North Polk Community Schools Pacing & Course Description Guide

Grade Level: 9-12	Content: Geometry	Year: 2022-23

Course Description/Rationale

A systematic and deductive study of lines, angles, triangles, quadrilaterals, and other geometric figures as they exist in both a plane and a 3-dimensional world. Once the properties of the figure are established by deductive reasoning, the properties of algebra are applied in finding length, size, area, and volume. This course emphasizes geometry as an axiomatic system including the study of postulates, theorems, and formal proofs: concepts of congruence, similarity, parallelism, perpendicularity, and proportion; and problem solving. **A graphing calculator is recommended for this class. A TI-84 will be sufficient for this and future math classes. If you are planning to major in engineering or something math related,** (2 HS credits)

Name of Unit	Time Frame	Essential Learning Target	Standard(s)
Unit 1 Coordinate Geometry	2.5 weeks	• Rewrite expressions involving radicals and rational exponents using the properties of exponents. (N-RN.A.2) • Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2). (G-GPE.B.4) • Prove 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.B.5) • Find the point on a directed line segment between two given points that partitions the segment in a given ratio. (G-GPE.B.6) • Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.★ (G-GPE.B.7)	(N-RN.A.2) (G-GPE.B.4) (G-GPE.B.5) (G-GPE.B.6) (G-GPE.B.7)
Unit 2 Basics of Geometry	2.5 weeks	• Know precise definitions of 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.A.1) • 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.C.9)	(G-CO.A.1) (G-CO.C.9)
Unit 3 Intro to Proofs	3 weeks	• Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. (A-REI.A.1) • 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.C.9) • Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2). (G-GPE.B.4)	(A-REI.A.1) (G-CO.C.9) (G-GPE.B.4)
Unit 4 Triangle Congruence	3 weeks	• Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. (G-CO.B.6)• Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. (G-CO.B.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.B.8) • Prove theorems about triangles. Theorems include: 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.C.10) • Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. (G-SRT.B.5)	(G-CO.B.6) (G-CO.B.7) (G-CO.B.8) (G-CO.C.10) (G-SRT.B.5)

Unit 5 Segments In Triangles	2 weeks	• Prove theorems about triangles. Theorems include: 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.C.10)	(G-CO.C.10)
Unit 6 Quadrilaterals	3 weeks	● Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals. (G-CO.C.11) ● Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2). (G-GPE.B.4)	(G-CO.C.11) (G-GPE.B.4)
Unit 7 Similarity	2 weeks	● Verify experimentally the properties of dilations given by a center and a scale factor: o 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. o The dilation of a line segment is longer or shorter in the ratio given by the scale factor. (G-SRT.A.1) ● 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.A.2) ● Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. (G-SRT.A.3) ● 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.B.4) ● Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. (G-SRT.B.5)	(G-SRT.A.1) (G-SRT.A.2) (G-SRT.A.3) (G-SRT.B.4) (G-SRT.B.5)
Unit 8 Right Triangle Trig	3 weeks	• 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.C.6) • Explain and use the relationship between the sine and cosine of complementary angles. (G-SRT.C.7) • Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.★ (G-SRT.C.8)	(G-SRT.C.6) (G-SRT.C.7) (G-SRT.C.8)
Unit 9 Circles	3 weeks	● Prove that all circles are similar. (G-C.A.1) ● 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.A.2)	(G-C.A.1) (G-C.A.2)
Unit 10 Area	2 weeks	Derive the area formulas of rectangles, squares, rhombi, trapezoids, parallelograms, and kites and use the area formulas to solve problems • Find the area and circumference of a circle and use the formulas to solve problems • Derive the formulas for arc length and area of a sector and use the formulas to solve problems	G.MG.1 G.GPE.7 G.C.5
Unit 11 Surface Area	2 weeks	Find the surface area of a prism and a cylinder Find the surface area of a pyramid and a cone Find the surface area of a sphere	G.GMD.4 G.MG.1

Unit 12 Volume	2 weeks	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.A.1) ● Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.★ (G-GMD.A.3) ● 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.B.4) ● Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).★ (G-MG.A.1) ● Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).★ (G-MG.A.2) ● Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).★ (G-MG.A.3)	(G-GMD.A.3) (G-GMD.B.4) (G-GMD.A.1) (G-MG.A.2)

Unit 13 End of the year Project	5 weeks	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).★ (G-MG.A.3)	(G-MG.A.3) (G-MG.A.1)