Geometry Mathematics Curriculum Guide

Grade Level/Course Title: Geometry	**Quarter** 1	**Academic Year:** 2018-2019

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 reasoning to complete geometric constructions and explain why they work?
2. …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?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 1: **(Aug – Sept)** **Geometry Essentials** **17 days**	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.	Proper Syntax Review and Introduce: Geometry Undefined Terms, Defined Terms, Figures, and Formulas Constructions Draw and Label Diagrams when Appropriate Develop Logical and Visual Thinking Skills Coordinate, Paragraph, Two Column, and Flow Proof Algebra Focus: Solving Linear Equations	O1.1 Use the Ruler and the Segment Addition Postulates. Use the Protractor and the Angle Addition Postulates. Identify congruent segments and angles. **Lesson 1-1** (2 days) O1.2 Construct congruent segments, congruent angles, segment bisectors, and angle bisectors. **Lesson 1-2** (2 days) O1.3 Use the Midpoint and Distance formulas to find segment lengths. **Lesson 1-3** (2 days) Distance Formula [CP] O1.4 Use inductive and deductive reasoning. Write conditional and bi-conditional statements **Lessons 1-4** (2 days) **Mathematical Modeling pg. 35** (1 day) **Lessons 1-5, 1-6** (3 days) O1.5 Introduce proofs: using deductive and indirect reasoning. **Lessons 1-7, 1-8** (3 days) Review, Assess, Test Corrections/Corrective Instruction (2 days)
	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.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.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.*		

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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 reasoning to complete geometric constructions and explain why they work?
2. build 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?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 1: **(Sept – Oct)** **Parallel/ Perpendicular Lines & Angle Relationships in Triangles** **12 days**	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.	Proper Syntax Use properties of angles and lines to solve real-world mathematical problems Constructions Draw and Label Diagrams when Appropriate Develop Logical and Visual Thinking Skills Coordinate, Paragraph, Two Column, and Flow Proof Algebra Focus: Graphing and Writing Linear Equations	O2.1 Define parallel lines. Prove theorems about lines and angles. **Lesson 2-1** (2 days) Geometry Investigations [L] Parallel Lines Cut by a Transversal [L] O2.2 Use the converses of parallel line angle relationship theorems. **Lesson 2-2** (2 days) O2.3 Use parallel lines, the triangle sum conjecture, and the exterior angles conjecture to solve problems. **Lesson 2-3** (2 days) O2.4 Prove slope criteria for parallel and perpendicular lines. Write equations of parallel and perpendicular lines through a point not on a given line. **Lesson 2-4** (2 days) **Mathematical Modeling pg. 99** (1 day) Slope of Lines [L] Discovering Slope [L] Review, Assess, Test Corrections/Corrective Instruction (3 days)
	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.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 typo		
	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)		

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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 transformations—and solve problems about triangles, quadrilaterals, and other polygons?
4. …identify criteria for similarity of triangles and use similarity to solve problems?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 1: **(Oct)** **Congruence, Proof and Transformation** **13 days**	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).	*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.* *Students will use geometric descriptions of rigid motions to transform figures.* *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).*	O3.1 Find a reflective image and write a rule for a reflection. Define a reflection and perform reflections on and off a coordinate grid. **Lesson 3-1** (2 days) O3.2 Translate a figure and write a rule for a translation. Find the image of a figure after a series of rigid motions. **Lesson 3-2** (2 days) O3.3 Rotate a figure and write a rule for a rotation. Prove that a rotation can be written as the composition of two reflections. **Lesson 3-3** (2 days) O3.4 Specify a sequence of transformations that will carry a given figure onto another. **Lesson 3-4** (2 days) O3.5 Describe these transformations and make predictions. Identify symmetry in a figure **Lessons 3-5** (1 day) **Mathematical Modeling pg. 142** (1 day) Review, Assess, Test Corrections/Corrective Instruction (3 days) **Quarterly Assessment #1**
	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.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.		

