Geometry
Summer Review
Packet

Geometry Summer Review Packet

Welcome to Geometry!

This packet is designed to strengthen the skills you learned in Algebra so you are ready to apply them in Geometry. It is important that you are ready with these skills as they are necessary for success in Geometry. Having these skills mastered will help you be able to focus on the new Geometry materials as they are presented. If you need more practice in any of the skills listed, Kahn Academy, You Tube, and math.com are resources available to you online.

The materials are separated into weeks so you can work a little at a time. This will help your math skills stay sharp all summer and you will be ready for the first topic in Geometry. Please finish this packet and bring it with you the first day of classes. **It will be graded for accuracy and completion.**

Week 1: Arithmetic, Order of Operations, and Rounding

Week 2: Ratios and Proportions

Week 3: Solving Linear Equations

Week 4: Solving for a Variable in an Equation

Week 5: Solving Systems of Equations

Week 6: Graphing in the Coordinate Plane

Week 7: Graphing Linear Equations

Week 8: Using Formulas

Week 9: Word Problems

Materials needed for Geometry:

- Scientific Calculator (TI-30xIIS preferred)
- Folder/Binder for Geometry only
- Spiral notebook or 3-ring binder with loose-leaf paper
- Pencils
- Compass
- Protractor

Algebra – Things to Remember!

Scientific Notation:
3.2×10^{13}
The first number must be $1 \le n < 10$

Factorial:
$5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$
$1! = 1$
FYI: $0! = 1$

Absolute Value:
$|-5| = 5$
$|5| = 5$
Represents distance

Undefined:
$\frac{6}{7-x}$ is undefined when $x = 7$ since the denominator $= 0$.

Multiply: (distribute or FOIL)
$(x+3)(x+2) = x \cdot x + x \cdot 2 + 3 \cdot x + 3 \cdot 2$
$= x^2 + 5x + 6$
$(a+b)^2 = a^2 + 2ab + b^2$
$(a-b)^2 = a^2 - 2ab + b^2$

Add Fractions:
Get the common denominator:
$\frac{5x}{6} + \frac{3x}{2} = \frac{5x}{6} + \frac{9x}{6} = \frac{14x}{6} = \frac{7x}{3}$

Inequalities:
$5 - 3x \le 13 + x$ Remember to
$-3x \le 8 + x$ change direction
$-4x \le 8$ of inequality when
$x \ge -2$ mult/div by a negative.

x = abscissa, y = ordinate

Slope:
$m = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$.

Exponents:
$(-3)^2 \neq -3^2$
$2^0 = 1$
$4^{-3} = \frac{1}{4^3}$
$x^m \cdot x^n = x^{m+n}$
$(x^n)^m = x^{n \cdot m}$
$\frac{x^m}{x^n} = x^{m-n}$
$(xy)^n = x^n \cdot y^n$

Polygons and sides:
triangle – 3
quadrilateral – 4
pentagon – 5
hexagon – 6
septagon – 7
octagon – 8
nonagon – 9
decagon – 10
dodecagon - 12

Direct Variation:
$y = kx$ where k = constant of variation
$k = y/x$

Factor:
Look for a GCF (greatest common factor)
Factor binomial or trinomial.
$a^2 - b^2 = (a+b)(a-b)$

Systems:

$y - 2x = 1$ $y + 2x = 9$	*Linear:* substitute; add to eliminate one variable or graph.
$y = x^2 - x - 6$ $y = 2x - 2$	*Linear Quadratic:* substitute or graph

For inequality systems, graph.

Equations of Lines: m = slope
$y = mx + b$ slope-intercept
$y - y_1 = m(x - x_1)$ point-slope

Properties of Real Numbers:

Commutative Property:	$a + b = b + a$	$ab = ba$
Associative Property:	$a+(b+c) = (a+b)+c$	$a(bc) = (ab)c$
Distributive Property:	$a(b+c) = ab + ac$	
Identity:	$a + 0 = a$	$a \cdot 1 = a$
Inverse:	$a + (-a) = 0$	$a \cdot (1/a) = 1$
Zero Property:		$a \cdot 0 = 0$

Degree:
Degree of monomial = sum of exponents
$4x^3$ is of degree 3
x^2y^3 is of degree 5

Solving Equations:
1. Deal with any parentheses in the problem.
2. Combine similar terms on same side of = sign.
3. Get the needed variables on the same side of = sign.
4. Isolate the needed variable by add or subtract.
5. Find the needed variable by divide or multiply.

