

Geometry Course Description

The main goal of Geometry is for students to develop the structure of Euclidean geometry logically and apply the resulting theorems, proofs, and formulas to address meaningful problems. Students will use experimentation and inductive reasoning to construct geometric concepts, discover geometric relationships, and formulate conjectures. Students will employ deductive logic to construct formal logical arguments and proofs. Students will extend their pre-existing experiences with algebra and geometry to trigonometry and coordinate geometry. Students will use dynamic geometry software, compass and straightedge, and other tools to investigate and explore mathematical ideas and relationships and develop multiple strategies for analyzing complex situations. Students will apply mathematical skills and make meaningful connections to life's experiences.

Geometry Big Ideas

Geometry students learn to use and understand the following eight fundamental concepts:

1. Mathematical Language, Geometric Symbols and Geometric Notation
2. Algebraic, Spatial, and Logical Reasoning
3. Properties of Geometric Figures – Triangle, Quadrilaterals, Polygons, and Circles
4. Introduction to Trigonometry
5. Constructions
6. Coordinate Geometry
7. 3-D Geometry
8. Perimeter, Area, Volume and Probability

Through the topics presented in this course students solidify understandings introduced in Pre-Algebra and Algebra 1 and extend these concepts. In addition, many new topics are introduced. A student completing both Algebra 1 and Geometry should be confident and competent in using algebra and geometry to represent and analyze real situations.

The following matrix lists topics covered in Geometry and is designed to show flow of understanding for students as they progress from other math classes to this course. The two columns following each big idea detail how this topic should be covered. “Solidify” indicates students have seen this concept in a previous course (see the Algebra 1 outline); it is not intended to be an exhaustive list of all topics previously covered. These concepts may need to be reviewed and should be used throughout the course so that students have mastery by the end of this class. “Develop” indicates new aspects of the big idea presented in this course and it is expected that students successfully completing Geometry will have facility with these new topics. The USOE Core is linked to big ideas and sub topics, and should be referenced for clarification of concepts. In addition, a blank column is included for textbook alignment. It is suggested that each school match this curriculum with their textbook and other instructional resources for alignment.

Indicators have been created in outline form for each “develop” topic and are included as an attachment to this document. These indicators provide clarification for each topic.

<u>Big Idea</u>	<u>Solidify</u>	<u>Develop</u>	<u>State Core Correlation</u>	<u>Textbook Alignment</u>
Notations		<ul style="list-style-type: none"> Use accepted geometric notations (e.g., congruencies, transformations, similarities) 	<ul style="list-style-type: none"> 1.2.a 	
Points, Lines & Planes	<ul style="list-style-type: none"> Classify angles Identify parallel lines from a drawing 	<ul style="list-style-type: none"> Identify angle pairs as adjacent, complementary, supplementary, a linear pair, or vertical angles Classify angle pairs formed by two lines and a transversal Prove relationships in angle pairs. Prove lines parallel or perpendicular using angle relationships. 	<ul style="list-style-type: none"> 1.2.b 1.2.c 1.2.d 1.2.e 	
Logical Reasoning and Proof	<ul style="list-style-type: none"> Identified patterns and found the next item in a patterns Check a possible solution for a given equation 	<ul style="list-style-type: none"> Write conditional statements, converses, and inverses and determine the truth value of the statements. Formulate conjectures using inductive reasoning. Prove a statement false by using a counterexample. 	<ul style="list-style-type: none"> 1.1.a 1.1.b 1.1.c 	

<p>Triangles</p>	<ul style="list-style-type: none"> • Classify and use the properties of acute, right scalene, obtuse, isosceles, equilateral, or equiangular triangles. • Use proportional reasoning to find missing sides in similar figures • Identify similar figures using scale factors • Use Pythagorean Theorem 	<ul style="list-style-type: none"> • Prove congruency and similarity of triangles using postulates and theorems. • Prove the Pythagorean theorem in multiple ways, find missing sides of right triangles using the Pythagorean Theorem, and determine whether a triangle is a right triangle using the converse of the Pythagorean theorem. • Prove and apply theorems involving isosceles triangles. • Apply triangle inequality theorems. • Identify medians, altitudes, and angle bisectors of a triangle and the perpendicular bisectors of the sides of a triangle and justify the concurrency theorems. • Solve problems using the Pythagorean Theorem and its converse. 	<ul style="list-style-type: none"> • 1.3.a • 1.3.b • 1.3.c • 1.3.d • 1.3.e • 4.2.a 	
<p>Quadrilaterals</p>	<ul style="list-style-type: none"> • Identify rectangle, square, and parallelograms • Identify similar rectangles 	<ul style="list-style-type: none"> • Use examples and counterexamples to classify subsets of quadrilaterals. • Prove properties of quadrilaterals using triangle congruence relationships, postulates, and theorems. 	<ul style="list-style-type: none"> • 1.4.a • 1.4.b 	

