



NAME: \_\_\_\_\_

# Honors Geometry

Summer Packet 2022  
WLPCS

Welcome to geometry! Geometry is a language of mathematics that describes the world around us. Architects, artists, engineers, physicists, surveyors, and video game designers all use geometry every day. We will learn about where these concepts come from and how to use them. This packet will help you prepare for the upcoming year by drawing on what you already know.

This packet is **entirely assembled** from materials from previous math classes. You should be familiar with each of these problems. The skills in this packet are the ones *you will be using* this upcoming year in geometry, so you need to refresh them before you begin.

If there are any terms, topics, or problems you do not remember, do your best to find instruction online (Khan Academy or Youtube, for example), and try to do as many steps as possible. Do not leave any problems blank. You will receive your first major grade of the year for this packet.

## Directions:

Show your work. The work is not only to show an answer, but to show the reader your sequence of thinking and operations.

All final expressions or other solutions must be in simplest form.

Box your answers.

### EXAMPLES

- **EX1** – Simplify the expression (PEMDAS)

$$\frac{(3-13)^2 + 14}{2^3 - 5 \cdot 2} \rightarrow \frac{(-10)^2 + 14}{2^3 - 5 \cdot 2} \rightarrow \frac{100 + 14}{8 - 5 \cdot 2} \rightarrow \frac{100 + 14}{8 - 10} \rightarrow \frac{114}{-2} = \boxed{-57}$$

- **EX2** – Solve the proportion using the “cross multiplication” method

$$\frac{y-3}{2} = \frac{y}{5} \rightarrow 2 \cdot y = 5(y-3) \rightarrow 2y = 5y - 15 \rightarrow -3y = -15 \rightarrow y = 5$$

- **EX3** – Find the area

rectangle:  $A = b \cdot h$

$b = 10.3 \text{ km}$   
 $h = 5 \text{ km}$

$$A = 10.3 \cdot 5 = \boxed{51.5 \text{ km}^2} \text{ units!}$$

- **EX4** – Set up an equation and solve

“The sum of five times a number and two is 17”

$$5x + 2 = 17$$

$$5x + 2 = 17$$
$$\begin{array}{r} -2 \\ -2 \end{array}$$
$$\frac{5x}{5} = \frac{15}{5} \rightarrow \boxed{x = 3}$$

## Properties of Algebra

Review the Properties of Algebra and the provided examples. Then, answer the following questions

<p><b>Commutative Property (+, ×)</b> Order of values does not matter.</p> $a + b = b + a$ $2 + 3 = 3 + 2$ $5 = 5$ $x \cdot y = y \cdot x$ $5 \cdot 4 = 4 \cdot 5$ $20 = 20$	<p><b>Associative Property (+, ×)</b> Grouping of values does not matter.</p> $(a + b) + c = a + (b + c)$ $(5 + 1) + 3 = 5 + (1 + 3)$ $6 + 3 = 5 + 4$ $9 = 9$ $(a \cdot b) \cdot c = a \cdot (b \cdot c)$ $(2 \cdot 4) \cdot 7 = 2 \cdot (4 \cdot 7)$ $8 \cdot 7 = 2 \cdot 28$ $56 = 56$	<p><b>Identity Property (+, ×)</b> Values stay the same after operation.</p> <p style="text-align: center;"><i>Additive Identity (0)</i></p> $a + 0 = a$ <p style="text-align: center;"><i>Multiplicative Identity (1)</i></p> $a \cdot 1 = a$
<p><b>Inverse Property (+, ×)</b> Use the opposite (inverse) to eliminate a value (identity).</p> <p style="text-align: center;"><i>Additive Inverse</i> (negative)</p> $a + (-a) = 0$ $a - a = 0$ <p style="text-align: center;"><i>Multiplicative Inverse</i> (reciprocal)</p> $a \cdot \left(\frac{1}{a}\right) = 1$ $\frac{a}{a} = 1$	<p><b>Property of Zero</b> Multiplying by zero (0) always equals zero (0).</p> $a \cdot 0 = 0$ $17 \cdot 0 = 0$ $\frac{1}{a} \cdot 0 = 0$ $\frac{1}{-4} \cdot 0 = 0$	<p><b>Distributive Property</b> Multiply a value to each value of an expression inside parentheses ().</p> $a(b + c) = ab + ac$ $2(x + 7) = 2x + 14$ $-5(y - z) = -5y + 5z$ <p>** Notice that <math>-5 \cdot -z = 5z</math>, because a negative times a negative is positive (<math>- \cdot - = +</math>)</p>
<p><b>Reflexive Property</b> A value is always equal to itself.</p> $a = a$ $16 = 16$ $5x = 5x$ $4y^2 = 4y^2$	<p><b>Symmetric Property</b> The order of an equation does not matter.</p> <p>If <math>a = b</math>, then <math>b = a</math></p> <p>If <math>3 = x</math>, then <math>x = 3</math></p> <p>If <math>5x = 30</math>, then <math>30 = 5x</math></p>	<p><b>Transitive Property</b> If two objects equal the same value, the objects are equal.</p> <p>If <math>a = b</math> and <math>b = c</math>, then <math>a = c</math></p> <p>If <math>4 + 3 = 7</math> and <math>7 = \sqrt{49}</math>, then <math>4 + 3 = \sqrt{49}</math></p> <p>If <math>x + 5 = y</math> and <math>y = 15</math>, then <math>x + 5 = 15</math></p>

