Geometry
Mathematics Curriculum

DOMAIN DESCRIPTION	CLUSTER DESCRIPTION	MLS CODE	MLS DESCRIPTION	DOK	INSTRUCTIONAL ACTIVITIES	ASSESSMENTS
Congruence	Experiment with transformations in the plane.	G.CO.A.1	Define angle, circle, perpendicular line, parallel line, line segment and ray based on the undefined notions of point, line, distance along a line and distance around a circular arc.	2	Understand and use definitions of angles, circles, perpendicular lines, parallel lines, and line segments based on the undefined term of a point, a line, the distance along a line, and the length of an arc.	Students will compare formal and informal definitions of given terms and discuss the importance of having precise definitions. (SMP 6)
	Experiment with transformations in the plane.	G.CO.A.2	Represent transformations in the plane, and describe them as functions that take points in the plane as inputs and give other points as outputs.	2	Given various geometric figures, e.g. triangles, parallelograms, trapezoids, students will perform all transformations of these figures on the Cartesian plane	Students will perform transformations on a wide variety of geometric figures represented on a Cartesian plane. (SMP 5, 6)
	Experiment with transformations in the plane.	G.CO.A.3	Describe the rotational symmetry and lines of symmetry of two-dimensional figures.	2	Given various geometric figures determine if it has rotation symmetry and line symmetry.	Students will state whether the figure has rotational symmetry. If so, copy the figure, locate the center of symmetry, and state the order and magnitude of symmetry.
	Experiment with transformations in the plane.	G.CO.A.4	Develop definitions of rotations, reflections and translations in terms of angles, circles, perpendicular lines, parallel lines and line segments.	2	Students will use previous comparisons and descriptions of transformations develop and understand the meaning of rotations, reflections, and translations based on angles, circles, perpendicular lines, parallel lines, and line segments.	Students will perform a translation, rotation, and reflection with a given polygon using coordinate notation. (SMP 5, 6, 7)

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Congruence	Experiment with transformations in the plane.	G.CO.A.5	Demonstrate the ability to rotate, reflect or translate a figure, and determine a possible sequence of transformations between two congruent figures.	2	Transform a geometric figure given a rotation, reflection, or translation using graph paper, tracing paper, or geometric software.	Students will reflect a triangle about the y-axis and provide the image's coordinates. (SMP 3, 5, 7)
	Understand congruence in terms of rigid motions.	G.CO.B.6	Develop the definition of congruence in terms of rigid motions.	2	Knowing that rigid transformations preserve size and shape or distance and angle, use this fact to connect the idea of congruency. Students identify corresponding sides and corresponding angles of congruent triangles of congruent triangles.	Students will work backwards – given two figures that have the same size and shape, find a sequence of rigid motions that will map one onto the other. (SMP 3, 5, 7) Students will label and compare a given triangle and its image to verify that corresponding sides and angles are congruent. (SMP 3)
	Understand congruence in terms of rigid motions.	G.CO.B.7	Develop the criteria for triangle congruence from the definition of congruence in terms of rigid motions.	2	List the sufficient conditions to prove triangles are congruent and map a triangle with one of the sufficient conditions (e.g., SSS) onto the original triangle then show that corresponding sides and corresponding angles are congruent.	Students will construct pairs of triangles that satisfy the ASA, SAS or SSS congruence criteria, and use rigid motions to verify that they satisfy the definition of congruent figures. (SMP 2, 3)

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Congruence	Prove geometric theorems.	G.CO.C.8	Prove theorems about lines and angles.	3	Prove angle measures given parallel lines cut by a transversal and one angle measure, find the measures of alternate interior angles, alternate exterior angles, corresponding angles, and same-side interior angles.	Given parallel lines cut by multiple parallel transversals and one given angle, students will solve for various types of angle relationships and provide proofs. (SMP 2, 3, 5)
	Prove geometric theorems.	G.CO.C.9	Prove theorems about triangles.	3	Given two triangles with additional information prove the triangles are congruent using SAS, ASA, etc	Students will write a 2 column proof showing 2 triangles are congruent by SAS or ASA given the necessary information. (SMP 2, 3, 5)
	Prove geometric theorems.	G.CO.C.10	Prove theorems about polygons.	2	Construct parallelograms by applying the five theorems that prove a quadrilateral is a parallelogram.	Students will prove the diagonals of a rectangle are congruent by applying the distances formula to a rectangle plotted on a coordinate plane. (SMP 2, 3, 5)
	Make geometric constructions.	G.CO.D.11	Construct geometric figures using various tools and methods.	2	Students will recognize formal geometric constructions using a compass, protractor, and a straightedge. Construct various regular polygons inscribed in a circle.	Students will match the construction with the transformation. (SMP 5, 6) Students will construct a regular hexagon inscribed in a circle. (SMP 5, 6)

