



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 | ➤ Distance formula |
| ➤ Solving systems of equations | ➤ Midpoint formula |
| ➤ Factoring | ➤ Graphing lines |
| ➤ The quadratic formula | ➤ Writing equations of lines |

Plus more!!

Some links that might be helpful are:

<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:

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

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

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

$$18 = 6x - 5$$

$$23 = 6x$$

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

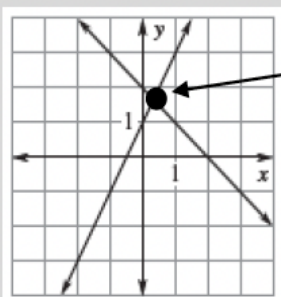
7. $\frac{a}{6} = \frac{-5}{2}$	8. $\frac{2k}{3} = \frac{k+1}{2}$	9. $\frac{j+3}{-5} = \frac{j-2}{3}$
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SOLVING SYSTEMS OF EQUATIONS

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.

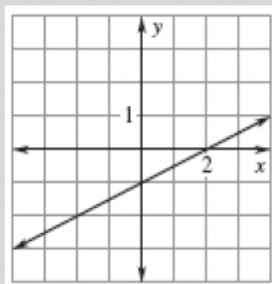
Possibilities:

One Solution



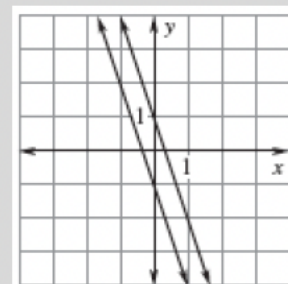
The lines intersect and the solution is the ordered pair where the two lines meet.

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 \emptyset .

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:

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

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.

$$\begin{array}{r} x + y = 5 \\ + x - y = 1 \\ \hline 2x = 6 \\ x = 3 \end{array}$$

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

$$\begin{array}{r} 3 + y = 5 \\ y = 2 \end{array}$$

SOLUTION: (3, 2)

B. $2x + 4y = -18$ $2x + 4y = -18$
 $-3x + y = -1$ $\rightarrow -4(-3x + y = -1)$

$$\begin{array}{r} 2x + 4y = -18 \\ + 12x - 4y = 4 \\ \hline 14x = -14 \\ x = -1 \end{array}$$

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

$$\begin{array}{r} 2(-1) + 4y = -18 \\ -2 + 4y = -18 \\ 4y = -16 \\ y = -4 \end{array}$$

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:

$$2x^2 - 5x - 12 = 0$$

$$a = 2 \quad b = -5 \quad c = -12$$

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.

$$x = \frac{5 \pm \sqrt{25 + 96}}{4}$$

$$x = \frac{5 \pm \sqrt{121}}{4}$$

Start simplifying under the root and follow the order of operations!

$$x = \frac{5 \pm 11}{4}$$

$$x = \frac{5 + 11}{4} \text{ and } \frac{5 - 11}{4}$$

Once the root is simplified, split the problem into two and solve.

$$x = \frac{16}{4} \text{ and } \frac{-6}{4}$$

$$x = 4 \text{ and } x = -1.5 \text{ (or } -\frac{3}{2})$$

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. $2v^2 - 36 - 4v = -3v$
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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:

<u>GCF (Greatest Common Factor)</u>	<u>DOTS (Difference of Two Squares)</u>
$3x^2 - 12x = 3x(x - 4)$ <p>Check:</p> $ \begin{aligned} &3x(x - 4) \\ &3x(x) - 3x(4) \\ &3x^2 - 12x \quad \checkmark \end{aligned} $	$x^2 - 36 = (x + 6)(x - 6)$ <p>Check:</p> $ \begin{aligned} &(x + 6)(x - 6) \\ &x(x) + x(-6) + 6(x) + 6(-6) \\ &x^2 - 6x + 6x - 36 \\ &x^2 - 36 \quad \checkmark \end{aligned} $
Trinomials	
No leading coefficient (no number in front of the squared term)	With leading coefficient (number in front of squared term)
$c^2 + 8c + 12 = (c + 6)(c + 2)$ <p>Check:</p> $ \begin{aligned} &(c + 6)(c + 2) \\ &c(c) + c(2) + 6(c) + 6(2) \\ &c^2 + 2c + 6c + 12 \\ &c^2 + 8c + 12 \quad \checkmark \end{aligned} $	$3x^2 + 4x - 7 = (3x + 7)(x - 1)$ <p>Check:</p> $ \begin{aligned} &(3x + 7)(x - 1) \\ &3x(x) + 3x(-1) + 7(x) + 7(-1) \\ &3x^2 - 3x + 7x - 7 \\ &3x^2 + 4x - 7 \quad \checkmark \end{aligned} $