Match the property from the bank to the corresponding example.

1) \_\_\_\_\_ -  $16 = 16$

2) \_\_\_\_\_ -  $7 + (a + b) = (7 + a) + b$

3) \_\_\_\_\_ -  $(4y + 1) \cdot 0 = 0$

4) \_\_\_\_\_ - If  $5 \cdot 2 = 10$  and  $10 = \sqrt{100}$ , then  $5 \cdot 2 = \sqrt{100}$

5) \_\_\_\_\_ -  $-2(x - y) = -2x + 2y$

6) \_\_\_\_\_ -  $3 \cdot \frac{1}{3} = 1$

7) \_\_\_\_\_ - If  $8x = 24$ , then  $24 = 8x$

8) \_\_\_\_\_ -  $(2 + 1) + 9 = (1 + 2) + 9$

9) \_\_\_\_\_ -  $6m \cdot 1 = 6m$

- Commutative Property
- Associative Property
- Distributive Property
- Identity Property
- Inverse Property
- Property of Zero
- Reflexive Property
- Symmetric Property
- Transitive Property

## Expressions (Order of Operations)

Evaluate each expression using order of operations (PEMDAS).

10)  $24 - 4^2 \cdot 3 + 15$

11)  $\frac{(7-2^2)+17}{-14+2 \cdot 5}$

12)  $(4 - 7)^2 - 6 \cdot 7 + 20$

13)  $1 + (-2 - 5)^2 + (14 - 17)(4)$

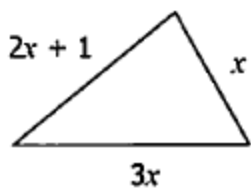
### Simplify Expressions (Like Terms)

Simplify each expression by combining like terms.

14)  $7m - 5m - 6$

15)  $8k^2 - k - 5k + 7 - 2k^2$

16) Write the perimeter of the figure as a simplified expression



17) Write the perimeter of the figure as a simplified expression

## Distributive Property

An expression is in simplest form (simplified) when there are no parentheses and no like terms. Use the distributive property to simplify each expression.

18)  $2(b - 3)$

19)  $x(2y - 5z + 1)$

20)  $9(2k - 4) - 2(7k - 12)$

21)  $-3(-9y - 4) - 2(y - 2)$

## Evaluating Expressions (Substitute and Solve)

Evaluate each expression by substituting the values of variables.

22)  $3x^2 - 4x$ , if  $x = -2$

23)  $\frac{a^2 + b^2}{a - b}$ , if  $a = 3$  and  $b = 4$

24)  $4p^2 + 7q^3$ , if  $p = -3$  and  $q = -2$

25)  $\frac{5c-d^2+3}{2c-4d}$ , if  $c = -1$  and  $d = -4$

### Solving Equations (1 and 2 step)

Solve for the variable in each equation.

26)  $m + 12 = 10$

27)  $-7y = -91$

28)  $\frac{2}{3}x = 10$

29)  $4 = \frac{w+8}{9}$

### Multistep Equations

Solve each equation.

30)  $9x + 1 - 7x - 5 = -20$

31)  $4m - 5(3m + 10) = 126$

32)  $-25 = \frac{1}{2}(10x - 2) + 3x$

## Fractions and Proportions

Simplify each fraction by eliminating common factors in the numerator and denominator.

33)  $\frac{8}{24}$

34)  $\frac{91}{27}$

35)  $\frac{15st}{36t}$

Solve each proportion using the “cross-multiplication” method. Remember to distribute when necessary!

