Geometry (Grades 9-12)

Course Description:

The curriculum for this course is developed from the Common Core State Standards for Mathematics. Geometry is the study of objects in two and three dimensions. This course provides students with basic mathematical skills needed for further work in mathematics, science, and engineering as well as in everyday life. Euclidean geometry is studied with an emphasis on problem solving. The topics of the course include the study of arcs, area, volume and an introduction to trigonometry. The study of geometry is required for entrance into 4-year colleges.

Essential Understandings:

1. Using the structure, patterns, and language of mathematics to express ideas precisely through reasoning, representations, symbols, and notation is essential to communicate fluently across multiple disciplines. (N-Q.1, G-CO.1, G-MG.1)
2. Making formal geometric constructions solidifies background knowledge of geometric figures in order to solve problems. (G-CO.12, G-CO.13)
3. Constructing and judging the validity of a logical argument consisting of a set of premises and a conclusion enhances critical thinking skills. (G-CO.9, G-CO.10, G-CO.11, G-GPE.4, MP3, G-SRT.B.4, G-SRT.B.5)
4. Writing linear equations for parallel and perpendicular lines assists in connecting algebraic concepts to geometric situations. (G-GPE.5, G-GPE.6, A-CED.A.2)
5. Understanding concepts related to probability is necessary to solve problems, make hypotheses and interpret data and outcomes. (S-CP.1, S-CP.2)
6. Applying congruence and similarity properties allows for the measurements of geometric figures to be found indirectly which can be applied to real-world situations. (G-CO.7, G-CO.8)
7. Exploring proportional relationships between similar triangles, the relationships among the angles and sides of right triangles, and transformations in the coordinate plane is essential in solving meaningful geometric representations. (G-CO.2, G-CO.3, G-CO.4, G-CO.5, G.SRT.A.1, G-SRT.A.2, G-SRT.A.3, G-SRT.C.6, G-SRT.C.7, G-SRT.C.8, G-SRT.D.11)
8. Using formulas and the properties of polygons and circles allows for the solving of practical problems involving perimeter, area, surface area, and volume. (G-C.A.1, G-C.2, G-C.5, G-GPE.1, G-GPE.7, G-GMD.1, G-GMD.4)

Unit	Description of Unit and Learning Targets
Geometric Structure • How are geometric concepts used to model mathematical or real-life relationships? • How can you use deductive reasoning to form logical proofs? • What does the process of constructing a proof look in everyday situations? • What information can be gained when you know lines are parallel?	In this unit students will understand basic geometric terms, such as lines, planes, and angles and how they can be used to prove theorems. <u>Learning Targets:</u> • I can identify points, lines, planes, and collinear and coplanar points. • I can measure segments and determine accuracy of measurements. • I can find the distances between points and the midpoints of segments. • I can measure and classify angles and identify angle relationships. • I can make conjectures, determine whether a statement is true or false, and find counterexamples for statements. • I can use deductive reasoning to reach valid conclusions.

	● I can create equations in two variables for parallel and perpendicular lines. ● I can graph equations that represent parallel and perpendicular lines on coordinate axes with labels and scales. ● I can identify angle relationships that occur with parallel lines and a transversal, and identify and prove lines parallel from given angle relationships. ● I can find the distance between a point and a line and between two parallel lines.
Transformations ● How can you convince others that what you think about a shape is true? ● How can you change a figure's position without changing its size or shape? ● How can you change a figure's size without changing its shape?	In this unit students will learn about transformations (translations, reflections, rotations, dilations) as students study how to flip, turn, and slide shapes. <u>Learning Targets:</u> ● I can name, draw, and recognize figures that have been reflected, translated, rotated, or dilated. ● I can name and label corresponding parts of congruent triangles, and determine what transformation was used. ● I can verify experimentally the properties of dilations given by a center and a scale factor.
Congruence ● How can angle and side relationships be used to verify conjectures involving triangles? ● How do the constraints of geometric figures affect their classifications?	In this unit students will use a variety of representations, tools, and technology to solve meaningful problems by representing and transforming figures and analyzing relationships. <u>Learning Targets:</u> ● I can test for triangle congruence using SSS, SAS, ASA, and AAS. ● I can use indirect proof with algebra and geometry. ● I can apply the Triangle Inequality Theorem and SAS and SSS inequalities. ● I can recognize and apply the properties of triangles, parallelograms, rectangles, rhombi, squares, and trapezoids. ● I can make formal constructions with a variety of tools. ● I can construct regular shapes.
Similarity ● How can you use proportional parts and relationships in the real-world to read maps accurately, work with blueprints or adapt recipes? ● How can I use the properties of congruent and similar triangles to develop the basis of right triangle trigonometry? ● What career paths would use trigonometry in their work?	In this unit students will explore proportional relationships between similar triangles, the relationships among the angles and sides of right triangles, and transformations in the coordinate plane. <u>Learning Targets:</u> ● I can identify similar polygons and use ratios and proportions to solve problems involving their perimeters and/or parts. ● I can use the definition of similarity in terms of similarity transformations to decide if two figures are similar. ● I can use properties of similarity transformations to establish the AA criterion for two triangles to be similar. ● I can prove theorems about triangles, including the Pythagorean Theorem and its converse. ● I can use the definitions of trigonometric ratios and understand the relationship between the sine and cosine of complementary angles. ● I can use the Pythagorean Theorem and trigonometric ratios to solve right triangle problems. ● I can solve triangles using the Law of Sines and Law of Cosines.

Two and Three Dimensional Measurement ● How can I use the properties of polygons that I've learned to determine the surface area and volume of three-dimensional figures?	In this unit students will calculate measures in two and three dimensions and use the properties of circles. <u>Learning Targets:</u> ● I can identify parts of a circle and solve problems involving circumference and area. ● I can find arc, angle measures, and measures of segments in a circle. ● I can write the equation of a circle. ● I can find geometric probability and areas of sectors and segments of circles. ● I can find the lateral and surface areas of prisms, cylinders, pyramids, spheres, hemispheres, and cones. ● I can use units as a way to understand problems. ● I can identify the shapes of two-dimensional cross sections of three-dimensional figures and identify three-dimensional objects generated by rotations of two-dimensional objects.