Geometry Mathematics Curriculum Guide

Grade Level/Course Title: Geometry	**Quarter** 2	**Academic Year:** 2018-2019

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?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 1: **(Oct-Nov)** **Triangle Congruence** **14 days** **Prove geometric theorems.**	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.	*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).*	O4.1Demonstrate that two figures are congruent using rigid transformations. **Lesson 4-1** (2 days) Congruent and Similar Polygons [L] Congruence Through Transformations [L] O4.2 Use properties and theorems about isosceles and equilateral triangles to solve problem and to identify congruent triangles. **Lesson 4-2** (2 days) **Mathematical Modeling pg. 166** (1 day) O4.3 Prove triangle congruence by SAS, SSS criteria and use to solve problems. **Lesson 4-3** (2 days) O4.4 Prove triangle congruence by ASA and AAS criteria and use to solve problems. **Lesson 4-4** (2 days) O4.5 Prove and use the HL Theorem. **Lesson 4-5** (1 day) O4.6 Apply congruence criteria to problems involving multiple triangles. **Lesson 4-6** (2 days) Review, Assess, Test Corrections/Corrective Instruction (2 days)
	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.		
	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.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.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. …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: **(Nov-Dec)** **Bisectors, Medians, & Altitudes** **14 days** **Make geometric constructions**	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.*	Constructions Draw and Label Diagrams when Appropriate Develop Logical and Visual Thinking Skills Algebra Focus: Solving Linear Equations	O5.1 Prove the Perpendicular Bisector Theorem, the Angle Bisector Theorem, and their converses. Use these theorems to solve problems. **Lesson 5-1** (2 days) O5.2 Prove that a circumcenter is equidistant from the vertices of a triangle. Prove that an incenter is equidistant from the sides of a triangle. **Lesson 5-2** (2 days) **Mathematical Modeling pg. 217** (1 day) O5.3 Identify special segments in triangles and understand theorems about them. **Lesson 5-3** (2 days) O5.4 Prove that the side lengths of a triangle are related to the angle measures of the triangle. **Lesson 5-4** (2 days) O5.5 Prove the Hinge Theorem and its converse. **Lesson 5-5** (2 days) Review, Assess, Test Corrections/Corrective Instruction (3 days)
	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.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, reflective devices, paper folding, dynamic geometric software, etc.).		
	G.SRT.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.		
	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.C.3	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.		

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Essential Questions for this Unit: How can students…

1. …use triangle congruence as a familiar foundation for the development of formal proof?
2. …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?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 1: (Dec-Jan) **Quadrilaterals and Other Polygons** **16 days** **Experiment with transformations in the plane.** **Make geometric constructions**	G.SRT.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	Proper Syntax Review and Introduce: Geometry Undefined Terms, Defined Terms, Figures, and Formulas Constructions Draw and Label Diagrams when Appropriate Develop Logical and Visual Thinking Skills Coordinate, Paragraph, Two Column, and Flow Proof Algebra Focus: Solving Linear Equations	O6.1 Show that the sum of the exterior angles of a polygon is 360°and the sum of the interior angles of a polygon is the product of 180°. **Lesson 6-1** (2 days) **Mathematical Modeling pg. 252** (1 day) O6.2 Use properties of kites and trapezoids to solve problems. **Lesson 6-2** (2 days) O6.3 Understand the properties of parallelograms and their relationships. **Lesson 6-3** (2 days) The Parallelogram Law [L] O6.4 Demonstrate that a quadrilateral is a parallelogram based on its sides, diagonals, and angles. **Lesson 6-4** (2 days) Quadrilaterals [CP] O6.5 Understand the properties of rhombuses, rectangles, and squares. **Lesson 6-5** (2 days) O6.6 Identify rhombuses, rectangles and squares **Lesson 6-6** (2 days) Review, Assess, Test Corr/Corrective Instruction (3 days) **Quarterly Assessment #2**
	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.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** 3	**Academic Year:** 2018-2019

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. …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 **(Jan-Feb)** **Dilations and Similarity Proofs** **13 days** **Understand similarity in terms of similarity transformations** **Prove theorems involving similarity.**	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).	Dilations: [Contraction (reduction), expansion (enlargement)], scale factor, centers of dilation The **similarity transformations** are 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.	O7.1 Dilate figures on and off the coordinate plane. **Lesson 7-1** (2 days) O7.2 Identify a combination of rigid motions and dilation that maps one figure to a similar figure. **Lesson 7-2** (2 days)
	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.C.1	Prove that all circles are similar.		
	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.		
	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.		