36)  $\frac{4}{n+9} = \frac{2}{7}$

37)  $\frac{a}{2} = \frac{a-4}{6}$

### Justify

The steps required to solve an equation are justified by the properties of equality. They ensure that the equation stays balanced in order to solve for a missing variable.

<b>Addition Property of Equality</b> Add the same value to both sides of an equation	<b>Subtraction Property of Equality</b> Subtract the same value from both sides of an equation
<b>Multiplication Property of Equality</b> Multiply the same value to both sides of an equation	<b>Division Property of Equality</b> Divide both sides of an equation by the same value

Sometimes you will need to use the **Distributive Property** before you can use the properties of equality.

38) Identify which property justifies each step used to solve the equation below.

Equation Steps	Properties/Reasons
1) $2(x - 9) = -10$	1) Given
2) $2x - 18 = -10$	2)
3) $2x = 8$	3)
4) $x = 4$	4)

59) Identify which property justifies each step used to solve the equation below.

Equation Steps	Properties/Reasons
1) $\frac{m}{-3} + 10 = -1$	1) Given
2) $\frac{m}{-3} = -11$	2)
3) $m = 33$	3)

### General Equations

Solve each general equation for the given variable. In other words, isolate the given variable.

60)  $A = lw$ , solve for  $w$

61)  $V = \frac{1}{3}Bh$ , solve for  $B$

62)  $P = 2L + 2W$ , solve for  $W$

63)  $y = mx + b$ , solve for  $x$



## Coordinates and Slope

Write the coordinates for each point on the graph. Remember, a point on the graph has an  $x$ -coordinate and  $y$ -coordinate, written as an ordered pair in the form  $(x, y)$

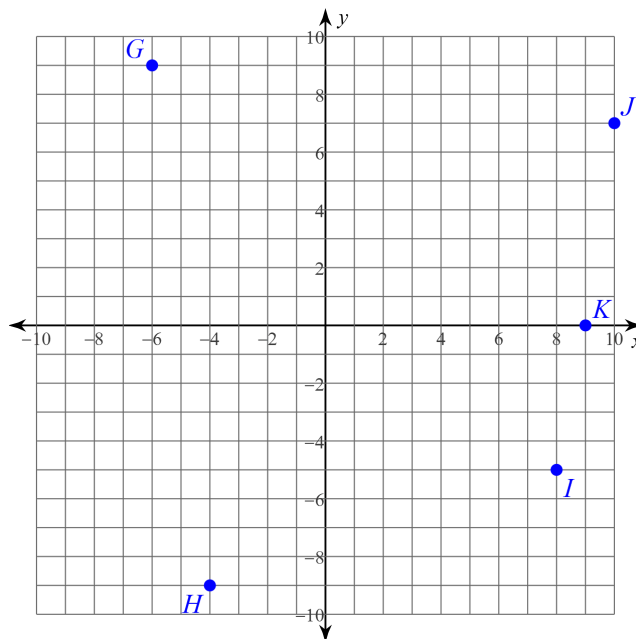
68) G \_\_\_\_\_

69) H \_\_\_\_\_

70) I \_\_\_\_\_

71) J \_\_\_\_\_

72) K \_\_\_\_\_



Calculate the slope between each pair of points.

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

73) Slope of line with points H and J (from graph above)

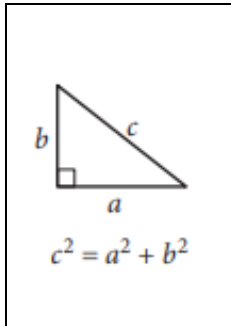
74) Slope of line with points G and K (from graph above)

75) Slope of line with points  $(3, 3)$  and  $(5, 3)$ .

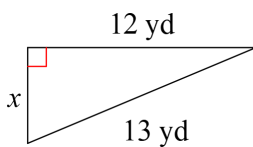
## Polygons, Area, and Volume

Use the formulas below to solve each problem

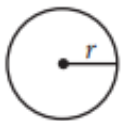
### Pythagorean Theorem



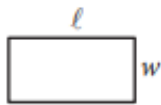
76) Find the missing side length



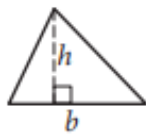
### Area



$$A = \pi r^2$$
$$C = 2\pi r$$

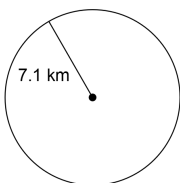


$$A = \ell w$$

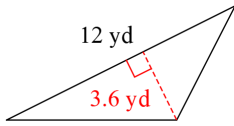


$$A = \frac{1}{2}bh$$

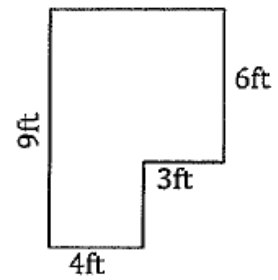
77) Find the area. Round your answer to the nearest tenth.



