Geometry Mathematics Curriculum Guide

Grade Level/Course Title: Geometry	**Quarter** 1	**Academic Year:** 2015-2016

Mathematics Focus for the Course: For the high school Model Geometry course, instructional time should focus on six critical areas:
(1) establish criteria for congruence of triangles based on rigid motions; (2) establish criteria for similarity of triangles based on dilations and proportional reasoning;
(3) informally develop explanations of circumference, area, and volume formulas; (4) apply the Pythagorean Theorem to the coordinate plan;
(5) prove basic geometric theorems; and (6) extend work with probability.

Essential Questions for this Unit: How can students…

1. …establish triangle congruence criteria based on analyses of rigid motions and formal constructions?
2. …use triangle congruence as a familiar foundation for the development of formal proof?
3. …prove theorems—using a variety of formats including deductive and inductive reasoning and proof by contradiction—and solve problems about triangles, quadrilaterals, and other polygons?
4. …apply reasoning to complete geometric constructions and explain why they work?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 1: Congruence, Proof and Constructions **Cluster 1.1: (19 days)** **Experiment with transformations in the plane.** **Make geometric constructions**	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.	*Build on student experience with rigid motions (i.e. isometric transformations), which preserve distance and angles from earlier grades.* *Translations move points a specified distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle.* *Two shapes are congruent if there is a sequence of rigid motions in the plane that takes one shape exactly onto the other.* *Describing transformations using precise names of points, translation vectors, and lines of symmetry or reflection. Ex:(x,y)-->(x+2, y-1)* *flip (reflection), turn (rotate), slide (translate) and scale (dilate)* *input, output, pre-image, image, prime notation, bisect* *Isometric v. non-isometric*	O1.1 Define line segment, angle and circle. Use symbolic notation to represent them. Construct a congruent line segment and angle. (Key 3.1) O1.2 Define perpendicular and parallel lines. Use symbolic notation to represent them. Construct perpendicular and parallel lines. (3 days) (Key 3.2, 3.3, 3.5) Expository Writing in Math [L] O1.3 Prove problems about distance along a line and distance along an arc. O1.4 Bisect a segment and angle. Use related symbolic notation. (Key 3.4) O1.5 Use basic constructions to create basic geometric shapes. O1.6 Represent transformations in the general plane. Compare isometric v non-isometric transformations. Relate transformations as functions. (Key 7.1) (2 days) O1.7 Define different symmetries. Given a shape, describe the rotations and reflections that carry it onto itself. (Key 7.1) O1.8 Define isometric transformations. Relate to simple constructions. Practice transformations on the coordinate plane. (Key 7.1, 7.2) (3 days) O1.9 Describe sequence of transformations that will carry a given figure onto another. (Key 7.3) Congruence Through Transformations [L] Review, Assess, Test Corrections/Corrective Instruction (4 days)
	G.CO.2	Represent transformations in the plane; 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).		
	G.CO.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.		
	G.CO.4	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.		
	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.		
	G.CO.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, 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.*)		
	G.CO.13	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.		

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(5) prove basic geometric theorems; and (6) extend work with probability.

