Unit One: Geometric Tools: Points, Lines, Planes, Angles, Constructions (4 Weeks)

Big Ideas: **Honors Course Additions in Italics*

- Geometric figures, symbols and definitions
- Segment midpoints/bisectors and angle bisectors, and constructions: copy segment, midpoint, bisectors
- Angle pairs: vertical angles, complementary and supplementary angles
- Distance and midpoints in coordinate plane

Topics	Assessments	Standards
1) Students identify and model geometric terms with appropriate mathematical symbols and pictures. 2) Students use an understanding of vertical, supplementary, and complementary angles to solve problems as well as midpoints and bisectors. 3) Students will be able to use formulas (distance, midpoint, and Pythagorean theorem) 4) Constructions of congruent segments and angles, midpoints, bisectors 5) Students will be able to write two column algebraic proofs, and two column and paragraph proofs involving segments and angles. 6) *Students will be able to solve systems of equations and three dimensional distance problems*	1. Homework and in-class assignments 2. Quiz – definitions and geometric symbols, solving problems with angles and segments Quiz – Constructions 3. Test Note: Split into Unit 1 part A and B. Part B includes conditional and converses, algebraic proofs and proofs about segments and angles.	1. Know precise definitions of ray, angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. (G.CO.1) 2. Use coordinates to prove simple geometric theorems algebraically. (G. GPE.4) 3. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, paper folding, dynamic geometric software). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment. (G.CO.12) 4. Prove and apply theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints Proofs should include paragraph, flowchart and two-column proofs. (G.CO.9)

Unit Two: Angle Pairs with Parallel Lines, Perpendicular Lines (3 Weeks)

Big Ideas:

- Use parallel lines with transversals to determine angle measures
- Determine whether lines are parallel, perpendicular or neither
- Graph parallel and perpendicular lines

Topics	Assessments	Standards
1. Students will be able to identify the angle pair relationships from parallel lines cut by a transversal 2. Solve problems with angles in parallel lines 3. Students will be able to graph parallel and perpendicular lines and write the equations of lines parallel or perpendicular to a given line. 4. Constructions of parallel and perpendicular lines 5. *Students will be able to prove lines are parallel* 6. *Relate to A.REI.5 from Alg 1 – solving systems of equations*	1. Homework and in-class assignments 2. Quiz – Identify angle pairs with parallel lines and a transversal, solve angle problems algebraically 3. Test	1. Justify the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). (G.GPE.5) 2. Make formal geometric constructions with a variety of tools and methods; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line. (G.CO.12) 3. Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints. (G.CO.9)

Unit Three: Congruence – Transformations and Congruent Triangles (4 Weeks)

Big Ideas:

- Recognize and apply rigid transformations on the coordinate plane, and composite transformations
- Symmetry – line symmetry, rotational symmetry and point symmetry
- Congruence statements for polygons
- Prove triangles are congruent

Topics	Assessments	Standards
1) Students will able to identify and apply transformations – reflections, rotations and translations. 2) Students will be able to identify line and rotational symmetry. 3) Students will be able to perform transformations using graph paper and software *4) Use vectors to apply translations; transformations of functions* 5) Students will be able to interpret congruence statements and mark congruent parts on a diagram 6) Students will be able to prove triangles are congruent by SSS, SAS, ASA, AAS and HL. 7) Students will be able to prove that corresponding parts of triangles are congruent by first showing the triangles are congruent	1. Homework and in-class assignments 2. Quiz – Transformations 3. Test	1) Represent transformations in the plane using transparencies, and geo software. Describe them as functions that take points in the plane as inputs and give other points as outputs. (G.CO.2) 2) Identify symmetries of a figure, which are the rotations and reflections that carry it onto itself. Identify figures that have line symmetry or rotational symmetry and use these to analyze shapes. (G.CO.3) 3) Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines and line segments. (G.CO.4) 4) Given a geometric figure and a rotations, reflection or translation, draw the transformed figure using graph paper, tracing paper or geom software. (G.CO.5). 5) Use the definition of rigid motions to predict the effect of a given rigid motion. Given 2 figures, use definition of rigid motions to decide if they are congruent. (G.CO.6) 6) Use the definition of congruence in terms of rigid motions to show that 2 triangles are congruent if corresponding sides and angles are congruent. (G.CO.7) 7) Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. (G.CO.8)

Unit Four: Triangles (3 Weeks)

Big Ideas:

- Apply Triangle sum theorem and Exterior angles theorem
- Isosceles and equilateral triangle theorems, triangle inequality theorem
- Classify triangles on the coordinate plane

