

## 1. Geometric Notation

- a. draw, identify, or define the geometry terms:
  - i. point, line, plane, angle, ray, and segment.
  - ii. collinear, coplanar, and bisector.
- b. use and/or interpret shorthand notation for geometric figures.
- c. correctly use geometric shorthand to name and/or interpret : points, lines, planes, angles, rays, segments, circles, triangles, and other polygons
- d. use and/or interpret congruence marks on a diagram.
- e. write a congruence statement relating congruent figures using proper order and notation.

## 2. Solving linear equations

- a. Students will be able to solve linear equations and proportions in one variable.

## 3. Square root operations

- a. Simplify a square root completely without the use of a calculator.
- b. Estimate the value of a square root expression.
- c. Evaluate or simplify expressions containing square roots.

## 4. Segments

- a. apply the Segment Addition Postulate to solve for missing lengths or set up equations.
- b. calculate the distance between two points on a graph or given as coordinate points by either using the distance formula or Pythagorean Theorem.
- c. calculate the midpoint of a line segment given the coordinates of the endpoints using the midpoint formula and/or graphically.
- d. determine the coordinates of the endpoint of a segment given the coordinates of its initial endpoint and the midpoint graphically or using the midpoint formula.

## 5. Angles

- a. classify angle measures as **acute**, **right**, **obtuse** or **straight**.
- b. use facts about supplementary angles, complementary angles, vertical angles, linear pairs, adjacent angles, and angle bisectors in a multi-step problem to write and solve simple equations for an unknown angle in a figure.
- c. solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems. (**Angle Addition Postulate**)

## 6. Proof Fundamentals

- 1. demonstrate a working knowledge of the Algebraic Properties:
  - 1. Addition Property of Equality
  - 2. Subtraction Property of Equality
  - 3. Multiplication Property of Equality
  - 4. Division Property of Equality
  - 5. Distributive Property

6. Simplify (Combine like terms)
7. Symmetric Property
2. Write an algebraic proof using the properties above.
3. Write a statement in conditional form (if \_\_\_\_, then \_\_\_\_.)
4. Identify the hypothesis and/or conclusion of a conditional statement.
5. Determine the truth value of a conditional statement.
6. Write the converse of a conditional statement, given the conditional statement.
7. Write a biconditional statement given the conditional statement and/or the converse.
8. Write a 2-column proof in a logical order with all necessary steps.

## **7. Angles and parallel lines with transversals**

- a. Identify corresponding angles, alternate interior angles, alternate exterior angles, consecutive interior angles.
- b. Use Corresponding Angles Theorem, Consecutive Interior Angles Theorem, Alternate Interior Angles Theorem, Alternate Exterior Angles Theorem.
- c. Use Corresponding Angles Converse, Consecutive Interior Angles Converse, Alternate Interior Angles Converse, Alternate Exterior Angles Converse.

## **8. Slope of Lines**

- a. Find the slope of a line given two points on the line, a table, or a graph of the line.
- b. Identify slope from any modality of a line (slope-intercept form, point-slope form or standard form)
- c. Identify parallel and perpendicular lines from their slopes.

## **9. Equations of lines**

- a. Graph a line given an equation in any form; slope-intercept form, point-slope form or standard form.
- b. Write the equation of a line in slope-intercept form or point-slope form given two points on the line or the graph of the line.
- c. Find the y-intercept and x intercept of a line from a graph or equation.

## **10. Transformations**

- a. Identify a transformation as a translation, rotation, reflection, or dilation.
- b. translate a point or figure given written directions (left 3, up 2) or directions in terms of coordinate points (x-3, y+2)
- c. reflect a point or figure across a horizontal or vertical line.
- d. rotate a point or figure about the origin 90, 180, 270, or 360 degrees in the clockwise or counterclockwise direction
- e. Dilate a point or figure about the origin given the scale factor.
- f. identify and explain why translations, rotation, and reflections create congruent figures while dilations create similar figures.
- g. identify the transformations or transform a figure that has been created by multiple transformations.