Essential Questions for this Unit: How can students…

1. …establish triangle congruence criteria based on analyses of rigid motions and formal constructions?
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3. …prove theorems—using a variety of formats including deductive and inductive reasoning and proof by contradiction—and solve problems about triangles, quadrilaterals, and other polygons?
4. …apply reasoning to complete geometric constructions and explain why they work?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 1: Congruence, Proof and Constructions **Cluster 1.2: (20 days)** **Understand congruence in terms of rigid motions.** **Prove geometric theorems.** **Benchmark 1 Assessment at end of this unit.**	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.	*Rigid motions are at the foundation of the definition of congruence.* *Students reason from the basic properties of rigid motions (that they preserve distance and angle), which are assumed without proof.* *Rigid motions and their assumed properties can be used to establish the usual triangle congruence criteria, which can then be used to prove other theorems.* *Encourage multiple ways of writing proofs, such as in narrative paragraphs, using flow diagrams, in two-column format, and using diagrams without words.* *Students should be encouraged to make conjectures based on experimentation, to justify their conjectures, and to communicate their reasoning to their peers (MP.3).* *Vertical angles, transversal, corresponding angles, interior angles, equidistant, midpoint, base angles, medians…*	O1.10 Demonstrate that two figures are congruent using rigid transformations. (2 days) Congruent and Similar Polygons [L] O1.11 Recognize that if all corresponding parts of two shapes are congruent, the shapes are congruent. Identify congruent parts in congruent triangles. O1.12 Use transformations (and other methods) to prove theorems about lines and angles (vertical angles, pairs of angles, angles formed by parallel lines) (3 days) Geometry Investigations [L] Parallel Lines Cut by a Transversal [L] O1.13 Create triangles with given characteristics and determine whether they map onto one another (SAS, ASA, SSS) (2 days) O1.14 Use triangle congruence theorems in proofs. (2 days) O1.15 Use transformations (and other methods) to prove theorems about triangles. Use theorems to solve problems. (3 days) O1.16 Use transformations (and other methods) to prove theorems about parallelograms. Use theorems to solve problems. (5 days) –**For this objective, consider a mini-unit outside of this cluster, with emphasis on triangle congruence.** Quadrilaterals [CP] Review, Assess, Test Corrections/Corrective Instruction (4 days)
	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.		
	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.		
	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.*		
	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.*		
	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.*		

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Grade Level/Course Title: Geometry	**Quarter** 2	**Academic Year:** 2015-2016

Mathematics Focus for the Course: For the high school Model Geometry course, instructional time should focus on six critical areas: (1) establish criteria for congruence of triangles based on rigid motions; (2) establish criteria for similarity of triangles based on dilations and proportional reasoning; (3) informally develop explanations of circumference, area, and volume formulas; (4) apply the Pythagorean Theorem to the coordinate plan; (5) prove basic geometric theorems; and (6) extend work with probability.

Essential Questions for this Unit: How can students…

1. …apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity?
2. …identify criteria for similarity of triangles, use similarity to solve problems, and apply similarity in right triangles to understand right triangle trigonometry, with particular attention to special right triangles and the Pythagorean Theorem?
3. …derive the Laws of Sines and Cosines in order to find missing measures of general (not necessarily right) triangles, building on their work with quadratic equations done in Model Algebra I? *(additional mathematics to prepare students for advanced courses)*
4. …learn to distinguish whether three given measures (angles or sides) define 0, 1, 2, or infinitely many triangles?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 2 Similarity, Proof and Trigonometry **Cluster 2.1: (17 days)** **Understand similarity in terms of similarity transformations** **Prove theorems involving similarity.**	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.	Dilations: [Contraction (reduction), expansion (enlargement)], scale factor, centers of dilation The **similarity transformations** ar e Reflection, Rotation, Translation, and Dilation. A similarity transformation preserves the shape, which means proportionality of sides and congruence of angles. Two figures are similar if and only if one can be obtained from the other by a single or sequence of similarity transformations.	O2.1 Verify experimentally the properties of dilations given by a center and a scale factor. Use properties to create dilations given certain parameters. (Key 11.1) (3 days) Congruent and Similar Polygons [L] Exploration: Constructing a Dilation Design O2.2 Use the properties of similarity transformations to establish the Angle-Angle criterion for two triangles to be similar. (Key 11.2) (2 days) Investigating Similar Triangles [L] Proportions [L] O2.3 Decide whether two given figures, are similar using similarity transformations. Determine if two triangles are similar based on their corresponding parts. (Key 11.4) (2 days) O2.4 Use congruence and similarity criteria for triangles to solve problems (Key 11.3) (3 days) O2.5 Prove theorems about triangles and use theorems to solve problems. (Key 11.4, 11.7) (3 days) ---Review, Assess, Test Corrections/Corrective Instruction (4 days)
	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.		
	G.SRT.3	Use the properties of similarity transformations to establish the Angle-Angle (AA) criterion for two triangles to be similar.		
	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.		
	G.SRT.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.		