Topics	Assessments	Standards
1) Students identify and classify triangles by their angles and sides using the Triangle Sum Theorem when necessary 2) Students will be able to determine if 3 given lengths will make a triangle 3) Solve problems involving isosceles and equilateral triangles, construct equilateral triangles 4) Students will be able to classify a triangle on the Cartesian Coordinate system. Use slopes to determine right angles. 5) Construct an equilateral triangle, regular hexagon. 6) *Understand how to find the circumcenter, incenter, centroid and orthocenter of triangles – construct and use their properties to solve problems (G.CO.10 – medians meet at a point)*	1. Homework and in-class assignments 2. Quizzes 3. Test	1) Prove theorems about triangles: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point. (G.CO.10) 2) Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle. (G.CO.13) 3) Use coordinates to prove simple geometric theorems algebraically and to verify geometric relationships, including properties of special triangles, quadrilaterals and cirlces.. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove that a triangle is scalene, isosceles or equilateral. (G.M2)

Unit Five: Probability (2-3 Weeks)

Big Ideas:

- Understand and determine experimental and theoretical probabilities
- Use frequency tables and probability distributions
- Identify independent and dependent events and determine compound probabilities
- Understand and calculate conditional probabilities and determine if events are independent

Topics	Assessments	Standards
1. Students will be able to use probability to make informed decisions 2. Understand the difference between theoretical and experimental probability 3. Apply Addition and Multiplication rules for probability 4. Construct and interpret frequency tables 5. Calculate conditional probability 6. Determine whether events are independent	1) Homework and in-class assignments 2) Quizzes 3) Test	1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). (S.CP.1) 2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent. (S.CP.2) 3. Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional prob. of B given A is the same as the probability of B(S.CP.3, 5) 4. Construct/interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the table to decide if events are independent and to find conditional probabilities. (S.CP.4) 5. Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model. (S.CP.7) 6. (+) Apply the general Multiplication Rule in a uniform probability model, and interpret the answer in terms of the model. (S.CP.8)

Unit Six: Polygons – Quadrilaterals (3 Weeks)

Big Ideas:

- Apply theorems to find the sum of interior and exterior angles in polygons
- Classify special quadrilaterals by their specific names, including classification in the coordinate plane
- Solve problems using the properties of polygons

Topics	Assessments	Standards
1. Apply theorems to find the sum of interior and exterior angles in polygons 2. Prove and apply theorems about parallelograms. 3. Students will be able to identify and classify specific quadrilaterals and their properties, justifying classification using slope and distance in the coordinate plane 4. Students will be able to solve problems involving special quadrilaterals using the properties of each of the shapes 5. Students will find the perimeter and area of quadrilaterals in the coordinate plane	1. Homework and in-class assignments 2. Quizzes 3. Test	1. Prove and apply theorems about parallelograms. Theorems include opposite angles are congruent, opposite sides are congruent, diagonals of a parallelogram bisect each other. (G.CO.11) 2. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. 3. Classify two-dimensional figures in a hierarchy based on properties. (G.CO.14) 4. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles using Pythagorean theorem (distance formula). (G.GPE.7) 5. Use coordinates to prove simple geometric theorems algebraically and to verify geometric relationships, including properties of special triangles, quadrilaterals and cirlces.. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle. (G.M2)

Unit Seven: Similar Figures (3-4 Weeks)

Essential Questions:

- How can AA, SSS, and SAS be used to prove triangles are similar?
- What makes a transformation a similarity transformation?
- What is the relationship between a pre-image and the image resulting from a similarity transformation?

Objectives	Assessments/Acvities	Standards
1) Students will be able to identify similar figures by using the AA, SSS, and SAS postulates. 2) Students will be able to use ratios and proportions to solve similar figures. 3) Students will be able to set up proportions based on similar figures to find missing lengths and areas 4) Students will be able to identify and apply dilations to geometric figures and understand that all circles are similar 5) Students will be able to prove triangles are similar	1) Homework and in-class assignments 2) Quizzes 3) Test 4) Use shadows and similar right triangles to measure the heights of objects indirectly Key Vobaulary -	1) Verify experimentally the properties of dilations given by a center and a scale factor: a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor. (G.SRT.1) 2) 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 the proportionality of all corresponding pairs of sides.(G.SRT.2) 3) Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.(G.SRT.3) 4) Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity. (G.SRT.4) 5) Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. Use paragraph proof, flowchart proof and 2-column proofs. (G.SRT.5) 6) Find the point on a directed line segment between two given points that partitions the segment in a given ratio. (G.GPE.6)

Unit Eight: Right Triangles: Pythagorean Theorem and Converse, Trigonometry (3 Weeks)

Essential Questions:

- How is the Pythagorean Theorem used in real world settings?
- How do trigonometric functions relate angle measure to side length of right triangles?