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Similarity, Right Triangles, and Trigonometry	Understand similarity in terms of similarity transformations.	G.SRT.A.1	Construct and analyze scale changes of geometric figures.	2	Perform a dilation with a given center and scale factor on a figure in the coordinate plane. Verify that when a side passes through the center of dilation, the side and its image lie on the same line. Verify that corresponding sides of the preimage and images are parallel. Verify that a side length of the image is equal to the scale factor multiplied by the corresponding side length of the preimage.	Students will apply a dilation by a factor of 3, centered at the point C to the given figure. (SMP 2, 5, 6, 8)
	Understand similarity in terms of similarity transformations.	G.SRT.A.2	Use the definition of similarity to decide if figures are similar and to solve problems involving similar figures.	2	Determine that two figures are similar by verifying that angle measure is preserved and corresponding sides are proportional.	Students will test for similarity given two figures with stated angle measures and side lengths. (SMP 3, 5, 7)
	Understand similarity in terms of similarity transformations.	G.SRT.A.3	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	2	Identify and explain that AA similarity is a sufficient condition for two triangles to be similar.	Students will recognize the use of a ruler and a protractor to prove two triangles are similar by the AA similarity criterion. (SMP 3)

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Similarity, Right Triangles, and Trigonometry	Prove theorems involving similarity.	G.SRT.B.4	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	2	Given similar triangles students will set up and use proportions to solve for missing segment lengths and will extend the application to real-world problems (e.g., using similar figures, calculate the height of a building given the height of a person; the length of a football field given the length of a shadow on the ground.	Students will set up and use proportions to solve problems of similar triangles having missing segment lengths and will apply this process to solve a variety of real-world problems. (SMP 3, 4, 6, 7)
	Define trigonometric ratios, solve problems involving right triangles.	G.SRT.C.5	Understand that side ratios in right triangles define the trigonometric ratios for acute angles.	2	Use triangle similarity to prove other theorems about triangles such as proving a line parallel to one side of a triangle divides the other two proportionally, and it's converse.	Given two triangles are similar, then prove the ratio of corresponding altitudes is equal to the ratio of corresponding sides. (SMP 3, 5)
	Define trigonometric ratios, solve problems involving right triangles.	G.SRT.C.6	Explain and use the relationship between the sine and cosine of complementary angles.	3	Students will apply trigonometric relationships of sine, cosine and tangent to find lengths of sides and angle measures of a variety of right triangles and will apply trigonometry to solve real-world problems	Students will use trigonometric relationships to find missing angles and sides of a variety of right triangles, including real-world applications. (SMP 2, 3)

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Similarity, Right Triangles, and Trigonometry	Define trigonometric ratios, solve problems involving right triangles.	G.SRT.C.7	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles.	3	Students will solve a wide variety of problems involving angle relationships (complementary, supplementary) of adjacent angles, interior and exterior angles of a polygon, acute angles of a right triangle and will find missing sides of a right triangle using the Pythagorean Theorem.	Find the length of the ladder leaning against a building given the height the ladder reaches and the distance the base of the ladder is from the building. (SMP 1, 4, 5)
Circles	Understand and apply theorems about circles	G.C.A.1	Prove that all circles are similar using similarity transformations.	2	Using the fact that the ratio of diameter to circumference is the same for circles, prove that all circles are similar.	Students will use the appropriate tools to measure the necessary dimensions of circular objects to prove all circles are similar. (SMP 3, 5)
	Understand and apply theorems about circles	G.C.A.2	Identify and describe relationships among inscribed angles, radii and chords of circles.	2	Identify when a diameter (or radius) of a circle is perpendicular to a chord, then it bisects the chord and its arc.	Given a circle, with a diameter of 30 in and a chord of 22 in, find the length from the center of the circle to the chord.
	Understand and apply theorems about circles	G.C.A.3	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.	2	Construct the circumscribed circle whose center is the point of intersection of the perpendicular bisectors of each side of the triangle (the circumcenter).	Students will use formal geometric constructions to construct perpendicular bisectors of the sides and angle bisectors of a given triangle. (SMP 3, 5)

