Math Common Core State Standards and Long-Term Learning Targets
High School Geometry

Traditional Pathway; see Appendix A of the CCS Standards for information on high school course design: http://www.corestandards.org/assets/CCSSI_Mathematics_Appendix_A.pdf

Unit 1: Congruence, Proof, and Constructions	
Standards: Interpreting Congruence	**Long-Term Target(s)**
Experiment with transformations in the plane	
G-CO1. 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.	I can define the following terms precisely in terms of point, line, distance along a line, and arc length: *angle, circle, perpendicular line, parallel line, line segment.*
G-CO2. 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).	I can represent transformations visually (e.g. by using manipulatives and/or geometry software). I can describe transformations as functions with inputs and outputs. I can compare transformations that preserve congruence with those that do not.
G-CO3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.	I can describe the lines of symmetry in rectangles, parallelograms, trapezoids, and regular polygons in terms of the rotations and reflections that carry each shape onto itself.
G-CO4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	I can develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
G-CO5. 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.	When given a geometric figure and a specific transformation, I can draw the transformed figure by using graph paper, tracing paper, or geometry software. Given two figures, I can specify a sequence of transformations that will carry one figure onto another.
Understand congruence in terms of rigid motions	
G-CO6. 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.	I can transform a figure using a geometric description of a rigid motion. I can predict what effect a transformation will have on a figure. Given two figures, I can determine if they are

	congruent using properties of rigid motion.
G-CO7. 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.	I can show that triangles are congruent if and only if their corresponding sides and angles are congruent.
G-CO8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.	I can prove the following triangle congruence theorems (ASA, SAS, SSS) using properties of rigid motion.
Prove geometric theorems	
G-CO9. 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.*	I can prove the following theorems about lines and angles: • 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-CO10. 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.*	I can prove the following theorems about triangles: • the measures of interior angles of a triangle sum to 180°; • the 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-CO11. 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.*	I can prove the following theorems about parallelograms: • opposite sides are congruent; • opposite angles are congruent; • the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.

Make geometric constructions	
G-CO12. 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.*	I can perform the following geometric constructions using a variety of tools (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; • constructing a line parallel to a given line through a point not on the line.
G-CO13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.	I can construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
Unit 2: Similarity, Proof, and Trigonometry	
Standards: Similarity, Right Triangles, and Trigonometry	**Long-Term Target(s)**
Understand similarity in terms of similarity transformations	
G-SRT1. 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.	Given a center and scale factor, I can verify that dilating a figure: • leaves any lines passing through the center of the figure unchanged; • takes a line not passing through the figure's center to a parallel line; • makes dilations of line segments longer or shorter in the ratio given by the scale factor.
G-SRT2. 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.	Given two figures, I can apply the definition of similarity in terms of similarity transformations to: • decide if the two figures are similar; • explain the meaning of similarity for triangles.
G-SRT3. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	I can apply the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
Prove theorems involving similarity	
G-SRT4. 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*	I can prove two theorems using triangle similarity: the theorem that a line parallel to one side of a triangle divides the other two

proved using triangle similarity.	proportionally, and the Pythagorean theorem.
G-SRT5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	I can prove theorems about geometric figures using triangle congruence and similarity.
Define trigonometric ratios and solve problems involving right triangles	
G-SRT6. 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.	I can explain how to derive the trigonometric ratios for acute angles.
G-SRT7. Explain and use the relationship between the sine and cosine of complementary angles.	I can explain the relationship between the sine and cosine of complementary angles. I can apply the relationship between sine and cosine of complementary angles to solve mathematical problems.
G-SRT8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.★	I can solve right triangle problems using trigonometric ratios and the Pythagorean Theorem.
Apply trigonometry to general triangles	
G-SRT9. (+) Derive the formula $A = 1/2\ ab\ \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.	I can derive the formula for the area of a triangle using trigonometric ratios and the Pythagorean Theorem.
G-SRT10. (+) Prove the Laws of Sines and Cosines and use them to solve problems.	I can prove the Law of Sines. I can prove the Law of Cosines. I can apply the Laws of Sines and Cosines to problems.
G-SRT11. (+) 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).	I can apply the Law of Sines and Cosines to problems involving unknown measures in right and non-right triangles.
Standards: Modeling with Geometry	**Long-Term Target(s)**
Apply geometric concepts in modeling situations	
G-MG1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).★	I can describe real world objects using the measures and properties of geometric shapes.
G-MG2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).★	I can explain how density relates to area and volume and apply it to multiple situations.
G-MG3. 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).★	I can apply geometric methods to solve design problems.