**11. Properties of triangles**

- a. apply the **triangle sum theorem** (know the three interior angles sum to  $180^\circ$ ).
- b. given the angle (or side) measures of a triangle, name the side lengths (or angles) in order from smallest to largest using a compound inequality.
- c. determine if three side lengths can form a triangle using the *Triangle Inequality* theorem.
- d. use the *Triangle Inequality* theorem to state all possible lengths for the third side of a triangle using a compound inequality.
- e. classify a triangle by its **sides** as scalene, isosceles or equilateral.
- f. classify a triangle by its **angles** as acute, right, equiangular or obtuse.
- g. prove a triangle is a right triangle using **slope criteria** for perpendicular lines.
- h. use the **triangle sum theorem**, the definitions of an isosceles, right and equilateral (equiangular) triangles, and your understanding of congruence notation to find missing angles and side lengths in diagrams.
- i. apply the base angles theorem and its converse.

**12. Triangle congruence**

- a. use the definition of congruence to show that two figures are congruent if and only if corresponding pairs of sides and angles are congruent.
- b. interpret a given congruence statement relating two congruent triangles in order to identify corresponding parts.
- c. apply the SAS, SSS, ASA, AAS or HL postulates/theorems to prove triangles congruent.
- d. demonstrate an understanding that AAA and SSA do NOT prove triangles congruent.
- e. Use CPCTC (Corresponding Parts of Congruent Triangles are Congruent) to prove segments or angles congruent.

**13. Similarity**

- a. use a **similarity statement** to write the pairs of corresponding and congruent angles.
- b. apply the definition of similarity to determine if two polygons are similar.
- c. write a **similarity statement** given two similar polygons.
- d. write a **statement of proportionality** given a similarity statement and/or the diagrams of two similar polygons.
- e. determine the **scale factor** (similarity ratio) that relates two similar polygons.
- f. relate the perimeters of similar polygons (if two polygons are similar, then the ratio of their perimeters is equal to the ratio of their corresponding side lengths).
- g. solve for sides and angles in a polygon given the similarity ratio (**scale factor**).

**14. Special right triangles**

- a. Use the ratio of sides in a 45-45-90 degree triangle (isosceles right triangle) to find in exact form:

- missing hypotenuse and other leg given leg
- missing legs given a hypotenuse
- b. Use the ratio of sides in a 30-60-90 degree triangle to find in exact form:
  - missing hypotenuse and longer leg given shorter leg
  - missing shorter leg and hypotenuse given longer leg
  - missing shorter and longer legs given hypotenuse

## 15. Pythagorean Theorem

- a. Find the hypotenuse of a right triangle given the lengths of the legs.
- b. Find the length of a leg of a right triangle given the length of the other leg and the length of the hypotenuse.
- c. Use the Converse of the Pythagorean Theorem to classify a triangle as right, acute, or obtuse.

## 16. Properties/classifying of polygons

- a. determine if a plane figure is a polygon.
- b. use the definitions of convex and concave.
- c. Use the definitions of equiangular, equilateral, and regular polygon.
- d. classify polygons by their popular names for polygons that contain  $n$  sides within the range  $3 \leq n \leq 12$ . *Note:* The name of an 11 sided polygon is an 11-gon.
- e. apply the ***polygon interior angles theorem*** (the sum of the measures of the interior angles of a convex  $n$ -gon is  $(n - 2) \cdot 180^\circ$ ) and its corollary.
- f. apply the ***polygon exterior angles theorem*** (the sum of the measures of the exterior angles of a convex  $n$ -gon, one angle at each vertex, is 360 degrees) and its corollary.
- g. Classify a quadrilateral as a trapezoid, isosceles trapezoid, or kite.
- h. Use theorems about trapezoids to find segment lengths and angle measures.
  - i. Isosceles Trapezoid Base Angles Theorem
  - ii. Midsegment Theorem
- i. Use the properties of a kite to find missing segment lengths and angle measures.

