Geometry Yearlong Mathematics Map

Resources: Approved from Board of Education

Assessments: PARCC Assessments, District Benchmark Assessments

Common Core State Standards – Standards for Mathematical Practice:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Conceptual Category	Domain	Cluster	Common Core Standard	Content	Skills	Academic Vocabulary
G	CO	Experiment with transformations in the plane	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.	transformations	G-CO.1 - Define geometric terms based on undefined notions of point, line, distance along the line, and distance around a circular arc	Collinear, coplanar, postulate, skew, undefined terms, *adjacent, bisector, complementary, congruent, opposite rays, plane, linear pair*
G	CO	Experiment with transformations in the plane	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).	transformations	G-CO.2 - Model transformations visually in a plane	Rotational symmetry, prime notation, isometry, composition of transformations, *angle of rotation, center of rotation, image, pre-image, glide reflection, line of reflection, rotation, translation*

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G	CO	Experiment with transformations in the plane	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).	transformations	G-CO.2 - Describe a transformation as a function	
G	CO	Experiment with transformations in the plane	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).	transformations	G-CO.2 - Compare isometries to non-isometries	
G	CO	Experiment with transformations in the plane	G-CO.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.	transformations	G-CO.3 - Describe a polygon's rotational and/or reflectional symmetry	*angle of rotation, center of rotation, image, pre-image, line of reflection, rotation, translation*
G	CO	Experiment with transformations in the plane	G-CO.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	transformations	G-CO.4 - Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments	isometry, composition of transformations, *rotation, angle of rotation, center of rotation, image, pre-image, glide reflection, line of reflection, translation*

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G	CO	Experiment with transformations in the plane	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.	transformations	G-CO.5 - Draw a geometric figure after a transformation	composition of transformations, *glide reflection, line of reflection, pre-image, image*
G	CO	Experiment with transformations in the plane	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.	transformations	G-CO.5 - Identify a sequence of transformations that will carry given figure onto another	
G	CO	Understand congruence in terms of rigid motions	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.	congruence	G-CO.6 - Predict the effect of a given rigid motion transformation on a given figure	*congruent, congruent figures, corresponding parts, rotation, reflection, translation*
G	CO	Understand congruence in terms of rigid motions	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.	congruence	G-CO.6 - Decide if two figures are congruent using the definition of congruence in terms of rigid motion	
G	CO	Understand congruence in terms of rigid motions	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.	congruence	G-CO.7 - Justify that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angle are congruent, using the definition of congruence in terms of rigid motion	*corresponding parts, congruent, congruent figures*
G	CO	Understand congruence in terms of rigid motions	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.	congruence	G-CO.8 - Explain how triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions	theorem, *congruent, translation, reflection, rotation*

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G	CO	Prove geometric theorems	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.	geometric theorems - lines and angles	G-CO.9 - Prove theorems about lines and angles	alternate exterior, alternate interior, consecutive, corresponding, transversal, *linear pair, supplementary, complementary, adjacent, bisector, vertical angles*
G	CO	Prove geometric theorems	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.	geometric theorems - triangles	G-CO.10 - Prove theorems about triangles	theorem, midsegment, *interior angles, vertex angle, triangle sum theorem*
G	CO	Prove geometric theorems	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.	geometric theorems - parallelograms	G-CO.11 - Prove theorems about parallelograms	*diagonal, congruent, convex*
G	CO	Make geometric constructions	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.	Geometric Constructions	G-CO.12 - Create formal geometric constructions with a variety of tools and methods	*plane*

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G	CO	Make geometric constructions	G-CO.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.	Geometric Constructions	G-CO.13 - Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle	*interior angles*
G	SRT	Understand similarity in terms of similarity transformations	G-SRT.1 Verify experimentally the properties of dilations given by a center and a scale factor:	similarity transformations - (Dilations)	G-SRT.1 - Verify experimentally the properties of dilations given by a center and a scale factor	*pre-image, image*
G	SRT	Understand similarity in terms of similarity transformations	G-SRT.1a 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.	similarity transformations - (Dilations)	G-SRT.1a - Verify experimentally the properties of dilations given by a center and a scale factor	*pre-image, image, transformation*
G	SRT	Understand similarity in terms of similarity transformations	G-SRT.1b The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	similarity transformations - (Dilations)	G-SRT.1b - Verify experimentally the properties of dilations given by a center and a scale factor	*pre-image, image, transformation*
G	SRT	Understand similarity in terms of similarity transformations	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.	Similarity of figures	G-SRT.2 - Decide if two figures are similar using the definition of similarity	*corresponding parts, interior angles, transformations*
G	SRT	Understand similarity in terms of similarity transformations	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.	Similarity in triangles	G-SRT.2 - Explain the meaning of similarity for triangles using similarity transformations	
G	SRT	Understand similarity in terms of similarity transformations	G-SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	Similarity in triangles	G-SRT.3 - Establish the AA criterion using properties of similarity transformations for two triangles	*transformations, corresponding parts, triangle sum theorem*