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Essential Questions for this Unit: How can students…

1. …apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity?
2. …identify criteria for similarity of triangles, use similarity to solve problems, and apply similarity in right triangles to understand right triangle trigonometry, with particular attention to special right triangles and the Pythagorean Theorem?
3. …derive the Laws of Sines and Cosines in order to find missing measures of general (not necessarily right) triangles, building on their work with quadratic equations done in Model Algebra I? *(additional mathematics to prepare students for advanced courses)*
4. …learn to distinguish whether three given measures (angles or sides) define 0, 1, 2, or infinitely many triangles?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 2: Similarity, Proof and Trigonometry **Cluster 2.2: (18 days)** **Define trigonometric ratios and solve problems involving right triangles.** **Benchmark 2 Assessment at end of this unit.**	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.	Opposite, adjacent, hypotenuse, sine, cosine tangent, angles of elevation and depression surveying problems, resultant forces, triangulation Practice diagraming relationships. Use multiple methods to solve problems. Use a trig table and calculator to determine relationships between trig ratios. Practice proper math syntax when solving equations.	O2.6 Review: Radical Expressions (2 days) Simplifying Radicals [L] Square and Square Roots [L] O2.7 Review: Solve problems using the Pythagorean Theorem and its converse. (Key 9.1, 9.2) (2 days) Pythagorean Theorem Cutout [G] Pythagorean Theorem and its Converse [L] O2.8 Prove relationships in geometric figures. Solve problems using Special Right Triangles (Key 9.3) (2 days) Investigating Special Right Triangles [L] O2.9 Understand trig ratios by similarity properties. Label a triangle in relation to the reference angle (opposite, adjacent & hypotenuse). Define trig ratios. (Key 12.1) (3 days) Introduction to Trigonometric Functions [L] O2.10 Understand and use the relationship of sine and cosine to solve problems multiple ways. O2.11 Determine the most appropriate trigonometric ratio (sine, cosine, and tangent) to use for a given problem and solve for sides and angles of right triangles using trigonometry. (Key 12.1, 12.2) (4 days) Review, Assess, Test Corrections/Corrective Instruction (4 days)
	G.SRT.7	Explain and use the relationship between the sine and cosine of complementary angles.		
	G.SRT.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.		

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Grade Level/Course Title: Geometry	**Quarter 2**	**Academic Year:** 2015-2016

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(3) informally develop explanations of circumference, area, and volume formulas; (4) apply the Pythagorean Theorem to the coordinate plan;
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Essential Questions for this Unit: How can students…

1. …apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity?
2. …identify criteria for similarity of triangles, use similarity to solve problems, and apply similarity in right triangles to understand right triangle trigonometry, with particular attention to special right triangles and the Pythagorean Theorem?
3. …derive the Laws of Sines and Cosines in order to find missing measures of general (not necessarily right) triangles, building on their work with quadratic equations done in Model Algebra I? *(additional mathematics to prepare students for advanced courses)*

…learn to distinguish whether three given measures (angles or sides) define 0, 1, 2, or infinitely many triangles?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 2: Similarity, Proof and Trigonometry **Cluster 2.3: (extra 10 days)** ***(NOTE: This cluster is additional mathematics to prepare students for advanced courses.)***	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.	*With respect to the general case of the Laws of Sines and Cosines, the definitions of sine and cosine must be extended to obtuse angles.* Surveying problems, resultant forces, triangulation.	O2.12 Derive the formula A=1/2ab sin C for the area of a triangle and solve problems. (Key 12.3) (2 days) O2.13 Prove the Law of Sines and Cosines and use them to solve problems. (Key 12.3, 12.4) (3 days) Law of Sines [L] O2.14 Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (Key 12.3, 12.4, 12.5) (3 days) Review, Assess, Test Corrections/ Corrective Instruction (2 days)
	G.SRT.10 +++	Prove the Law of Sines and Cosines and use them to solve problems.		
	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).		