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Essential Questions for this Unit: How can students…

4. …apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity?
5. …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?
6. …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 **Dilations and Similarity Proofs (cont.)** **Understand similarity in terms of similarity transformations** **Prove theorems involving similarity.**	G.SRT.3	Use the properties of similarity transformations to establish the Angle-Angle (AA) criterion for two triangles to be similar.	Dilations: [Contraction (reduction), expansion (enlargement)], scale factor, centers of dilation The **similarity transformations** are 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.	O7.3 Prove and use the AA, SSS, and SAS theorems to prove triangles are similar. **Lesson 7-3** (2 days) Congruent and Similar Polygons [L] Investigating Similar Triangles [L] O7.4 Use similarity and length relationships of right triangles, including altitudes, to solve problems. **Lesson 7-4** (2 days) **Mathematical Modeling pg. 332** (1 day) O7.5 Use the Side-Splitter theorem, The Triangle Mid-segment Theorem, and the Triangle-Angle-Bisector Theorem to find lengths of sides and segments of triangles. **Lesson 7.5** (1 day) Review, Assess, Test Corr/Corrective Instruction (3 days)
	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.		
	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.*		

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Essential Questions for this Unit: How can students…

1. … 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?
2. …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)*.

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 2: **(Feb-Mar)** **Similarity, Proof and Trigonometry** **14 days** **Define trigonometric ratios and solve problems involving right triangles.**	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.	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.	O8.1 Prove the Pythagorean Theorem using similar right triangles. **Lesson 8-1** (2 days) Investigating Special Right Triangles [L] O8.2 Understand trig ratios by similarity properties Define and calculate trig ratios. **Lesson 8-2** (2 days) Introduction to Trigonometric Functions [L] O8.3 Understand why the Law of Sines applies to any triangle and use it to solve problems. **Lesson 8-3** (2 days) Law of Sines [L] O8.4 Understand the Law of Cosines and use it to solve problems. **Lesson 8-4** (2 days) **Mathematical Modeling pg. 373** (1 day) O8.5 Use trig ratios to solve problems involving angles of depression and elevation. **Lesson 8-5** (2 days) Review, Assess, Test Corrections/Corrective Instruction (3 days)
	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.		
	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.		
	G.SRT.10	Prove the Laws 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).		

Grade Level/Course Title: Geometry	**Quarter 3**	**Academic Year:** 2018-2019

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, 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: (Mar) Connecting Algebra and Geometry Through Coordinates 13 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).*	*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)	O9.1 Use coordinate geometry to classify triangles and quadrilaterals on the coordinate plane and solve problems. **Lesson 9-1** (2 days) **Mathematical Modeling pg. 392** (1 day) O9.2 Prove theorems using coordinate geometry and algebra. **Lesson 9-2** (2 days) O9.3 Write the equation for a circle given its graph, or given its radius and center. Graph a circle from its equation. **Lesson 9-3** (2 days) Finding the Equation of a Circle [L] Completing the Square [CP] O9.4 Define, construct and derive the equation of a parabola (with vertex at the origin). **Lesson 9-4** (3 days) Conics Intro and Parabola [L] -Review, Assess, Test Corr/Corrective Inst (3 days) **Quarterly Assessment #3**
	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.1	Derive the equation of a circle given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.		
	G.GPE.2	Derive the equation of a parabola given a focus and directrix.		

Geometry Mathematics Curriculum Guide

Grade Level/Course Title: Geometry	**Quarter 4**	**Academic Year:** 2018-2019

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. …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: (Mar-Apr) Circles With and Without Coordinates **14 days** **Understand and apply theorems about circles.** **Find arc lengths and areas of sectors of circles.**	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.	*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.*	O10.1 Calculate arc length and the area of sectors and segments in circles. **Lesson 10-1** (2 days) Arcs and Angles [L] Circle Vocabulary [CP] O10.2 Identify tangent lines of circles. Use tangent properties to solve problems. **Lesson 10-2** (2 days) **Mathematical Modeling pg. 435** (1 day) O10.3 Prove and apply relationships between chords, arcs, and central angles. Use chord properties to solve problems. **Lesson 10-3** (2 days) O10.4 Identify and apply relationships between the measures of inscribed angles, arcs, and central angles. Identify the relationships between an angle formed by a chord and a tangent to its intercepted arc. **Lesson 10-4** (2 days) O10.5 Recognize and apply angle relationships formed by secants and tangents intersecting inside and outside a circle. **Lesson 10-5** (2 days) ---Review, Assess, Test Corrections/Corrective Instruction (3 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.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.		
	G.CO.13	Construct an equilateral triangle, square, and a regular hexagon inscribed in a circle.		

