# Brushing up on Essential Geometry and Algebra Skills to get you ready for Geometry Summer Packet

### (For students entering Geometry)

Students entering Geometry should complete the problems in this packet before returning to school from Summer Break. All the material in this packet will be used at some point this year. These topics should have been covered in previous years (not necessarily last year). The entirety of this packet should be completed without the use of a calculator unless noted.

## Students will be held responsible for understanding these concepts and teachers will check for completion and assess understanding.

Answers to all problems are included on the last page of this packet. Make note of any questions you have on these topics; your teacher will address any questions within the first few classes and then there will be an assessment on the material.

**<u>Need help on some of the topics?</u>** For each section a link to an instructional video has been provided!

Have a great summer and see you in the fall! ©

#### **GEOMETRY BASIC SKILLS:**



3. Given the information below, write an equation and solve the equation to determine the missing angle lengths.



4. In #4a,  $\angle 1$  and  $\angle 2$  are a pair of (complementary/supplementary) angles. (circle correct word)

*Ratios, Proportions and Scale Factors:* understand the concepts of ratio and proportions and use this relationship to solve real-world and mathematical problems by reasoning about tables, equivalent ratios or equations.

Ratios and Proportions: <u>https://www.khanacademy.org/test-prep/praxis-math/praxis-math-lessons/praxis-math-number-and-guantity/a/gtp--praxis-math--article--ratios-and-proportions--lesson</u>

Solving Proportions: <u>https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-ratio-proportion/cc-7th-write-and-solve-proportions/v/find-an-unknown-in-a-proportion</u>

Scale Factor: <u>https://www.khanacademy.org/math/7th-engage-ny/engage-7th-module-1/7th-module-1-topic-d/v/identifying-scale-factors</u>

- 5. In #4b,  $\angle 3$  and  $\angle 4$  are a pair of (complementary/supplementary) angles. (circle correct word)
- 6. Tell whether the following ratios form a proportion. Explain your reasoning.
- a.  $\frac{2}{7}, \frac{4}{21}$  b.  $\frac{3}{10}, \frac{15}{50}$
- 7. A cookie recipe calls for  $\frac{1}{3}$  cup sugar and  $\frac{1}{2}$  cup flour for 3 dozen cookies.
- a. What is the ratio of sugar to flour?
- b. How much of each ingredient should be used to make 2 dozen cookies?
- 8. Solve for *x*:  $\frac{2}{3} = \frac{x+7}{3x}$
- 9. A scale drawing has a scale of 9mm: 2cm. What is the scale factor?

**POLYGONS:** categorize shapes and classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines and triangles based on right angle and side length.

Polygons: <u>https://www.khanacademy.org/math/cc-fifth-grade-math/properties-of-shapes/properties-shapes/a/polygons-review</u>

Scalene, Isosceles, Equilateral, Acute, Right, and Obtuse Triangles: <u>https://www.khanacademy.org/math/cc-fourth-grade-math/plane-figures/imp-classifying-triangles/v/scalene-isosceles-equilateral-acute-right-obtuse</u>

10. Classify each polygon below by the number of sides and name.



11. Classify each triangle below as obtuse, acute, or right triangle, then as scalene, isosceles, or equilateral triangle.

Triangle	A 120° B 30° " 30° C	13 9 14	A 4 cm B 3 cm C
Obtuse, Acute or Right Triangle			
Scalene, Isosceles or Equilateral Triangle			

12. Find the value of x.

a.





**PERIMETER and AREA:** know and apply the area and perimeter formulas for polygons and the area and circumference formulas for circle and use them to solve problems.

Perimeter and Area of a Polygon: <u>https://www.khanacademy.org/math/geometry-home/geometry-area-perimeter/geometry-perimeter/v/perimeter-and-area-basics</u>

Area and Circumference of a Circle: <u>https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-geometry/cc-7th-area-circumference/v/circles-radius-diameter-and-circumference</u>

https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-geometry/cc-7th-areacircumference/v/area-of-a-circle

#### **Calculator Allowed**



14. Find the circumference and Area of the circle below. Leave  $pi \pi$  in your answer or use  $pi \pi$  button and round to hundredth.



15. A farmer is putting up 220 ft of fence to enclose a rectangular pasture. Determine the total area of the rectangular pasture if the pasture must be 84 ft long.