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Grade Level/Course Title: Geometry	**Quarter 3**	**Academic Year:** 2015-2016

Mathematics Focus for the Course: For the high school Model Geometry course, instructional time should focus on six critical areas: (1) establish criteria for congruence of triangles based on rigid motions; (2) establish criteria for similarity of triangles based on dilations and proportional reasoning; (3) informally develop explanations of circumference, area, and volume formulas; (4) apply the Pythagorean Theorem to the coordinate plan; (5) prove basic geometric theorems; and (6) extend work with probability.

Essential Questions for this Unit:

1. How can students' experience with three-dimensional objects be extended to include informal explanations of circumference, area, and volume formulas?
2. How can students apply their knowledge of two-dimensional shapes to consider the shapes of cross-sections and the result of rotating a two-dimensional object about a line?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 3: Extending to Three Dimensions (20 days) **Explain volume formulas and use them to solve problems.** **Visualize the relation between two-dimensional and three-dimensional objects.** **Apply geometric concepts in modeling situations.**	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.*	*Informal arguments for area and volume formulas can make use of the way in which area and volume scale under similarity transformations: when one figure in the plane results from another by applying a similarity transformation with scale factor k, its area is k^2 times the area of the first. Similarly, volumes of solid figures scale by k^3 under a similarity transformation with scale factor k.* *Focus on situations that require relating two- and three-dimensional objects, determining and using volume, and the trigonometry of general triangles.* Edge, height/altitude, face, base, polyhedron, vertex	O3.1 Identify relationship between unit measures in different dimensions. (Key 8.1, 10.1, 10.2) O3.2 Informally derive formula for perimeter and circumference and use formulas to solve problems. Describe relationship between circumference and diameter. (Key 6.5) (2 days) O3.3 Informally derive area formulas of rectangles, parallelogram and triangles. Apply formulas to solve area problems. (3 days) (Key 8.1-8.3, 8.5, 8.6) O3.4 Give informal arguments for area of circles, trapezoids and regular polygons and apply formulas to solve problems. (3 days) (Key 8.2- 8.4) Area of Circles [CP] Discovering Pi [L] O3.5 Give informal arguments for volume formulas of prisms and cylinders. Use formulas to solve problems (including spheres). (2 days) (Key 10.2, 10.4) Rectangular Prisms [L] Volume of Prisms, Cylinders and Cones [CP] O3.6 Give informal arguments for volume formulas of pyramids and cones. Use formulas to solve problems (including spheres). (2 days) (Key 10.3, 10.4, 10.6) O3.7 Identify all possible shapes of cross sections for a given solid. (2 days) O3.8 Identify a 3D object created by rotation of a 2D object. (1 day) ---Review, Assess, Test Corrections/Corrective Instruction (4 days)
	G.GMD.3	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.		
	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.		
	G.MG.1	Use geometric shapes, their measures, and their properties to describe objects. (non-circular)		

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Essential Questions for this Unit:

