$

20. $p^2 + 6p + 5 = 0$	21. $a^2 - 8a = 0$	22. $c^2 + 8c + 12 = 0$
23. $m^2 - 144 = 0$	24. $4x^2 - 17x + 10 = -5$	25. $2n^2 + 13n + 19 = 4$
26. $5v^2 + 3 = -16v$	27. $6x^2 + 5x - 25 = 0$	28. $60p^2 + 4p - 160 = 0$

COMPLETING THE SQUARE

Like the quadratic formula and factoring, completing the square is another way to solve quadratics.
When you complete the square, you turn one side of equation into a perfect square trinomial.
Steps to completing the square:

1. Rewrite the quadratic equation as $x^2 + bx = c$ by moving the constant term, c, to the other side of the equation
2. Determine half of the coefficient of x and square it
3. Add this value to both sides of the equation
4. Factor the trinomial on the left hand side of the equation
5. To solve for x, take the square root of both sides of the equation.
6. Solve algebraically to get two solutions.

Here is an example if you are stuck:

$x^2 - 6x + 5$

$x^2 - 6x = -5$ ← Rewrite the equation by moving the constant term to the other side.

$\frac{-6}{2} = -3$
$(-3)^2 = 9$ ← Determine half of the coefficient of x and square it

$x^2 - 6x \boxed{+9} = -5 \boxed{+9}$ ← Add this value to both sides of the equation

$x^2 - 6x + 9 = 4$

$(x + 3)(x + 3) = 4$ ← Factor the trinomial on the left hand side of the equation

$(x + 3)^2 = 4$

$\sqrt{(x + 3)^2} = \sqrt{4}$ ← Take the square root of both sides of the equation

$x + 3 = \pm 2$

$x + 3 = 2 \quad or \quad x + 3 = -2$ ← Once the root is simplified, split the problem into two and solve.
If possible, simplify.
If not, leave your answer as a fraction in simplest form.

$x = -1 \quad or \quad x = -5$

29. $a^2 + 8a - 9 = 0$	30. $k^2 - 14k - 15 = 0$

31. $n^2 + 16n - 17 = 0$	32. $x^2 - 20x + 64 = 0$

SIMPLIFYING RADICALS

Simplify radical expressions by finding the **largest** perfect square that goes into the radicand (the number under the square root).

List the largest perfect squares up to and including 225:

Here is an example if you are stuck:

$$2\sqrt{50}$$
$$2 \cdot \sqrt{25} \cdot \sqrt{2}$$
$$2 \cdot 5\sqrt{2}$$
$$10\sqrt{2}$$

33. $\sqrt{49}$	34. $\sqrt{500}$	35. $\sqrt{169}$	36. $\sqrt{12}$
37. $\sqrt{243}$	38. $5\sqrt{32}$	39. $14\sqrt{448}$	40. $10\sqrt{63}$

ADDING AND SUBTRACTING RADICAL EXPRESSIONS

To add or subtract radical expressions,

1. Simplify all radicals
2. Combine all like radicals (radicals that have the same number under the square root) by adding or subtracting the coefficient

Here are some examples if you are stuck

$-3\sqrt{5}+5\sqrt{5}$ $(-3+5)\sqrt{5}$ $2\sqrt{5}$	$-3\sqrt{12}+5\sqrt{8}-3\sqrt{3}$ $-3\cdot\sqrt{4}\cdot\sqrt{3}+5\cdot\sqrt{4}\cdot\sqrt{2}-3\sqrt{3}$ $-3\cdot 2\cdot\sqrt{3}+5\cdot 2\cdot\sqrt{2}-3\sqrt{3}$ $-6\sqrt{3}+10\sqrt{2}-3\sqrt{3}$ $(-6-3)\sqrt{3}+10\sqrt{2}$ $-9\sqrt{3}+10\sqrt{2}$

41. $2\sqrt{8}-6\sqrt{18}$	42. $-3\sqrt{12}+3\sqrt{3}+3\sqrt{20}$	43. $3\sqrt{27}-10\sqrt{28}+6\sqrt{7}$

MULTIPLYING RADICALS

To multiply radical expressions,

1. Multiply the coefficients
2. Multiply the radicands
3. Simplify

Here are some examples if you are stuck

$(-3\sqrt{5})(5\sqrt{5})$ $(-3*5)(\sqrt{5*5})$ $-12\sqrt{25}$ $-12*5$ -60	$(-3\sqrt{12})(-4\sqrt{5})$ $(-3*-4)(\sqrt{12*5})$ $12\sqrt{60}$ $12\sqrt{4}\sqrt{15}$ $12(2)\sqrt{15}$ $24\sqrt{15}$

44. $(2\sqrt{8})(4\sqrt{6})$	45. $(-3\sqrt{12})(-5\sqrt{3})$	46. $(2\sqrt{7})(\sqrt{5})$

DIVIDING RADICALS/RATIONALIZING THE DENOMINATOR

Radicals **may not** be in the denominator of a fraction. To fix this we use a process called rationalizing the denominator.

To rationalize the denominator,

1. Simplify the fraction, if possible
2. Multiply the numerator and denominator by the radicand in the denominator
3. Simplify all radicands
4. Simplify all fractions

Here are some examples if you are stuck

$\frac{\sqrt{10}}{\sqrt{5}}$ $\frac{\sqrt{10}}{\sqrt{5}}\cdot\frac{\sqrt{5}}{\sqrt{5}}$ $\frac{\sqrt{50}}{\sqrt{25}}$ $\frac{\sqrt{25}\cdot\sqrt{2}}{5}$ $\frac{5\sqrt{2}}{5}$ $\sqrt{2}$	$\frac{2\sqrt{7}}{\sqrt{3}}$ $\frac{2\sqrt{7}}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}$ $\frac{2\sqrt{21}}{\sqrt{9}}$ $\frac{2\sqrt{21}}{3}$	$\sqrt{\frac{18}{27}}$ $\sqrt{\frac{2}{3}}$ $\frac{\sqrt{2}}{\sqrt{3}}$ $\frac{\sqrt{2}}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}$ $\frac{\sqrt{6}}{\sqrt{9}}$ $\frac{\sqrt{6}}{3}$

47. $\frac{\sqrt{11}}{\sqrt{6}}$	48. $\frac{4\sqrt{3}}{\sqrt{6}}$	49. $\sqrt{\frac{8}{30}}$	50. $\sqrt{\frac{32}{18}}$