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Circles	Find arc lengths and areas of sectors of circles.	G.C.B.4	Derive the formula for the length of an arc of a circle.	3	Students will write a proportion using an arc measure (degrees) divided by 360 degrees set equal to the arcs length divided by the circumference,	Students will find the arc length given an arc measure of 50 degrees and a circumference of 10 pi.
	Find arc lengths and areas of sectors of circles.	G.C.B.5	Derive the formula for the area of a sector of a circle.	3	Compute areas of sectors by first considering them as fractional parts of a circle. Then, using proportionality, derive a formula for their area in terms of radius and central angle.	Given a circle's radius and central angle students will use proportionality to find the area of the sector. Then derive the formula for the area of a sector. (SMP 2, 3, 6, 7)
Exploring Geometric Properties with Equations	Translate between the geometric description and the equation for a conic section.	G.GPE.A.1	Derive the equation of a circle.	2	Use the Pythagorean Theorem, the coordinates of a circle's center, and the circle's radius to write the equation of the circle.	Students will write an equation for a circle with a radius of 3 units and center at (2, 5). (SMP 2, 3, 7 .8)
	Translate between the geometric description and the equation for a conic section.	G.GPE.A.2	Derive the equation of a parabola given a focus and directory.	2	Find the distance from a point on the parabola (x, y) to the focus using the distance formula (Pythagorean Theorem).	Given a parabola with focus (-2. 1) and directrix y = -3 students will determine whether or not the point (2, 1) is part of the parabola. State true or false. (SMP 2, 3, 7,.8)

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Exploring Geometric Properties with Equations	Use coordinates to prove geometric theorems algebraically.	G.GPE.B.3	Use coordinates to prove geometric theorems algebraically.	3	Students will use slope and distance formula to verify the polygon formed by connecting the points (-3, -2), (5, 3), (9, 9), (1, 4) is a parallelogram.	Students will given two points, use the distance formula to find the coordinates of the point halfway between them. (SMP 2, 3, 7)
	Use coordinates to prove geometric theorems algebraically.	G.GPE.B.4	Prove the slope criteria for parallel and perpendicular lines and use them to solve problems.	3	Students will prove the slopes of parallel lines are congruent.	Students will given a line and a point not on it, find an equation of the line through the point that is parallel to the given line. (SMP 3, 8)
	Use coordinates to prove geometric theorems algebraically.	G.GPE.B.5	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	3	Given A(3, 2) and B(6, 11), students will find the point that divides the line segment AB two-thirds of the way from A to B.	For the line segment whose endpoints are (0, 0) and (4, 3), students will find the point that partitions the segment into a ratio of 3 to 2. (SMP 2, 7, 8)

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Exploring Geometric Properties with Equations	Use coordinates to prove geometric theorems algebraically.	G.GPE.B.6	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles.	3	Students will use the distance formula (based on the Pythagorean Theorem) to calculate the distance between vertices of geometric figures, such as triangles, to find lengths of segments and then using these lengths to determine if triangles are acute, right, or obtuse based on the lengths of sides of triangles.	Students will solve a variety of problems using the distance formula by applying it to figures plotted on the Cartesian plane. (SMP 1, 2, 5, 6)

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DOMAIN DESCRIPTION	CLUSTER DESCRIPTION	MLS CODE	MLS DESCRIPTION	DOK	INSTRUCTIONAL ACTIVITIES	ASSESSMENTS
Geometric Measurement and Dimension.	Explain volume formulas and use them to solve problems.	G.GMD.A.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.	2	For pyramids and cones, the factor 1/3 will need some explanation. An informal demonstration can be done using a volume relationship set of plastic shapes that permit one to pour liquid or sand from one shape into another.	Students will compare volumes of pyramids and prisms given congruent base areas and heights. Then demonstrate algebraically why the pyramid's volume is 1/3 that of the corresponding prism. (SMP 3, 4, 5)
	Explain volume formulas and use them to solve problems.	G.GMD.A.2	Use volume formulas for cylinders, pyramids, cones, spheres and composite figures to solve problems.	2	Solve surface area and volume problems of a variety of geometric figures including prisms, pyramids, cylinders, cones and spheres, e.g., solve more complex problems such as the difference in volumes of a cone inscribed in a cylinder.	Given the dimensions of a cylindrical tank of water and the necessary formulas the students will calculate the amount of paint needed to cover the lateral area and the amount of water needed to fill it completely. (SMP 1, 2, 3, 4, 5)
	Visualize relationships between two-dimensional and three-dimensional objects.	G.GMD.B.3	Identify the shapes of two-dimensional cross-sections of three-dimensional objects.	3	Based on written descriptions & examples, students will draw geometric figures, apply given dimensions & will solve a variety of problems involving cross-sections.	Given a cylinder slice horizontally, then find the area of the circle and slice vertically and find the area of the rectangle.
	Visualize relationships between two-dimensional and three-dimensional objects.	G.GMD.B.4	Identify three-dimensional objects generated by transformations of two-dimensional objects.	2	Given a two dimensional shape, perform a given transformation that results in a three figure.	Students will identify that rotating a rectangle around the x-axis will create a cylinder