Quadratic Equation:
$x^2 - 5x + 6 = 0$ Set = 0.
$(x-3)(x-2) = 0$ Factor.
$x = 3;\ x = 2$ Find roots

Function: Passes the vertical line test.
A set of ordered pairs in which each x element has only one y element associated with it.
$f(x) = 3x + 4$
$f(3) = 3 \cdot 3 + 4 = 13$

Parallel and Perpendicular:
Parallel: slopes are equal.
Perpendicular: slopes are negative reciprocals (flip over and negate)

Interval Notation:
$(1,5) \leftrightarrow 1 < x < 5$
$[1,5] \leftrightarrow 1 \le x \le 5$

Parabola:
$y = ax^2 + bx + c$
Axis of symmetry:
$x = \frac{-b}{2a}$
Roots: where the graph crosses the x-axis.

Week 1: Arithmetic and Order of Operations

It is important that you can do addition, subtraction, multiplication, and division of whole numbers, decimals, and fractions without a calculator. You will not be expected to do lengthy problems.

Order of Operations: PEMDAS (parentheses, exponents, multiply and divide, add and subtract)

Scan through each expression from left to right 4 times doing the math from each step before continuing to the next.

*Remember that a number connected to another number by parenthesis 2(4) means multiply and a fraction bar means divide.

First: Look for any parentheses containing arithmetic and do that math

Second: Evaluate any exponent or square root values

Third: Multiply or divide as it occurs moving from left to right

Fourth: Add and subtract as it occurs moving from left to right

*Remember that a number connected to another number by parenthesis 2(4) means multiply and a fraction bar means divide.

Simplify each expression. Show your steps.

1. $3 + 2(40) - 10/2$ 1. _____
2. $42 - 5(6 - 2)$ 2. _____
3. $1/2 + 6(1/2 - 1/3)$ 3. _____
4. $-3 + 24/5 - 2(1 - 3)$ 4. _____
5. $4x + 2(3x - 1)$ 5. _____
6. $\frac{8+(4-2)}{7-(3+2)}$ 6. _____

Round to the nearest tenth

7. 12.072 7. _____
8. -0.9801 8. _____
9. 2.0913 + 4.8102 9. _____
10. -24.807 – 5.181 10. _____

Week 2: Ratios and Proportions

A ratio is a comparison between two values. For example, 1 teacher for every 16 students. 1:16

A proportion is an equation made up of two congruent ratios. For example, if there are 16 students for every teacher, there would be 48 students for 3 teachers. $\frac{16}{1} = \frac{48}{3}$

Ratios should be written in simplest form. Cross-products can be used to solve for missing values in a proportion.

Solve for the missing value in the proportion: $\frac{4}{x} = \frac{6}{7}$ $4(7) = 6(x)$

$28 = 6x$ so $x = 28/6 = 14/3$

Write each ratio in simplest form. Show your set-up.

1. There were 4 trucks for every 10 cars in the parking lot 1. _____

2. My car went 540 miles on 15 gallons of gas 2. _____

Today there are 12 students wearing blue shirts, 16 students wearing white shirts and 5 students wearing yellow shirts.

3. Write the ratio of yellow shirts to blue shirts 3. _____

4. Write the ratio of white shirts to blue shirts 4. _____

5. Write the ratio of white shirts to all shirts 5. _____

Solve each proportion for the missing value.

6. $\frac{10}{16} = \frac{x}{24}$ 6. _____

7. $\frac{x}{4} = \frac{9}{12}$ 7. _____

8. $\frac{72}{x} = \frac{6}{24}$ 8. _____

9. $\frac{45}{36} = \frac{1.5}{x}$ 9. _____

10. $\frac{8}{1.6} = \frac{x}{2.4}$ 10. _____

Week 3: Solving Linear Equations

In solving for a missing value in an equation, we must always do the same math to both sides of the equation. Always do the inverse operation to "un-do" the math and remove each number on the side of the equation with the variable.

Ex: $2x - 4 = 32$

$+4 \quad +4$

$2x = 36$

$/2 \quad /2$

$x = 18$

Solve for the variable in each equation. Show your steps.