Polygons	<ul style="list-style-type: none"> Identify and name polygons 	<ul style="list-style-type: none"> Derive, justify, and use formulas for: the number of diagonals lines of symmetry angle measures 	<ul style="list-style-type: none"> 1.4.c 	
Trigonometry	<ul style="list-style-type: none"> Use Pythagorean Theorem Uses Ratios, Rates, Proportion 	<ul style="list-style-type: none"> Identify trigonometric relationships of sine, cosine, & tangent with the appropriate ratio of sides of a right triangle. Express trigonometric relationships using exact values (fractions) and approximations (decimals). Find the angle measure in degrees when given the trigonometric ratio. Find the trigonometric ratio given the angle measure in degrees using a calculator. Find unknown measures of right triangles using sine, cosine, & tangent functions and inverse trigonometric functions Solve problems involving trigonometric ratios 	<ul style="list-style-type: none"> 3.1.b 3.1.c 3.2.a 3.2.b 3.2.c 4.2.c 	
Constructions	<ul style="list-style-type: none"> Protractor and ruler familiarity 	<ul style="list-style-type: none"> Investigate geometric relationships using constructions. Copy and bisect angles and segments. Construct perpendicular and parallel lines. Justify procedures used to construct geometric figures. Discover and investigate conjectures about geometric properties using constructions 	<ul style="list-style-type: none"> 1.5.a 1.5.b 1.5.c 1.5.d 1.5.e 	

Circles	<ul style="list-style-type: none"> • Identify radius, diameter • Find area and circumference • Define pi as the ratio of the circumference to the diameter of a circle. 	<ul style="list-style-type: none"> • Identify radii, diameters, chords, secants, arcs, sectors, central angles, inscribed angles, and tangent of a circle and solve problems using their properties. • Show the relationship between intercepted arcs and inscribed or central angles, and find their measures. 	<ul style="list-style-type: none"> • 1.4.d • 1.4.e 	
Coordinate Geometry	<ul style="list-style-type: none"> • Find the slope of a line • Write the equation of a line 	<ul style="list-style-type: none"> • Prove line parallel and perpendicular using slope. • Verify the classification of geometric figures using coordinate geometry to find lengths and slopes • Find the distance between two given points and find the coordinates of the midpoint. • Write an equation of a line perpendicular or a line parallel to a line through a given point. • Graph a circle given the equation in the form $(x-h)^2 + (y-k)^2 = r^2$, and write the equation when given the graph. • Determine whether points in a set are collinear. • Solve problems using the distance formula. 	<ul style="list-style-type: none"> • 1.2.e • 2.1.a • 2.1.b • 2.1.c • 2.2.a • 2.2.b • 4.2.b 	

3D Geometry	<ul style="list-style-type: none"> • Identify cubes and pyramids, cylinders, and cones 	<ul style="list-style-type: none"> • Identify and classify prisms, pyramids, cylinders and cones based on the shape of their bases. • Identify three-dimensional objects from different perspectives using nets, cross-sections, and two-dimensional views. • Describe the symmetries of three-dimensional figures. • Describe relationships between the faces, edges, and vertices of polyhedra. (Euler's Formula) 	<ul style="list-style-type: none"> • 1.6.a • 1.6.b • 1.6.c • 1.6.d 	
Perimeter, Area, Volume and Probability	<ul style="list-style-type: none"> • Find perimeter and area of quadrilaterals • Use a formula to find surface area and volume for cubes, rectangular prisms and cylinders • Find probability of a single event 	<ul style="list-style-type: none"> • Find linear and angle measures in real-world situations using appropriate tools or technology • Develop surface area and volume formula for polyhedra, cones, and cylinders. • Determine perimeter, area, surface area, lateral area, and volume for prisms, cylinders, pyramids, cones, and spheres when given the formulas. • Calculate or estimate the area of irregular region. • Find the length of an arc and the area of a sector when given the angle measure and radius. • Solve problems involving geometric probabilities 	<ul style="list-style-type: none"> • 4.1.a • 4.1.b • 4.1.c • 4.1.d • 4.1.e • 4.2.d 	