Unit 3: Extending to Three Dimensions	
Standards: Geometric Measurement and Dimension	**Long-Term Target(s)**
Explain volume formulas and use them to solve problems	
G-GMD1. 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.*	I can explain why these formulas work: • the formula for the circumference of a circle; • the area formula for a circle; • the volume formulas of a cylinder, pyramid, and cone.
G-GMD3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.★	I can apply formulas for cylinders, pyramids, cones, and spheres to multiple problems.
Visualize relationships between two-dimensional and three- dimensional objects	
G-GMD4. Identify the shapes of two-dimensional cross-sections of three- dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	I can determine the two-dimensional cross-section of a three-dimensional object. I can determine the three dimensional object generated by rotating a two-dimensional object.
Standards: Modeling with Geometry	**Long-Term Target(s)**
Apply geometric concepts in modeling situations	
G-MG1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).★	I can describe real world objects using the measures and properties of geometric shapes.
Unit 4: Connecting Algebra and Geometry Through Coordinates	
Use coordinates to prove simple geometric theorems algebraically	
G-GPE4. 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).*	I can prove geometric theorems algebraically by using coordinate points.
G-GPE5. 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).	I can determine the equation of a line parallel or perpendicular to a given line that passes through a given point.
G-GPE6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	I can determine the coordinates of the point on a line segment that divides the segment into a given ratio.

G-GPE7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.★	I can compute the area and perimeter of triangles and rectangles in the coordinate plane. I can compute the perimeters of polygons in the coordinate plane.
Translate between the geometric description and the equation for a conic section	
G-GPE2. Derive the equation of a parabola given a focus and directrix.	I can derive the equation of a parabola given a focus and directrix.
Unit 5: Circles With and Without Coordinates	
Standards: Circles	**Long-Term Target(s)**
Understand and apply theorems about circles	
G-C1. Prove that all circles are similar.	I can prove that all circles are similar.
G-C2. 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.*	I can identify and describe relationships among inscribed angles, radii, and chords.
G-C3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.	I can construct the inscribed and circumscribed circles of a triangle. I can prove properties of angles for a quadrilateral inscribed in a circle.
G-C4. (+) Construct a tangent line from a point outside a given circle to the circle.	I can determine the equation of a tangent line given the circle and a point outside the circle.
Find arc lengths and areas of sectors of circles	
G-C5. 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; derive the formula for the area of a sector.	I can determine the relationship between an arc intercepted by an angle and the radius. I can describe radian measure in terms of proportionality. I can determine the formula for the area of a sector.
Standards: Expressing Geometric Properties with Equations	**Long-Term Target(s)**
G-GPE1. 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.	I can derive the equation of a circle given its center and radius. I can determine the center and radius of a circle given its equation.

Use coordinates to prove simple geometric theorems algebraically	
G-GPE4. 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).*	I can prove geometric theorems using algebra.
Standards: Modeling with Geometry	**Long-Term Target(s)**
Apply geometric concepts in modeling situations	
G-MG1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).★	I can describe real-world objects using the measures and properties of geometric shapes.
Unit 6: Applications of Probability	
Standards: Conditional Probability and the Rules of Probability	**Long-Term Target(s)**
Understand independence and conditional probability and use them to interpret data	
S-CP1. 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").	I can describe subsets of a sample space in terms of outcomes, unions, intersections, and complements.
S-CP2. 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.	I can determine whether two events are independent based on their probability.
S-CP3. 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 probability of *B* given *A* is the same as the probability of *B.*	I can explain the conditional probability of A given B. I can explain independence of A and B using conditional probability.
S-CP4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.*	I can construct and interpret two-way frequency tables of data when two categories are associated with each object. I can determine independence of events using a two-way table as a sample space. I can approximate conditional probabilities using a two-way table as a sample space.

S-CP5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*	I can distinguish between conditional probability and independence in everyday language and everyday situations.
Use the rules of probability to compute probabilities of compound events in a uniform probability model	
S-CP6. Find the conditional probability of *A* given *B* as the fraction of *B's* outcomes that also belong to *A,* and interpret the answer in terms of the model.	I can determine the conditional probability of two events and interpret the solution within a given context.
S-CP7. 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.	I can calculate the probability P(A or B) by using the Addition Rule. I can interpret the solution to P(A or B) in the given context.
S-CP8. (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.	I can calculate the probability of compound events and interpret the solution in context.
S-CP9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.	I can calculate the probabilities of compound events using permutations and combinations.
Standards: Using Probability to Make Decisions	**Long-Term Target(s)**
Use probability to evaluate outcomes of decisions	
S-MD6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).	I can evaluate the fairness of a decision using probabilities.
S-MD7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).	I can analyze decisions and strategies by using probabilities.