1. How can students, building on their work with the Pythagorean Theorem in eighth grade to find distances, use the rectangular coordinate system to verify geometric relationships, including properties of special triangles and quadrilaterals, and slopes of parallel and perpendicular lines, which relates back to work done in the Model Algebra I course?
2. How can students continue their study of quadratics by connecting the geometric and algebraic definitions of the parabola?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 4: Connecting Algebra and Geometry Through Coordinates (20 days) **Use coordinates to prove simple geometric theorems algebraically.** **Translate between the geometric description and the equation for a conic section.**	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, sqrt3) lies on the circle centered at the origin and containing the point (0, 2).*	*This unit has a close connection with the next unit. For example, a curriculum might merge G.GPE.1 and the Unit 5 treatment of G.GPE.4 with the standards in this unit.* *Reasoning with triangles in this unit is limited to right triangles; e.g., derive the equation for a line through two points using similar right triangles.* *Relate work on parallel lines in G.GPE.5 to work on A.REI.5 in High School Algebra I involving systems of equations having no solution or infinitely many solutions.* *G.GPE.7 provides practice with the distance formula and its connection with the Pythagorean theorem.* A parabola is the locus (set) of points that are equidistant from a fixed point, called the focus, and a straight line, called the directrix. Vector (magnitude and direction)	O4.1 Find the slope of a line using multiple methods. Discovering Slope [L] Slope of Lines [L] O4.2 Use the distance formula to find segment lengths on the coordinate plane. (Key p502) Distance Formula [CP] O4.3 Compare slopes from a graph to determine parallel or perpendicular lines to solve problems. (Key p167, p 287) (2 days) O4.4 Compare slopes and distances of sides of a polygon on the coordinate plane to determine its label (isosceles triangle, rectangle, square, etc) (2 days) The Parallelogram Law [L] O4.5 Partition a directed line segment (vectors) based on a provided ratio. (2 days) O4.6 Use coordinates to compute perimeter. (2 days) O4.7 Use coordinates to compute area using multiple methods. (3 days) O4.8 Define, construct and derive the equation of a parabola (with vertex at the origin). (3 days) Conics Intro and Parabola [L] -Review, Assess, Corrections/Corrective Instruction (4 days)
	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).		
	G.GPE.6	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.		
	G.GPE.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.		
	G.GPE.2	Derive the equation of a parabola given a focus and directrix.		

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Grade Level/Course Title: Geometry	**Quarter 4**	**Academic Year:** 2015-2016

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(5) prove basic geometric theorems; and (6) extend work with probability.

Essential Questions for this Unit: How can students…

1. …learn to prove basic theorems about circles, with particular attention to perpendicularity and inscribed angles, in order to see symmetry in circles and as an application of triangle congruence criteria?
2. …study relationships among segments on chords, secants, and tangents as an application of similarity?
3. … use the distance formula to write the equation of a circle when given the radius and the coordinates of its center?
4. …given an equation of a circle, draw the graph in the coordinate plane, and apply techniques for solving quadratic equations—which relates back to work done in the Model Algebra I course—to determine intersections between lines and circles or parabolas and between two circles?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 5: Circles With and Without Coordinates **Cluster 5.1 (26 days)** **Understand and apply theorems about circles.** **Find arc lengths and areas of sectors of circles.**	G.C.1	Prove that all circles are similar.	*Emphasize the similarity of all circles.* *Note that by similarity of sectors with the same central angle, arc lengths are proportional to the radius. Use this as a basis for introducing radian as a unit of measure. It is not intended that it be applied to the development of circular trigonometry in this course.*	O5.1 Prove circles are similar. Use circle vocabulary correctly. Circle Vocabulary [CP] Circle Vocabulary with Paper Plates [L] O5.2 Construct a tangent line from a point outside a given circle to the circle. O5.3 Use tangent properties to solve problems. (2 days) (Key 6.1) O5.4 Use chord properties to solve problems. (3 days) (Key 6.2) O5.5 Use arc and angle properties to solve problems. (4 days) (Key 6.3) Arcs and Angles [L] O5.6 Use arc length properties to solve problems. (2 days) (Key 6.7) O5.7 Construct inscribed and circumscribed triangles. (2 days) (Key 3.7) O5.8 Prove properties of circumscribed quadrilaterals and solve related problems. (2 days) O5.9 Derive formula for the area of a sector and use to solve problems. (2 days) O5.10 Use circle similarity to help understand connection between arc length and radius and to help define radian measure. (2 days) ---Review, Assess, Test Corrections/Corrective Instruction (4 days)
	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.*		
	G.C.3	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.		
	G.C.4	Construct a tangent line from a point outside a given circle to the circle. (In preparation for advanced courses.)		
	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.		

