Common Core State Standards High School Geometry

Curriculum Mapping

Geometry	Boardworks High School Geometry presentation
Congruence	
Experiment with transformations in the plane	
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.	Angles Parts of a circle Lines Using angles The length of an arc Parallel and perpendicular lines The distance between two points Angles in a circle Points, lines, planes and intersections
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).	Translation Rotation Combining transformations Dilation
3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.	Reflection symmetry Rotational symmetry Reflection and rotational symmetry Rotation
4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	Rotation Translation Reflection symmetry Combining transformations
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.	Combining transformations
Understand congruence in terms of rigid motions	
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.	Congruence and similarity Using congruence and similarity Combining transformations

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.	Congruence and similarity Similar right triangles
8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.	Congruence and similarity
Prove geometric theorems	
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.*	Lines Angles Using angles
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.*	Triangles The Triangle Inequality Theorem
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.*	Quadrilaterals
Make geometric constructions	
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.*	Constructing triangles Constructing bisecting lines and angles Using construction
13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.	Constructing triangles Using construction
Similarity, Right Triangles, and Trigonometry	
Understand similarity in terms of similarity transformations	
1. Verify experimentally the properties of dilations given by a center and a scale factor:	Dilation The center of dilation
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.	Dilation The center of dilation
b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	Dilation

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.	Congruence and similarity Similar right triangles
3. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	Congruence and similarity Similar right triangles
Prove theorems involving similarity	
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.*	The Pythagorean Theorem Similar right triangles
5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	Similar right triangles Using congruence and similarity
Define trigonometric ratios and solve problems involving right triangles	
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.	Right triangles
7. Explain and use the relationship between the sine and cosine of complementary angles.	The sine ratio The cosine ratio
8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems	Applying trigonometry Finding the length of diagonals using the Pythagorean Theorem Finding the height of triangles using the Pythagorean Theorem Using the Pythagorean Theorem to solve problems in context Opposite and adjacent sides The Pythagorean Theorem Identifying right triangles Calculating sides of a triangle Finding the distance between two points using the Pythagorean Theorem Finding the diagonal in a rectangular prism
Apply trigonometry to general triangles	
9. (+) 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.	The area of a triangle

10. (+) Prove the Laws of Sines and Cosines and use them to solve problems.	The law of sines The law of cosines
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).	The law of sines The law of cosines
Circles	
Understand and apply theorems about circles	
1. Prove that all circles are similar.	–
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.	Parts of a circle Angles in a circle Radius and circumference
3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.	Angles in a circle
4. (+) Construct a tangent line from a point outside a given circle to the circle.	–
Find arc lengths and areas of sectors of circles	
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; derive the formula for the area of a sector.	The area of a sector Degrees and radians The length of an arc
Expressing Geometric Properties with Equations	
Translate between the geometric description and the equation for a conic section	
1. 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.	The equation of a circle Using circle properties
2. Derive the equation of a parabola given a focus and directrix.	–
3. (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.	–
Use coordinates to prove simple geometric theorems algebraically	
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).	The equation of a circle
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).	Parallel and perpendicular lines Slopes and intercepts

6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	The midpoint of a line segment
7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.	The distance between two points Polygons
Geometric Measurement and Dimension	
Explain volume formulas and use them to solve problems	
1. 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.	The area of a circle Radius and circumference Pyramids Cylinders, cones and spheres
2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.	–
3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	Using length, area and volume formulas Pyramids Cylinders, cones and spheres
Visualize relationships between two-dimensional and three-dimensional objects	
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.	Reflection symmetry in 3-D shapes Rotational symmetry in 3-D shapes
Modeling with Geometry	
Apply geometric concepts in modeling situations	
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).	Using length, area and volume formulas
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	–
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).	–