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G	SRT	Prove theorems involving similarity	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.	Similarity theorems in triangles.	G-SRT.4 - Prove similarity theorems about triangles	midsegment
G	SRT	Prove theorems involving similarity	G-SRT.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	Applications of similarity	G-SRT.5 - Solve problems in geometric figures using triangle congruence and triangle similarity	theorems, *congruent figures, corresponding parts*
G	SRT	Prove theorems involving similarity	G-SRT.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	Applications of similarity	G-SRT.5 - Prove relationships in geometric figures using triangle congruence and triangle similarity	
G	SRT	Define trigonometric ratios and solve problems involving right triangles	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.	Similarity of right triangles	G-SRT.6 - Develop trigonometric ratios using similarity for acute angles in right triangles	Sine, Cosine, Tangent, *Pythagorean Triples, corresponding parts*
G	SRT	Define trigonometric ratios and solve problems involving right triangles	G-SRT.7 Explain and use the relationship between the sine and cosine of complementary angles.	Right triangle trigonometry	G-SRT.7 - Explain and interpret the relationship between the sine and cosine of complementary angles	sine, cosine, *complementary,*
G	SRT	Define trigonometric ratios and solve problems involving right triangles	G-SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.★	Application of right triangle trigonometry	G-SRT.8 - Solve right triangles in applied problems using trigonometric ratios & the Pythagorean Theorem	sine, cosine, tangent, *Pythagorean Theorem*
G	SRT	Apply trigonometry to general triangles	G-SRT.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.	Apply trigonometry to general triangles	G-SRT.9 (+) Derive the formula A = 1/2 ab sin(C) for the area of a triangle	
G	C	Understand and apply theorems about circles	G-C.1 Prove that all circles are similar.	Similarity of Circles	G-C.1 Prove that all circles are similar	Radians, Arc Measure, Arc Length, Central Angle, *congruent circles*

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G	C	Understand and apply theorems about circles	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.	Circles - relationships of angles and segments	G-C.2 - Describe and apply relationships among inscribed angles, radii, and chords	Inscribed angle, central angle, circumscribed angle, chord, tangent line, external tangent, internal tangent
G	C	Understand and apply theorems about circles	G-C.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.	Circles - construction	G-C.3 - Construct the inscribed and circumscribed circles of a triangle	cicumcenter, incenter, inscribed angle, arc measure
G	C	Understand and apply theorems about circles	G-C.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.	Circles - proofs of angle properties	G-C.3 - Prove properties of angles for a quadrilateral inscribed in a circle	
G	C	Understand and apply theorems about circles	G-C.4 (+) Construct a tangent line from a point outside a given circle to the circle.	Circles - construction	G-C.4 (+) - Contruct a tangent line from a point outside a given circle to the circle	
G	C	Find arc lengths and areas of sectors of circles	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; derive the formula for the area of a sector.	Circles - Arc Length and Radians	G-C.5 - Derive the proportionality of the arc length to the radius, and define the radian measure as the constant of proportionality	Radian, sector area, intercepted arc, congruent arcs, arc length, arc measure, congruent circles
G	C	Find arc lengths and areas of sectors of circles	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; derive the formula for the area of a sector.	Circles - Area of sector	G-C.5 - Derive the formula for area of a sector using similarity	
G	GPE	Translate between the geometric description and the equation for a conic section	G-GPE.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.	Equations of Circles	G-GPE.1 - Derive the equation of a circle of given center and radius using the Pythagorean Theorem	Standard Equation of a Circle, *Pythagorean Theorem*

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G	GPE	Translate between the geometric description and the equation for a conic section	G-GPE.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.	Equations of Circles	G-GPE.1 - Complete the square to find the center and radius of a circle given by an equation	
G	GPE	Use coordinates to prove simple geometric theorems algebraically	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).	Coordinate Geometry	G-GPE.4 - Prove simple geometric theorems algebraically using coordinate geometry	*Distance Formula, Pythagorean Theorem*
G	GPE	Use coordinates to prove simple geometric theorems algebraically	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).	Parallel & Perpendicular Lines	G-GPE.5 - Prove the slope criteria for parallel and perpendicular lines	slopes of parallel lines, slopes of perpendicular lines
G	GPE	Use coordinates to prove simple geometric theorems algebraically	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).	Equations of Parallel & Perpendicular Lines	G-GPE.5 - Solve geometric problems using slope criteria for parallel and perpendicular lines	
G	GPE	Use coordinates to prove simple geometric theorems algebraically	G-GPE.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	Coordinate Geometry	G-GPE.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio	*Pythagorean Theorem*
G	GPE	Use coordinates to prove simple geometric theorems algebraically	G-GPE.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.★	Coordinate Geometry - Perimeters & Area	G-GPE.7 - Compute perimeters of polygons and area of triangles and rectangles	*Distance Formula*

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G	GMD	Explain volume formulas and use them to solve problems	G-GMD.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.	Formulas for area and volume	G-GMD.1 - Justify the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.	Radians, arc measure, arc length, sector area, *altitude*
G	GMD	Explain volume formulas and use them to solve problems	G-GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.★	Application of area & volume formulas	G-GMD.3 - Solve volume problems using formulas for cylinders, pyramids, cones, and spheres	*Right prism, prism, altitude*
G	GMD	Visualize relationships between two-dimensional and three-dimensional objects	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.	Cross sections of solids	G-GMD.4 - Identify the shapes of two-dimensional cross-sections of three-dimensional objects	*cross sections, rotations*
G	GMD	Visualize relationships between two-dimensional and three-dimensional objects	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.	Solids from Revolutions	G-GMD.4 - Identify three-dimensional objects generated by rotations of two-dimensional objects	
G	MG	Apply geometric concepts in modeling situations	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).★	Model object using geometric shapes	G-MG.1 - Describe real-world objects using geometric shapes, their measures, and their properties	*prism, regular polygon, cross section*
G	MG	Apply geometric concepts in modeling situations	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).★	Model area and volume	G-MG.2 - Apply concepts of density based on area and volume in modeling situations	
G	MG	Apply geometric concepts in modeling situations	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).★	Solve design problems	G-MG.3 - Apply geometric methods to solve design problems	Efficiency, apothem