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Grade Level/Course Title: Geometry	**Quarter 4**	**Academic Year:** 2015-2016

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Essential Questions for this Unit: How can students…

1. …learn to prove basic theorems about circles, with particular attention to perpendicularity and inscribed angles, in order to see symmetry in circles and as an application of triangle congruence criteria?
2. …study relationships among segments on chords, secants, and tangents as an application of similarity?
3. … use the distance formula to write the equation of a circle when given the radius and the coordinates of its center?
4. …given an equation of a circle, draw the graph in the coordinate plane, and apply techniques for solving quadratic equations—which relates back to work done in the Model Algebra I course—to determine intersections between lines and circles or parabolas and between two circles?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 5: Circles With and Without Coordinates **Cluster 5.2 (10 days)** **Translate between the geometric description and the equation for a conic section.** **Use coordinates to prove simple geometric theorems algebraically.**	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.	*Include simple proofs involving circles.* *Focus on situations in which the analysis of circles is required.* *The circle is defined as the locus (set) of points equidistant from a given point, called the center.*	O5.11 Algebra Review: Binomial Multiplication Patterns O5.12 Derive the equation of a circle using the Pythagorean Theorem. Write the equation of a circle given its center and radius. (2 days) Finding the Equation of a Circle [L] O5.13 Algebra Review: Completing the Square Practice O5.14 Complete the square to find the center and radius of a circle given by an equation. (2 days) Completing the Square [CP] O5.15 Given a point, prove/disprove that it lies on a circle with center at the origin and containing a given point. ---Review, Assess, Test Corrections/Corrective Instruction (3 days)
	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, sqrt3) lies on the circle centered at the origin and containing the point (0, 2).*		

Geometry Mathematics Curriculum Guide

Grade Level/Course Title: Geometry	**Quarter 4**	**Academic Year:** 2015-2016

Mathematics Focus for the Course: For the high school Model Geometry course, instructional time should focus on six critical areas: (1) establish criteria for congruence of triangles based on rigid motions; (2) establish criteria for similarity of triangles based on dilations and proportional reasoning; (3) informally develop explanations of circumference, area, and volume formulas; (4) apply the Pythagorean Theorem to the coordinate plan; (5) prove basic geometric theorems; and (6) extend work with probability.

Essential Questions for this Unit: How can students…

1. …use the languages of set theory to expand their ability to compute and interpret theoretical and experimental probabilities for compound events, attending to mutually exclusive events, independent events, and conditional probability?
2. …make use of geometric probability models wherever possible?
3. …use probability to make informed decisions?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 6: Applications of Probability (17 days) **Understand independence and conditional probability and use them to interpret data.**	S.CP.1	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").	*Build on work with two-way tables from Algebra I Unit 3 (S.ID.5) to develop understanding of conditional probability and independence.* *The list of all possible outcomes is called the sample space.*	O6.1 Determine sample spaces using lists, tree diagrams, tables or charts. (2 days) O6.2 Determine the probability ratio of simple events and, based on the ratio, consider the event not likely, equally likely than not likely, or likely to occur. (2 days) Probability [L] O6.3 Defining subsets, using set notation and Venn diagrams. Understand difference between intersection and union. O6.4 Explain independence. Determine if two events are independent. Distinguish between mutually exclusive and independent. (2 days) O6.5 Construct and complete two-way frequency tables. Determine probabilities, intersections, unions, conditional probabilities, and independence from the table. (2 days) Conditional Probability [L] O6.6 Recognize concepts of conditional probability and independence based on given situation. (2 days) O6.7 Calculate conditional probabilities for both dependent and independent events. Use Venn diagrams to understand conditional probability. (2 days) O6.8 Calculate probabilities using the Addition Rule of probability. Use Venn diagrams to understand the Rule. (2 days) ---Review, Assess, Test Corrections/Corrective Instruction (2 days)
	S.CP.2	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.		
	S.CP.3	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*.		
	S.CP.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.		
	S.CP.5	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.		
	S.CP.6	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.		
	S.CP.7	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.		