1. $3x - 5 = 18$ $x =$ _____

2. $11 + 12x = 25$ $x =$ _____

3. $\frac{1}{2}x + 5 = 27$ $x =$ _____

4. $-17 = 25x + 8$ $x =$ _____

5. $\frac{3}{4}x - 6 = 12$ $x =$ _____

6. $8 - 9x = -4$ $x =$ _____

7. $3.2x + 5 = 10.44$ $x =$ _____

8. $11 + 44x = -11$ $x =$ _____

Week 4: Solving for a Variable in an Equation

We do the same steps in solving for a variable as we do in solving for a number. We must do the same math to both sides of the equation. Our results are not numbers in this case, but an algebraic expression.

Ex: solve $\frac{2y}{2} = \frac{3x}{2} - \frac{12}{2}$ for y

$y = 3/2\,x - 6$

solve $3x - 2y = 4$ for y

$-3x \quad -3x$

$\frac{-2y}{-2} = \frac{-3x}{-2} + \frac{4}{-2}$

$y = 3/2\,x - 2$

Solve for y in each equation. Show your steps.

1. $4y = 7x$ y =

2. $\frac{1}{2}y = 3x + 15$ y =

3. $2x + 3y = 9$ y =

4. $4y - 5x = 11$ y =

5. $12x - 5 = 3y$ y =

6. $1.5y - 1 = 3x + 5$ y =

7. $8x = 3y - 12$ y =

8. $\frac{3}{4}y = \frac{1}{2}x + 6$ y =

Week 5: Solving Systems of Equations

Sometimes we need to combine two equations to solve for missing values. Here we will practice combining by substitution to solve two equations for the shared x and y values that make both equations true.
First solve one equation for x or y. Next substitute that expression into the other equation and solve.

Example: solve the system $y = 3x + 1$ and $2y = 5x + 4$
Since the first equation already has y by itself, substitute the other half of its equation into the place where y is in the second equation: $2(3x + 1) = 5x + 4$. Now solve for x.

$$6x + 2 = 5x + 4$$
$$\underline{-2 \qquad -2}$$
$$6x = 5x + 2$$
$$\underline{-5x \quad -5x}$$
$$x = 2$$

Now substitute the value found in either of the original equations to solve for y:
$y = 3(2) + 1$
$x = 7$
So the solution is (2, 7) or $x = 2$, $y = 7$

You may have to use the week 4 skills to get one of the variables alone on one side of an equation so you can substitute.

Solve for x and y in each. Show your steps.

1. $3y = -4x + 6$ and $y = -x + 1$ x = y =

2. $2y = 4x - 6$ and $x = y + 7$ x = y =

3. $y + x = 11$ and $y - x = -1$ x = y =

4. $\frac{1}{2} y = x + 8$ and $y = -2x + 4$ x = y =

5. $2x - 1 = 3y + 1$ and $y = 4x + 1$ x = y =

Week 6: Graphing in the Coordinate Plane

When locating points on a coordinate plane, we use a pair of values called coordinates to tell us where to place the point. The coordinates are written this way: (x , y) where the x-value tells us how many spaces horizontally to travel away from the origin and the y-value tells us how many spaces vertically to travel away from the origin. The coordinates A(-3, 5) mean to go 3 spaces left of the origin and then 5 spaces up. Mark the point and call it A.

1. Graph the following points on the coordinate grid provided. Mark each point with the letter given.

A(-2, 3)

B(5, -7)

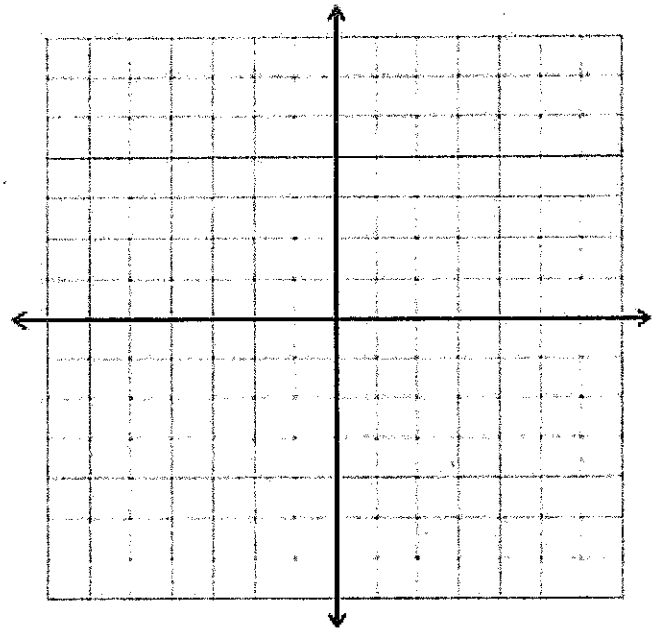
C(0, 4)

D(1, 6)

E(-4, -5)

F(-1, 0)

G(3, -3)



2. Use at least 6 points to mark points that form your initial when connected. Make sure you place points in all four sections (quadrants) of the graph. Name the points chosen like in question 1 and write the coordinates. Add more points below those listed if needed.