**VOLUME and SURFACE AREA:** solve problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, and cubes.

Volume: <u>https://www.khanacademy.org/math/cc-fifth-grade-math/5th-volume/volume-with-unit-cubes/v/how-we-measure-volume</u>

Surface Area: <u>https://www.khanacademy.org/math/geometry-home/geometry-volume-surface-area/geometry-surface-area/v/finding-surface-area-using-net?modal=1</u>

#### **Calculator Allowed**

16. Find the volume and surface area of the solid.



17. Find the surface area of the cylinder. Leave  $pi \pi$  in your answer **o**r use  $pi \pi$  button and round to hundredth.



18. Write and solve an equation to find the width of the box if its volume is  $2205 in^3$ . Then find its surface area.



**LINES:** identify parallel and perpendicular lines including notation.

Parallel and Perpendicular Lines: https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8thgeometry/cc-8th-angles-between-lines/v/identifying-parallel-and-perpendicular-lines



**PYTHAGOREAN THEOREM:** apply the Pythagorean Theorem to determine unknown side lengths in right triangles.



Pythagorean Theorem: https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-geometry/cc-8thpythagorean-theorem/v/the-pythagorean-theorem

#### **Calculator Allowed**

20. Find the length of the missing side in each diagram. Round your answers to the nearest hundredth. b.

a.





**SOLVING LINEAR EQUATIONS:** Solve linear equations in one variable with coefficients represented by real numbers and variables

Solving <u>https://www.khanacademy.org/math/algebra/solving-linear-equations-and-inequalities/solutions-linear-equations/v/equation-special-cases</u>

https://www.khanacademy.org/math/algebra/solving-linear-equations-andinequalities/complicated\_equations/v/ex-2-multi-step-equation

21. Solve each of the following equations for x.

a. 3-2(x-1) = 2 + 4xb. 16x - 3(4x + 7) = 6x - (2x + 21)c.  $x + 6 = \frac{1}{2}(x - 4)$ 

**LINEAR FUNCTIONS:** Calculate and interpret the average rate of change (slope) of a linear function and graph linear functions in different forms (e.g., slope-intercept, point-slope, and standard form) and show intercepts.

Slope: <u>https://www.khanacademy.org/math/algebra/two-var-linear-equations-and-intro-to-functions/slope/v/slope-intuition-example</u>

Slope-Intercept Form: <u>https://www.khanacademy.org/math/algebra/two-var-linear-equations-and-intro-to-functions/slope-intercept-form/v/graphing-a-line-in-slope-intercept-form</u>

Point-Slope Form: <u>https://www.khanacademy.org/math/algebra/two-var-linear-equations-and-intro-to-functions/point-slope/v/idea-behind-point-slope-form</u>

Standard Form: <u>https://www.khanacademy.org/math/algebra/two-var-linear-equations-and-intro-to-functions/standard-form/v/converting-to-slope-intercept-form</u>

22. Given two coordinate points M & N on the coordinate plane, find the slope of  $\overline{MN}$ , and state the slope of the line parallel and perpendicular to  $\overline{MN}$ .

a. M(9, 6), N(1, 4)

b. M(-2, 2), N(4, -4)

23. Find the slope and y-intercept of the graph of the equation. Using slope-intercept form, graph the line.

a. y - 1 = 2(x + 1)b.  $y = -\frac{2}{3}x + 3$ c. 3x + 6y = 12



 SYSTEM OF EQUATIONS:
 Solve systems of equations consisting of two linear equations in two variables algebraically and graphically

 Solving Linear Systems by Graphing:
 https://www.khanacademy.org/math/algebra/systems-of-eq-and-ineq/systems-through-examples/v/solving-linear-systems-by-graphing

 Solving Linear Systems by Substitution:
 https://www.khanacademy.org/math/algebra/systems-of-eq-and-ineq/systems-with-substitution/v/solving-systems-by-substitution-1

 Solving Linear Systems by Elimination/Combination:
 https://www.khanacademy.org/math/algebra/systems-of-eq-and-ineq/solving-systems-addition-elimination/v/solving-systems-by-elimination

 Snorial types of Linear Systems:
 https://www.khanacademy.org/math/algebra/systems-of-eq-and-ineq/solving-systems-addition-elimination/v/solving-systems-by-elimination

Special types of Linear Systems: <u>https://www.khanacademy.org/math/algebra/systems-of-eq-and-ineq/systems-solutions/v/inconsistent-systems-of-equations</u>

24. Solve the following equations for x & y. Use any method.

a. $y = 3x - 4$	b. $2x - 3y = 15$	c. $y = 4x - 1$
x - 4y = -28	-2x - 2y = 0	y = -2x - 7

