Topic 1 - Foundations of Geometry

- Know the precise definitions of angle, circle, perpendicular line, parallel line, and line segment based on the undefined notions of point, line, linear distance, and arc distance.
- Prove theorems about lines and angles
- Make formal geometric constructions with a variety of tools and methods.
- Use coordinates to compute perimeters of polygons & areas of triangles and rectangles.
- Use geometric shapes, their measures, and their properties to describe objects.
- Apply concepts of density based on area and volume in modeling situations.
- Identify parts of conditional statements, write converse and contrapositive statements. Use the Laws of Detachment and Syllogism.

Topic 2 - Parallel and Perpendicular Lines

- Know the precise definitions of perpendicular line and parallel line based on the undefined notions of point, line, linear distance, and arc distance.
- Prove theorems about lines and angles
- Prove theorems about triangles.
- Make formal geometric constructions with a variety of tools and methods.
- Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems.
- Use geometric shapes, their measures, and their properties to describe objects.

Topic 3 - Transformations

- Represent transformations in the plane using transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not.
- Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
- Develop definitions of rotations, reflections, translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
- Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure. Specify a sequence of transformations that will carry a figure onto another.
- Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure.
- Apply geometric methods to solve design problems.

Topic 4 - Congruence

- Given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
- Use the definition of congruence in terms of rigid motion to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
- Explain how the criteria for triangle congruence follow from the definition of congruence in terms of rigid motions.
- Prove theorems about triangles.
- Use congruence and similarity criteria for triangles to solve problems and prove relationships in Geometric figures.

Topic 5 - Perpendicular and Angle Bisectors

- Prove theorems about lines and angles
- Prove theorems about triangles.
- Construct inscribed and circumscribed circles of a triangle and prove properties of angles for a quadrilateral inscribed in a circle.

Topic 6 - Quadrilaterals and Other Polygons

- Prove theorems about parallelograms
- Use coordinates to prove objects are/are not rectangles.
- Use geometric shapes, their measures, and their properties to describe objects.

Topic 7 - Similarity

- Verify experimentally the properties of dilations given by a center and a scale factor.
- Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and proportionality of all corresponding pairs of sides.
- Use similarity transformations to establish the AA criterion for two triangles to be similar.
- Prove theorems about similar triangles.
- Use congruence and similarity criteria for triangles to solve problems and prove relationships in Geometric figures.
- Use geometric shapes, their measures, and their properties to describe objects.
- Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

Topic 8 - Right Triangles and Trigonometry

- Prove theorems about similar triangles.
- Use similarity to develop the definitions of trigonometric ratios for acute angles.
- Explain and use the relationship between sine and cosine of complementary angles.
- Use trig ratios & the Pythagorean Theorem to solve right triangles in applied problems.

Topic 9 - Coordinate Geometry

- Derive the equation of a circle of given center & radius using the Pythagorean Theorem.
- Derive the equation of a parabola given a focus and directrix.
- Use coordinates to prove that a point is/is not on a circle.
- Use coordinates to compute perimeters of polygons & areas of triangles and rectangles

Topic 10 - Circles

- Construct an equilateral triangle, square, and regular hexagon inscribed in a circle.
- Prove all circles are similar.
- Identify and describe relationships among inscribed angles, radii, and chords.
- Construct inscribed and circumscribed circles of a triangle and prove properties of angles for a quadrilateral inscribed in a circle.
- Derive the fact that the length of the arc intercepted by an angle is proportional to the radius & define the radian measure of the angle as the constant of proportionality.
- Give an informal argument for the formulas for circumference and area of a circle.
- Apply geometric methods to solve design problems.

Topic 11 - 2D and 3D Models

- Give an informal argument for the formulas volume of a cylinder, pyramid, and cone. Use dissection and Cavalieri's principle.
- Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
- Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
- Use geometric shapes, their measures, and their properties to describe objects.
- Apply concepts of density based on area and volume in modeling situations.
- Apply geometric methods to solve design problems.

Unit 12 - Additional Standards

- Understand, analyze, evaluate, and apply vertex-edge graphs to model and solve problems related to paths, circuits, networks, and relationships among a finite number of elements, in real-world and abstract settings.
- Model and solve problems using at least two of the following fundamental graph topics and models: Euler paths and circuits, Hamilton paths and circuits, the traveling salesman problem, minimum spanning trees, critical paths, vertex coloring.
- Compare and contrast vertex-edge graph topics and models in terms of:
    - Properties
    - Algorithms
    - Optimization
    - Types of problems that can be solved