A(_____, _____)

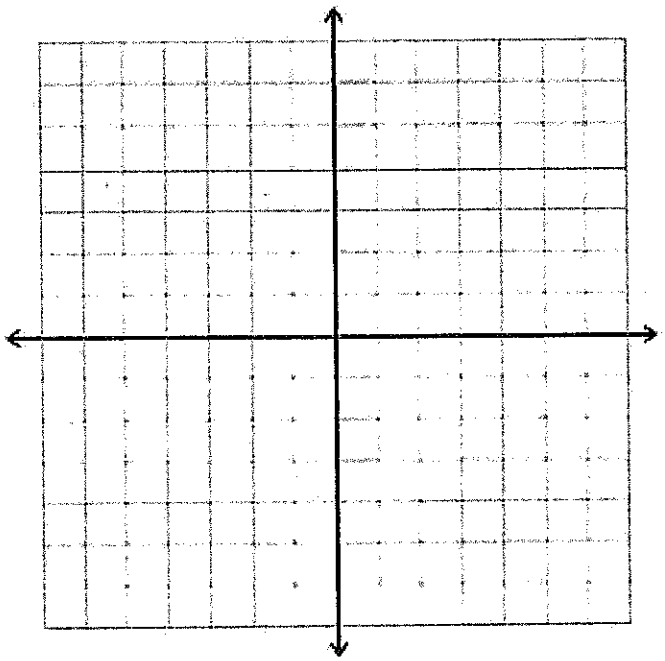
B(_____, _____)

C(_____, _____)

D(_____, _____)

E(_____, _____)

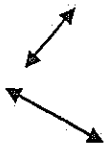
F(_____, _____)



Week 7: Graphing Linear Equations

When graphing all solutions to a linear equation, the graph is a line. We like the equations to be written in y = mx + b format. The letters y and x stand for the many points that are solutions to the equation. The place our graph crosses the y-axis is in the "b" position in the equation. The slope, or tilt of the line is the number in the "m" position right next to the x. The numerator of the slope tells us how many spaces we move between points in the vertical direction. The denominator of the slope tells us how many spaces we move between points in the horizontal direction.

A positive slope means the right side of the line is higher than the left side.

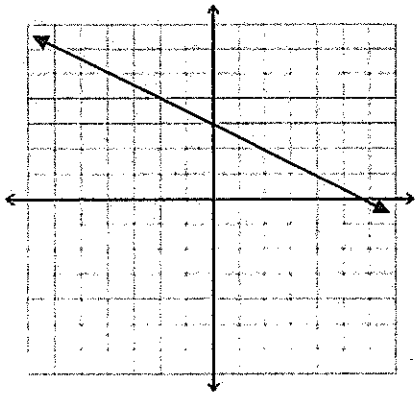


A negative slope means the left side of the line is higher than the right side.

A vertical line has an undefined slope and the line's equation is written x = number.

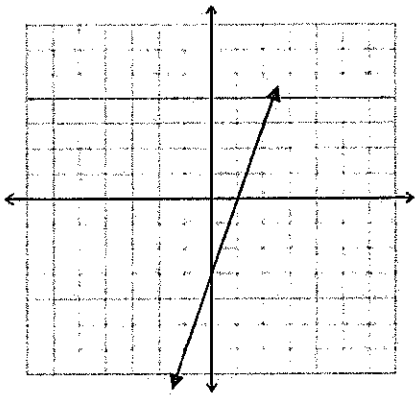
A horizontal line has a slope of zero and the line's equation is written y = number.