Grade Level/Course Title: Geometry	**Quarter 3**	**Academic Year:** 2018-2019

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: **(Apr-May)** **Extending to Three Dimensions** **12 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	O11.1 Use Euler's Formula to calculate the number of vertices, faces, and edges in polyhedrons. Describe cross sections of polyhedrons. **Lesson 11-1** (2 days) O11.2 Understand how the volume formulas for prisms and cylinders apply to oblique prisms and cylinders and solve problems. **Lesson 11-2** (2 days) **Mathematical Modeling pg. 479** (1 day) Rectangular Prisms [L] Volume of Prisms, Cylinders and Cones [CP] O11.3 Understand how the volume formulas of pyramids and cones apply to oblique pyramids and cones and solve problems. **Lesson 11-3** (2 days) O11.4 Use Cavalieri's Principle to show how the volume of a hemisphere is related to the volume of a cone and a cylinder. Calculate volumes and surface areas of spheres and composite figures. **Lesson 11-4** (2 days) Surface Areas of Prisms, Cylinders, & Spheres [CP] ---Review, Assess, Test Corrections/Corrective Instruction (3 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)		

Geometry Mathematics Curriculum Guide

Grade Level/Course Title: Geometry	**Quarter 4**	**Academic Year:** 2018-2019

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: **(May-Jun)** **Applications of Probability** **14 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.*	O12.1 Explain independence of events in everyday language and situations. Determine the probability of the union of two events (*A* or *B*) and the intersection of two independent events (*A* and *B*). **Lesson 12-1** (2 days) Probability [L] O12.2 Understand the conditional probability of A given B as the fraction of outcomes in B that also belong to A. Interpret independence of events in terms of conditional probability. Use a two-way frequency table to decide if events are independent and to approximate conditional probabilities **Lesson 12-2** (2 days) **Mathematical Modeling pg. 514** (1 day) Conditional Probability [L]
	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.		

Grade Level/Course Title: Geometry	**Quarter 4**	**Academic Year:** 2018-2019

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…

4. …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?
5. …make use of geometric probability models wherever possible?
6. …use probability to make informed decisions?

Unit (Time)	Standard	Standard Description	Content	Objectives and Resources
Unit 6: Applications of Probability (cont.) **Understand independence and conditional probability and use them to interpret data.**	S.CP.8	Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B]A) = P(B)P(A]B), and interpret the answer in terms of the model.	*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.*	O12.3 Calculate the number of permutations and combinations in mathematical and real world context. Use permutations and combinations to compute probabilities of compound events and solve problems. **Lesson 12.3** (2 days) O12.4 Develop a probability distribution based on theoretical probabilities or empirical data. Graph distributions. Calculate probability in binomial experiments. **Lesson 12.4** (2 days) O12.5 Calculate the expected value in situations involving chance. Weigh the possible outcomes of a decision by comparing expected values and finding expected payoffs. **Lesson 12-5** (2 days) O12.6 Analyze decisions and evaluate fairness using probability concepts. **Lesson 12.6** (1 days) ---Review, Assess, Test Corrections/Corrective Instruction (2 days) **Quarterly Assessment #4**
	S.CP.9	Use permutations and combinations to compute probabilities of compound events and solve problems.		
	S.MD.1	Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.		
	S.MD.2	Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.		
	S.MD.3	Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.		
	S.MD.4	Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.		
	S.MD.5	Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. a. Find the expected payoff for a game of chance. b. Evaluate and compare strategies on the basis of expected values.		
	S.MD.6	Use probabilities to make fair decisions.		
	S.MD.7	Analyze decisions and strategies using probability concepts.		