**QUADRATIC EQUATIONS:** Solve quadratic equations in one variable using square roots, factoring and quadratic formula

Factoring Quadratic Expressions:

https://www.khanacademy.org/math/algebra/quadratics/factoring\_quadratics/v/factoring-quadraticexpressions

Solving Quadratic Equations by Square Roots:

https://www.khanacademy.org/math/algebra/quadratics/quadratics-square-root/v/solving-quadratic-equations-by-square-roots

Solving Quadratic Equations using the Quadratic Formula: <u>https://www.khanacademy.org/math/algebra/quadratics/quadratic-formula/v/using-the-quadratic-formula</u>

 $a x^2 + b x + c = 0$ 

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

25. Factor each expression completely. a.  $x^2 - 25$  b.  $x^2 + 2x - 8$  c.  $2x^3 + 4x^2 - 6x$  d.  $2x^2 - 3x - 9$ 

26. Solve the following quadratic equations using any method. Non-Calculator, leave solution(s) exact and simplify radicals.

a.  $3x^2 = 48$ b.  $x^2 - 12 = 0$ c.  $x^2 - 9x - 36 = 0$ d.  $2x^2 - 15x - 8 = 0$ 

27. Using the Quadratic Formula to solve the following quadratic equation. Leave solution(s) exact and simplify if possible.

a.  $x^2 + 4x + 2 = 0$ b.  $2x^2 - 3x - 4 = 0$ 

#### Answer Key:

- 1. a.  $m \angle \approx 110^{\circ}$ , Obtuse 5. Supplementary b.  $m \angle \approx 57^{\circ}$ , Acute 6. a. No 2. a. Neither b. Yes 7. a.  $\frac{2}{3}$ b. Supplementary c. Complementary b.  $\frac{2}{9}$  cups sugar,  $\frac{1}{3}$  cup flour 3. a. Right, x + 2x = 90,  $\angle 1 = 30^{\circ}$ ,  $\angle 2 = 60^{\circ}$ 8. *x* = 7 b. Straight, y + (y + 40) = 180,  $\angle 3 = 70^{\circ}$ ,  $\angle 4 =$ 9. 9:20 110° 4. Complementary
- 10.

8	4	5	3	6
Octagon	Quadrilateral	Pentagon	Triangle	Hexagon

-	-	

Acute	Obtuse	Acute	Acute	Right
Isosceles	Isosceles	Scalene	Equilateral	Scalene

12. a.  $x = 50^{\circ}$ 17.  $SA = 384\pi \text{ or } 1206.37 \text{ cm}^2$ b.  $x = 70^{\circ}$ 18. x = 7 in., SA = 1134 in<sup>2</sup> 13. a.  $A = 6.2 yd^2$ , P = 10.2 yds19. a. parallel b.  $A = 56 \ km^2$ ,  $P = 25 \ km$ b. perpendicular c.  $A = 120 yd^2$ , P = 52 yds20. a.  $x = \sqrt{192}$  or 13.86 km 14.  $C = 16\pi \text{ or } 50.67 \text{ cm}, A = 64\pi \text{ or } 201.06 \text{ cm}^2$ b. x = 5 mi. 15. 2184  $ft^2$ 21. a.  $x = \frac{1}{2}$ 16. a.  $V = 36 in^3$ ,  $SA = 72 in^2$ b. infinitely many solutions b.  $V = 48 \ cm^3$ ,  $SA = 96 \ cm^2$ c. x = -1622. a. slope of  $\overrightarrow{MN} = \frac{1}{4}$ , parallel to  $\overrightarrow{MN} = \frac{1}{4}$ , perpendicular to  $\overrightarrow{MN} = -4$ b. slope of  $\overrightarrow{MN} = -1$ , parallel to  $\overrightarrow{MN} = -1$ , perpendicular to  $\overrightarrow{MN} = 1$ b. *slope*:  $-\frac{2}{3}$ , *y* - *int*: 3 c. *slope*:  $-\frac{1}{2}$ , *y* - *int*: 2 **23**. a. *slope*: 2, *y* - *int*: 3 24. a. x = 4, y = 8 or (4, 8)b. x = 3, y = -3 or (3, -3)c. x = -1, y = -5 or (-1, -5)25. a. (x+5)(x-5)b. (x+4)(x-2) c. 2x(x+3)(x-1)d. (2x+3)(x-3)d.  $x = -\frac{1}{2}, 8$ c. *x* = 12, −3 b.  $x = \pm 2\sqrt{3}$ 26. a.  $x = \pm 4$ b.  $x = \frac{3}{4} \pm \frac{\sqrt{41}}{4}$ 27. a.  $x = -2 \pm \sqrt{2}$