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Modeling with Geometry	Apply geometric concepts in modeling situations.	G.MG.A.1	Use geometric shapes, their measures and their properties to describe objects.	3	Students will find the lateral area of various cylindrical objects given their dimensions. (SMP 4, 5, 7)	Students will discover the formula for the lateral area of a cylinder by removing the label from a canned food, laying it flat on a table, and find its area recognizing the label is a rectangle.
	Apply geometric concepts in modeling situations.	G.MG.A.2	Apply concepts of density based on area and volume in modeling situations.	3	Students will discover the relationship between volume and density for various solids.	Students will find the weight of a cubic foot of water given a King Size waterbed that has the following dimensions 72 in. X 84 in. X 9.5in. It takes 240.7 gallons of water to fill it which would weigh 2071 pounds. (SMP 1, 4, 5)
	Apply geometric concepts in modeling situations.	G.MG.A.3	Apply geometric methods to solve design mathematical modeling problems.	3	Given one geometric solid and necessary formulas, students will design a different geometric solid that will hold the same amount of substance (e.g., a cone to a prism).	Students will design three cereal boxes (rectangular prisms) of differing dimensions that would contain congruent volumes using the necessary formulas. (SMP 1, 4, 5)

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Conditional Probability and Rules of Probability	Understand independence and conditional probability and use them to interpret data.	G.CP.A.1	Describe events as subsets of a sample space using characteristics of the outcomes, or as unions, intersections or complements of other events.	3	Students will draw Venn diagrams that show relationships between sets within a sample space.	Students will create a Venn diagram to display the information in a given table. (SMP 1, 2, 4, 6, 7)
	Understand independence and conditional probability and use them to interpret data.	G.CP.A.2	Understand the definition of independent events and use it to solve problems.	3	Students will understand that independent events satisfy the relationship P(A) * P(B) = P (A * B). Then predict if two events are independent, explain reasoning and check.	Working in groups of 4 students will roll a pair of dice 20 times and keep track of the outcomes. Find pairs of events that are independent and pairs that are not. Justify your conclusions. (SMP 1, 2, 3, 4, 6, 7)
	Understand independence and conditional probability and use them to interpret data.	G.CP.A.3	Calculate conditional probabilities of events.	3	Understand that conditional probability is the probability that when an event occurs another event has already occurred.	Calculate the probability that a student will draw a yellow marble after another student has already drawn a marble and not put it back

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Conditional Probability and Rules of Probability	Understand independence and conditional probability and use them to interpret data.	G.CP.A.4	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.	3	Students will construct a two-way frequency table for data using the appropriate categories for each variable. Then, determine if given events from the table are	Working in groups of 4 students will collect data from a random sample of students in their school on their favorite subject among math, science, history, and English. Using the data construct a two-way frequency table using the appropriate categories for each variable. Then, determine if given events are independent. (SMP 1-8)
	Understand independence and conditional probability and use them to interpret data.	G.CP.A.5	Recognize and explain the concepts of conditional probability and independence in a context.	3	Using everyday examples of dependent events, students will illustrate the concept of conditional probability. For example, at a high school the probability that a student takes a Business class and Spanish is 0.062. The probability that a student takes a Business class is 0.43. What is the probability that a student takes Spanish given that the student is taken a Business class?	Working in groups of 4 students will determine the probability of drawing a heart from a standard deck of cards on a second draw, given that a heart was drawn on the first draw and not replaced? Then, determine if these events are independent or dependent. (SMP 1, 4, 6, 8)

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Conditional Probability and Rules of Probability	Understand independence and conditional probability and use them to interpret data.	G.CP.A.6	Apply and interpret the Addition Rule for calculating probabilities.	3	Understand that when events are not mutually exclusive, then the probability that *A* or *B* occurs is the sum of their individual probabilities minus the probability that both *A* and *B* occur	Given a table with types of paintings, calculate using the addition rule what is the probability the student will select a portrait or an oil painting
	Understand independence and conditional probability and use them to interpret data.	G.CP.A.7	Apply and Interpret the general Multiplication Rule in a uniform probability model.	3	Understand that the porobability of two independent events both occurring is the product of the porbabilities of each individual event.	Students will toss a coin and roll a die and then use the Multiplication Rule to find the probability that the coin lands heads up and the number rolled on the die is a six.
	Understand independence and conditional probability and use them to interpret data.	G.CP.A.8	Use permutations and combinations to solve problems.	3	Students will recognize when the order of an event is important to determine the amount of possible outcomes.	Find the number of possible outcomes for arranging four books on a shelf.