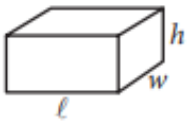
78) Find the area



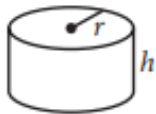
79) Find the area of the composite shape (shown right)



**Volume**



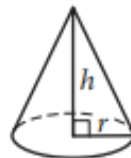
$$V = \ell wh$$



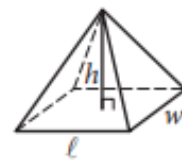
$$V = \pi r^2 h$$



$$V = \frac{4}{3} \pi r^3$$

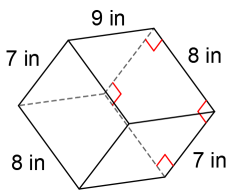


$$V = \frac{1}{3} \pi r^2 h$$

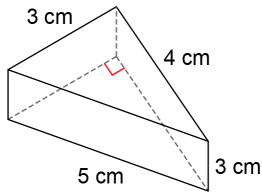


$$V = \frac{1}{3} \ell wh$$

80) Find the volume.






81) Calculate the volume. First find the area of the base then multiply by the height.



82) Pluto has a diameter of 1,477 miles. What is the volume of Pluto? (assume it is a perfect sphere)

## Angles and Measurement

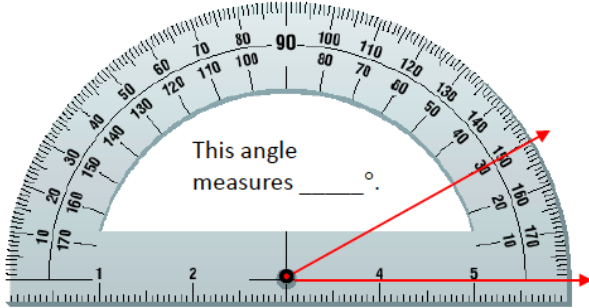
<u>Angle Classifications</u>	Examples
<p><b>Acute</b> angle - Angle with a measure of less than <math>90^\circ</math></p>	
<p><b>Right</b> angle - Angle with a measure of <math>90^\circ</math> . Two lines that intersect to form a right angle are said to be perpendicular.</p>	
<p><b>Obtuse</b> angle - Angle with a measure of more than <math>90^\circ</math> but less than <math>180^\circ</math></p>	

**Straight angle - Angle with a measure of  $180^\circ$  (straight line)**

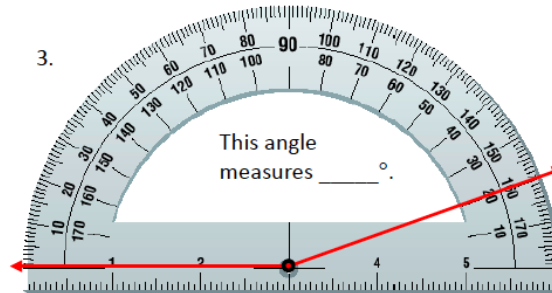


Find the measure of each angle, then classify the angle as acute, right, obtuse, or straight.

83) Find the measure and classify

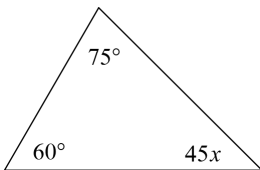


84) Find the measure and classify



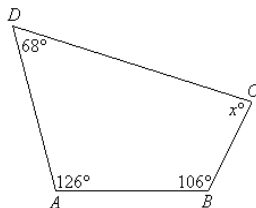
The sum of the angles in a triangle is equal to  $180^\circ$ . Use this information to solve the following problems.

85) Solve for  $x$ .



The sum of the angles in a quadrilateral is equal to  $360^\circ$ . Use this information to solve the following problem.

86) Solve for  $x$ .



## Word Problems

Set up and solve an equation for each problem.

- 87) Four times a number divided by 8 is 3
- 88) The highest score on an Algebra test was 42 points more than the lowest score. When added together, the combined score was 154. Find the highest and lowest score.
- 89) The Washington Redskins scored 24 more than twice the number of points that the Ney York Giants scored. Altogether, the teams scored 66 points. How many points did each team score individually?
- 90) The length of a rectangle is three centimeters less than twice its width. If the perimeter of the rectangle is 18 centimeters, find the length and width.