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

$$x + 3 = \pm 2$$

$$x + 3 = 2 \text{ or } x + 3 = -2$$

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.

$$x = -1 \text{ or } x = -5$$

29. $a^2 + 8a - 9 = 0$

30. $k^2 - 14k - 15 = 0$

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

<p>Simplify radical expressions by finding the largest perfect square that goes into the radicand (the number under the square root).</p> <p>List the largest perfect squares up to and including 225:</p> <p>Here is an example if you are stuck:</p> $\begin{aligned} &2\sqrt{50} \\ &2 \cdot \sqrt{25} \cdot \sqrt{2} \\ &2 \cdot 5\sqrt{2} \\ &10\sqrt{2} \end{aligned}$			
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

$ \begin{aligned} & -3\sqrt{5} + 5\sqrt{5} \\ & (-3 + 5)\sqrt{5} \\ & 2\sqrt{5} \end{aligned} $			$ \begin{aligned} & -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} \end{aligned} $		
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

$ \begin{aligned} & (-3\sqrt{5})(5\sqrt{5}) \\ & (-3 \cdot 5)(\sqrt{5} \cdot \sqrt{5}) \\ & -12\sqrt{25} \\ & -12 \cdot 5 \\ & -60 \end{aligned} $			$ \begin{aligned} & (-3\sqrt{12})(-4\sqrt{5}) \\ & (-3 \cdot -4)(\sqrt{12} \cdot \sqrt{5}) \\ & 12\sqrt{60} \\ & 12\sqrt{4}\sqrt{15} \\ & 12(2)\sqrt{15} \\ & 24\sqrt{15} \end{aligned} $		
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.


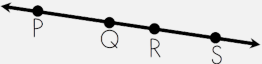
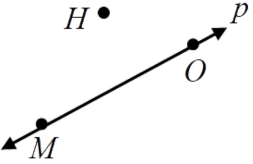

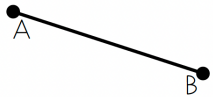
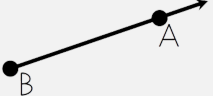
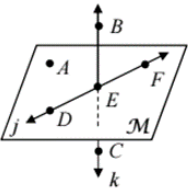
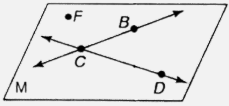
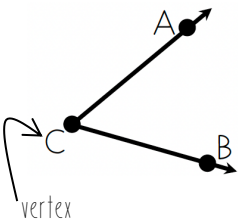
To rationalize the denominator,

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

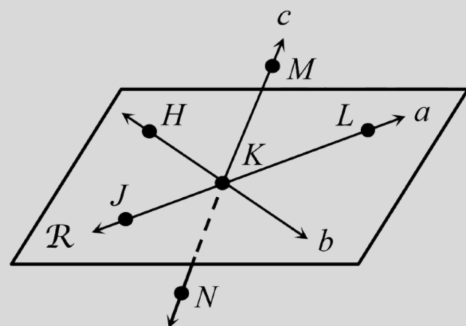
Here are some examples if you are stuck

$\frac{\sqrt{10}}{\sqrt{5}}$ $\frac{\sqrt{10}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$ $\frac{\sqrt{50}}{\sqrt{25}}$ $\frac{\sqrt{25} \cdot \sqrt{2}}{5}$ $\frac{5\sqrt{2}}{5}$ $\sqrt{2}$	$\frac{2\sqrt{7}}{\sqrt{3}}$ $\frac{2\sqrt{7}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$ $\frac{2\sqrt{21}}{\sqrt{9}}$ $\frac{2\sqrt{21}}{3}$	$\sqrt{\frac{18}{27}}$ $\sqrt{\frac{2}{3}}$ $\frac{\sqrt{2}}{\sqrt{3}}$ $\frac{\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$ $\frac{\sqrt{6}}{\sqrt{9}}$ $\frac{\sqrt{6}}{3}$	
47. $\frac{\sqrt{11}}{\sqrt{6}}$	48. $\frac{4\sqrt{3}}{\sqrt{6}}$	49. $\sqrt{\frac{8}{30}}$	50. $\sqrt{\frac{32}{18}}$

