Mathematics Standard
Catalina Foothills School District
High School: Geometry

Geometry students will use the language of geometry, its vocabulary, symbols, and logic, in order to make and prove conjectures and develop an understanding of geometric principles and relationships. Using the properties of geometric figures, students will write formal proofs, solve problems involving algebra and real-life situations, and visualize and draw geometric figures.

Standard for Geometry by Unit and Measurement Topic

UNIT 1: INTRODUCTION TO GEOMETRY	
Geometry: Congruence (G-CO)	
HS.G-CO.1	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.
CFSD.G-CO.1	Define and classify polygons and space figures.
HS.G-CO.9	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.*
UNIT 2: REASONING IN GEOMETRY	
Functions: Interpreting Functions (F-IF)	
HS.F-IF.3	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.*
Functions: Building Functions (F-BF)	
HS.F-BF.2	Write geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
Logic (L)	
CFSD.L.1	Use inductive and deductive reasoning to construct proof.
UNIT 3: CONSTRUCTIONS	
Geometry: Congruence (G-CO)	
HS.G-CO.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; 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.*
HS.G-CO.13	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
Circles (G-C)	
HS.G-C.3	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
HS.G-C.4	Construct a tangent line from a point outside a given circle to the circle.
Expressing Geometric Properties with Equations (G-GPE)	
HS.G-GPE.6	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
UNIT 4: CONGRUENT TRIANGLE PROPERTIES	
Geometry: Congruence (G-CO)	
HS.G-CO.8	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
HS.G-CO.10	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.*
CFSD-CO.10a	Applies postulates and theorems to find unknown angles measures and side lengths.

CFSD-CO.10b	Compare and contrast paragraph proofs, flow-chart proofs, and two-column proofs.
UNIT 5: POLYGON PROPERTIES	
Geometry: Congruence (G-CO)	
HS.G-CO.11	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.*
CFSD.G-CO.11	Prove, and use theorems about trapezoids, kites, rectangles, rhombuses, and squares.
Geometry: Expressing Geometric Properties with Equations (G-GPE)	
HS.G-GPE.4	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).*
HS.G-GPE.5	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).
UNIT 6: CIRCLE AND PARABOLIC PROPERTIES	
Geometry: Circles (G-C)	
HS.G-C.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.*
HS.G-C.5	Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality.
UNIT 7: TRANSFORMATIONS	
Geometry: Congruence (G-CO)	
HS.G-CO.2	Represent transformations in the plane using, e.g., 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 (e.g., translation versus horizontal stretch).
HS.G-CO.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
HS.G-CO.4	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
HS.G-CO.5	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
HS.G-CO.6	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.
HS.G-CO.7	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.
HS.G-CO.8	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
UNIT 8: RIGHT TRIANGLE PROPERTIES	
Geometry: Similarity, Right Triangles, and Trigonometry (G-SRT)	
HS.G-SRT.8	Use the Pythagorean Theorem to solve right triangles in applied problems.
CFSD.G-SRT.8	Use properties of special right triangles (30-60-90 and 45-45-90) to solve problems.
CFSD.G-SRT.8	Apply distance formula to solve problems.
UNIT 9: SIMILARITY	
Geometry: Similarity, Right Triangles, and Trigonometry (G-SRT)	
HS.G-SRT.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.
HS.G-SRT.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.
HS.G-SRT.3	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
HS.G-SRT.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.*

HS.G-SRT.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
Geometry: Circles (G-C)	
HS.G-C.1	Prove that all circles are similar.
UNIT 10: TRIGONOMETRY	
Functions: Trigonometric Functions (F-TF)	
HS.F-TF.1	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
HS.F-TF.2	Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
HS.F-TF.3	Use special triangles to determine geometrically the values of sine, cosine, tangent for π /3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π - *x*, π + *x*, and 2π - *x* in terms of their values for *x*, where *x* is any real number.
Geometry: Similarity, Right Triangles, and Trigonometry (G-SRT)	
HS.G-SRT.6	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.
HS.G-SRT.7	Explain and use the relationship between the sine and cosine of complementary angles.
HS.G-SRT.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
HS.G-SRT.9	Derive the formula $A = \frac{1}{2} ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
HS.G-SRT.10	Prove the Laws of Sines and Cosines and use them to solve problems.
HS.G-SRT.11	Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).
UNIT 11: AREA	
Geometry: Geometric Measurement and Dimension (G-GMD)	
HS.G-GMD.1	Give an informal argument for the formulas for the circumference of a circle, area of a circle. *Use dissection arguments and informal limit arguments.*
Geometry: Expressing Geometric Properties with Equations (G-GPE)	
HS.G-GPE.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.
Geometry: Geometric Measurement and Dimension (G-GMD)	
HS.G-GMD.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.
CFSD.G-GMD.4	Explain the relationship between area and surface area.
Geometry: Circles (G-C)	
HS.G-C.5	Derive the formula for the area of a sector.
UNIT 12: VOLUME	
Geometry: Geometric Measurement and Dimension (G-GMD)	
HS.G-GMD.1	Give an informal argument for the formulas for volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*
HS.G-GMD.2	Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.
HS.G-GMD.3	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
HS.G-GMD.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.
CFSD.G-GMD.4	Explain the relationship between area and surface area.
Geometry: Modeling with Geometry (G-MG) ★	
HS.G-MG.1	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
HS.G-MG.2	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
HS.G-MG.3	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).
STANDARDS FOR MATHEMATICAL PRACTICE	
HS.MP.1	Make sense of problems and persevere in solving them.
HS.MP.2	Reason abstractly and quantitatively.
HS.MP.3	Construct viable arguments and critique the reasoning of others.

HS.MP.4	Model with mathematics.
HS.MP.5	Use appropriate tools strategically.
HS.MP.6	Attend to precision.
HS.MP.7	Look for and make use of structure.
HS.MP.8	Look for an express regularity in repeated reasoning.