Example: $y = -1/2\,x + 3$



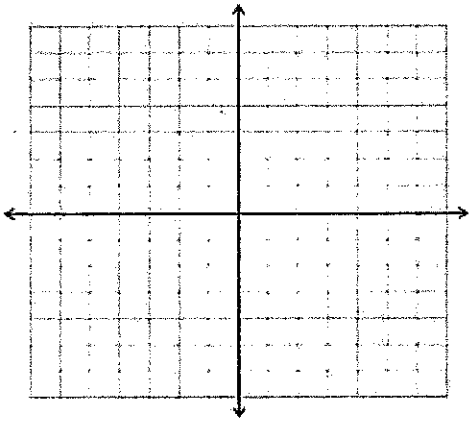
Example: $y = 3x - 2$

* the slope 3 has a denominator of 1 when written as a fraction



Graph the lines on the grid at right

1. $y = 1/3\,x + 4$
2. $y = -3/4x - 1$
3. $y = 2/3\,x + 1$
4. $y = 2/5\,x - 2$



Some equations don't look like they follow the y = mx + b rule.

They may look like their slope has no denominator. Like y = 3x + 1.

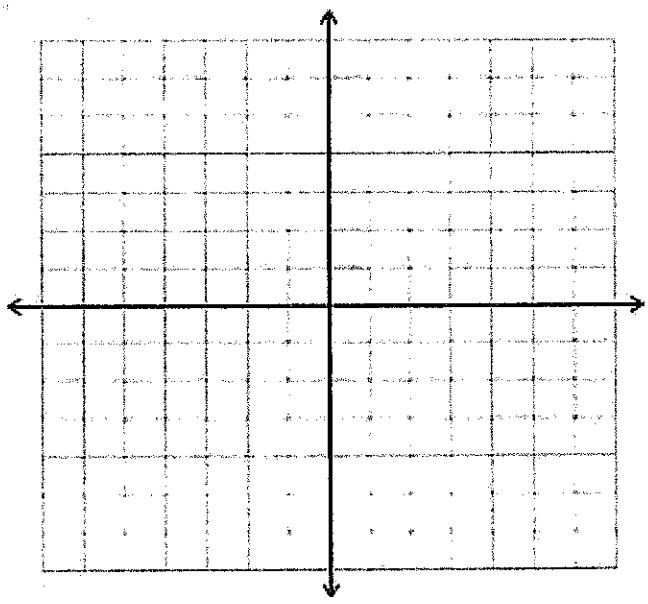
If he slope is a whole number, its denominator is 1 and the slope would be 3/1.

Move three spaces up for every one space over.

If the equation looks like y = 3x then the "b" is zero.

Graph these on the grid provided.

5. y = -2x + 1
6. y = 3x
7. y = 4
8. x = -2
9. y = x + 3



Week 8: Using Formulas

It is important that students be able to understand and use a variety of formulas in Geometry. The most important thing is to understand what the variables stand for. Then substitute in the values given for those variables.

Use the formulas to find the values below. Show your set-up.

1. The area of a circle is $A=\pi r^2$ where r is the radius of the circle.

Find the area of a circle with radius 3.5 inches. A =

2. The circumference of a circle is $C=\pi d$ where d is the diameter of the circle. Diameter is twice the radius.

Find the circumference of a circle having radius of 4.1 cm. C =

3. The volume of a sphere is $V=\frac{4}{3}\pi r^3$ where r is the radius of the sphere.

Find the volume of a sphere with a radius of 3.5 cm V =

4. The volume of a square pyramid is V = 1/3 bh where b is the area of the base and h is the height.

Find the volume of a square pyramid where the sides of the base are 5 m and the height is 6 m.

V =

5. The area of a trapezoid is found by averaging the two bases and multiplying by the height.

$A = \frac{1}{2}(b_1 + b_2)h$

Find the area of a trapezoid with bases of 12 cm and 9 cm and a height of 7.5 cm

A =

6. Volume of a prism is found by multiplying the area of the base and the height.

V = (base)h

Find the volume of a prism with base of 24.3 in^2 and a height of 15 in.

V =

7. The area of a rhombus is found by finding half of the product of the diagonals.

$A = \frac{1}{2} d_1 \cdot d_2$ A =

The diagonals of the rhombus are 12 cm and 9 cm.

Week 9: Word Problems

It is important that you can translate from English to Math so you can solve application problems. See what you can do to translate the following from English to Math. Write an expression or equation as indicated in each. **You will have nothing to solve**. Just translate. Choose your own variables, and tell what they stand for.

1. The height is 5 more than the base.

2. The height is half the base.

3. The sum of two distinct numbers is 23.

4. The length of a rectangle is 2 more than the width.

5. The product of two numbers is 24.

6. The quotient of a number and 4 is 11.

7. The average of two numbers is 7.

8. One side of a parallelogram is 5 less than the other.

9. Height is 11 more than ½ the base.

10. The sum of two consecutive integers is 11.