## 17. Properties of parallelograms

- a. use the properties of parallelograms to solve for missing segments or angles in parallelograms:
  - i. both pairs of opposite sides are parallel
  - ii. both pairs of opposite sides are congruent.
  - iii. both pairs of opposite angles are congruent.
  - iv. consecutive angles are supplementary
  - v. diagonals bisect each other
- b. Determine if a quadrilateral is a parallelogram:

- i. define a parallelogram as a quadrilateral with both pairs of opposite sides parallel.
- ii. if both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.
- iii. if both pairs of opposite angles of a quadrilateral are congruent, then the quadrilateral is a parallelogram.
- iv. if an angle of a quadrilateral is supplementary to both of its consecutive angles, then the quadrilateral is a parallelogram.
- v. if the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.
- vi. if one pair of opposite sides of a quadrilateral are congruent and parallel, then the quadrilateral is a parallelogram.
- c. Determine if a parallelogram can be further classified as a rhombus, rectangle, or square.
- d. Use properties of parallelograms, rectangles, rhombuses, and squares to find missing segments (sides and diagonals) and angle measures.

## 18. Trigonometry: Right Triangles

- a. Write the sine, cosine, or tangent ratio of sides.
- b. Use a given side length, angle of a right triangle, and the appropriate trigonometric ratios ( $\sin$ ,  $\cos$ ,  $\tan$ ) to solve for missing side lengths.
- c. Use two given side lengths of a right triangle and the appropriate inverse trigonometric ratio ( $\sin^{-1}$ ,  $\cos^{-1}$ ,  $\tan^{-1}$ ) to solve for missing angles.

## 19. Circumference/Area/Perimeter

- a. calculate the area of triangles, parallelograms, rectangles, rhombi, kites, squares and trapezoids.
- b. calculate the area of composite figures made up of triangles, parallelograms, rectangles, rhombi, kites, squares, trapezoids, and semicircles.
- c. calculate the length of a given arc given the central angle and radius of the circle
- d. find the area of a sector given the central angle and the radius of the circle.
- e. write final answer in either exact or approximate form.

## 20. Circle Relationships:

- a. identify and describe relationships among inscribed angles, radii, and chords.
- b. identify and define the lines, segments, angles and arcs associated with a circle (chord, radius, diameter, secant line, tangent line, point of tangency, minor arc, major arc, semicircle, inscribed angle).
- c. verify a tangent to a circle.

1. if a line is tangent to a circle, then it is perpendicular to the radius drawn to the point of tangency.
2. in a plane, if a line is perpendicular to a radius of a circle at its endpoint on the circle, then the line is tangent.
- d. build the equation of a tangent line given the center of a circle and a point of tangency
- e. apply theorems related to inscribed angles.
  1. if an angle is inscribed in a circle, then its measure is half the measure of its intercepted arc
  2. if two inscribed angles of a circle intercept the same arc, then the angles are congruent.

## 21. Surface area and Volume

- a. Use a net to name a 3d figure or create a net from a diagram of a 3d figure.
- b. Calculate the total surface area of rectangular and triangular prisms, cubes, and right square pyramids.
- c. Calculate the volume of a rectangular or triangular prism.
- d. calculate the volume of a rectangular, square, or triangular pyramid
- e. Calculate the volume of a cylinder, cone, sphere, and hemisphere in exact and approximate form.
- f. Find the missing dimension of a prism, pyramid, cylinder or cone given the volume of the solid and one dimension.

## 22. Attend to precision:

- a. following directions to express a final answer in simplest, exact, or approximate form.
- b. using appropriate units of measure.
- c. round numbers as directions indicate (to the nearest thousandth, hundredth, tenth, or whole number).