BASIC GEOMETRY DEFINITIONS

Term	Definition	Notation	Diagram	Notation
Point	<ul style="list-style-type: none"> A location It has no size or shape Points are represented by small dots 	<ul style="list-style-type: none"> Always use a <u>capital letter</u> to name a point 		point A A
Collinear Points	<ul style="list-style-type: none"> Points that are on the same line 			
Noncollinear points	<ul style="list-style-type: none"> Points that are not on the same line Must have 3 points to be noncollinear Two of the 3 points can be collinear 			
Line	<ul style="list-style-type: none"> Made up of 2 points Any 2 points make a line 	<ul style="list-style-type: none"> Name a line by any <u>two points</u> on the line You can also name a line using a <u>lowercase script letter</u> 		line ℓ \overleftrightarrow{AB} \overleftrightarrow{BA}
Line Segment	<ul style="list-style-type: none"> A part of a line that has two endpoints 	<ul style="list-style-type: none"> Name a line segment by its <u>two endpoints</u> 		\overline{AB} \overline{BA}
Ray	<ul style="list-style-type: none"> A part of a line that extends indefinitely in one direction 	<ul style="list-style-type: none"> Name a ray using <u>the endpoint and a point at end of ray</u> Endpoints always come first Arrow always points right! 		\overrightarrow{BA}
Plane	<ul style="list-style-type: none"> A flat surface made up of points that extends indefinitely in all directions 	<ul style="list-style-type: none"> Name a plane using <u>3 noncollinear points</u> You can also name a plane by a <u>capital letter</u> in the corner (<i>not a point</i>) 		Plane M AEF DFA
Coplanar	<ul style="list-style-type: none"> Points, lines, segments, etc that are on the same plane 			
Angle	<ul style="list-style-type: none"> Formed by two rays with a common endpoint The common endpoint is the vertex The rays are the sides 	<ul style="list-style-type: none"> Name an angle by <u>3 capital letters</u> The middle letter <u>must</u> be the vertex You can also name an angle by <u>just the vertex</u> if there is only one angle with that vertex 		Angle C $\angle ACB$ $\angle BCA$ $\angle C$

Examples:



Points: H, J, K, L, M, N

Collinear Points: J, K and L or N, K and M

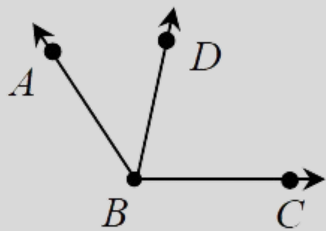
Noncollinear Points: J, K and H or N, J and H

Lines: line a, \overleftrightarrow{JL} (could also be named \overleftrightarrow{JK} , \overleftrightarrow{KL} , \overleftrightarrow{LK} , \overleftrightarrow{LJ})
 line c, \overleftrightarrow{MN} (could also be named \overleftrightarrow{MK} , \overleftrightarrow{KM} , \overleftrightarrow{KN} , \overleftrightarrow{NM})
 line b, \overleftrightarrow{HK} (could also be named \overleftrightarrow{KH})

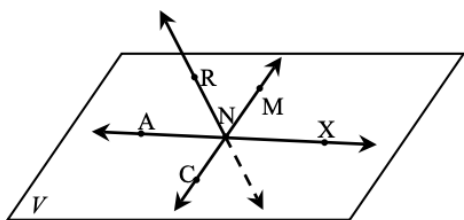
Plane: plane R, JHL or JKH or HLK

Line Segment: \overline{JL} or \overline{HK}

Ray: \overrightarrow{KH} , \overrightarrow{KL} , \overrightarrow{KM} , \overrightarrow{KJ} , \overrightarrow{KN}



Angles: $\angle ABD$, $\angle DBC$, $\angle ABC$



51. Name the points in the picture.

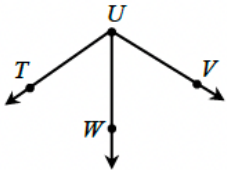
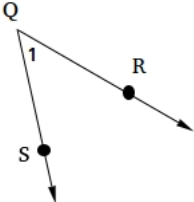
52. Name the lines in the picture.

53. Name 3 collinear points.

54. Name 3 noncollinear points.

55. Name 3 line segments.

56. Name 3 rays.

	57. Name all angles in the picture.
	58. What is another name for $\angle WUV$?
	59. Name the vertex and sides of the angle to the left.
	60. Name the angle every way possible.

IXL topics that will help:

Algebra 1 Tab:

- C.17 - Solve linear equations: mixed review (search code: DN6)
- O.14 Solve a system of equations using any method (search code: HLV)
- Z.3 - Solve a quadratic equation by factoring (search code: CSS)
- Z.5 - Solve a quadratic equation by completing the square (search code: XCL)
- Z.6 - Solve a quadratic equation using the quadratic formula (search code: XCF)
- EE.1 - Simplify radical expressions (search code: ZFF)
- EE.3 - Simplify radical expressions involving fractions (search code: VRZ)
- EE.4 - Multiply radical expressions (search code: HMX)
- EE.5 - Add and subtract radical expressions (search code: DLV)

Geometry Tab:

- B.1 - Lines, line segments, and rays (search code: XFC)
- C.1 - Angle vocabulary (search code: 9U2)