Objectives	Assessments/Activities	Standards
1) Students will demonstrate an understanding of the Pythagorean Theorem and apply it to real-world problems, and identify Pythagorean triples 2) Students will use the converse of the Pythagorean theorem to justify whether a triangle is a right triangle 3) Students use trigonometric ratios to find sides of a right triangle, and solve real-world problems using trig ratios 4) Students will be able to find missing angles in right triangles using the inverse trig functions (not an OST topic)	1) Homework and in-class assignments 2) Desmos activity 3) Quizzes/Test 4) Performance Task: Use clinometer, tape measures to fjnd the height of real world objects indirectly **Key Vocabulary**: - Pythagorean Triple - Trig ratio - Sine - Cosine - Tangent	1) Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. (G.SRT.6) 2) Explain and use the relationship between the sine and cosine of complementary angles. (G.SRT.7) 3) Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.(G.SRT.8) Standards focus on specific cases that excludes the use of inverse trig functions

Unit Nine: Circles (3-4 Weeks)

Big Ideas:

- Understand and apply theorems about circles
- Use the relationships among inscribed angles, central angles, radii and chords to solve problems
- Apply the standard equation of a circle and graph circles

Topics	Assessments	Standards
1) Students will be able to identify parts of a circle and use relationships between the radius and the tangent line. 2) Students will be able to solve problems involving central and inscribed angles. 3) Students will be able to find areas of sectors of circles and the lengths of arcs of a circle. *Honors: understand and use Radians to find arc lengths* 4) Students will be able to apply the standard equation of a circle and graph the circles. 5) Students will complete the square to find the center and radius of a circle equation. 6) *Students will solve for missing angles in problems with chords, secants and tangents.*	1) Homework and in-class assignments 2) Quizzes 3) Test	1) Prove that all circles are similar. (G.C.1) 2) Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.(G.C.2) 3) Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.(G.C.3) 4) Find arc lengths and areas of sectors of circles. Apply similarity to relate the length of an arc intercepted by a central angle to the radius. Derive the formula for the area of a sector and use it to solve problems. (G.C.5) 5) Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.(G.GPE.1)

Unit Ten: Area of 2D and 3D Figures and Volume of 3D Figures (3 Weeks)

Big Ideas:

- Understand and use formulas to find volumes of 3D figures
- Visualize relationships between 2D and 3D objects
- Identify cross-sections of 3D obects
- Understand the relationships between lengths, areas and volumes of similar figures

Topics	Assessments	Standards
1) Students will find areas and perimeters of geometric figures, including regular polygons 2) Students will be able to apply formulas to find volume of 3D geometric figures. 3) Students will find the areas and volumes of similar figures 4) Students will be able to explain how the formulas relate and how they were derived 5) Students will solve real world problems involving area and volume 6) Apply concepts to modeling situations, using density and geometric methods.	1) Homework and in-class assignments 2) Quizzes 3) Test 4) Possible projects: - House/roof project - Polyhedron project - Landscape architecture project - Pool project	1) Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments. (G.GMD.1) 2) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures. 3) Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.(G.GMD.3) 4) Identify the shapes of two-dimensional cross-sections of three- dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.(G.GMD.4) 5) When figures are similar, apply scale factor k to a figure and understand its effect on lengths, areas and volumes.(G.GMD.6) 6) Apply concepts of density based on area and volume in modeling situations, e.g., persons per square mile. (G.MG.2) 7) Use geometric shapes, their measures and their properties to describe objects, e.g., modeling a tree trunk with a cylinder. (G.MG.3)

Honors Only Unit: Triangle Centers (1-2 Weeks)

Essential Questions:

- How is the Pythagorean Theorem used in real world settings?
- How do trigonometric functions relate angle measure to side length of right triangles?

Objectives	Assessments/Activities	Standards
1) Use perpendicular and angle bisectors to solve problems 2) Use triangle bisectors to solve real world problems 3) Find the points of concurrency of the bisectors, medians and altitudes of triangles	1) In-class group exploration with constructions 2) Homework 3) Quizlet review 4) Quiz	G.CO.9 Prove and apply theorems about lines and angles. Theorems include but are not restricted to the following: points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints. G.CO.10 Prove and apply theorems about triangles. Theorems include but are not restricted to the following: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length**; the medians of a triangle meet at a point known as the centroid.** G.C.3 Construct angle bisectors and perpendicular bisectors and the inscribed and circumscribed circles of a triangle; Locate the incenter and circumcenter of a triangle.