Tunkhannock Area School District
Geometry
Curriculum Map 2014

Quarter 1
Targeted Standard(s): PA Core 2.3. HS.A.1 Use geometric figures and their properties to represent transformations in the plane. 2.3. HS.A.2Apply rigid transformations to determine and explain congruence. 2.3. HS.A.3Verify and apply geometric theorems as they relate to geometric figures. 2.3. HS.A.14Apply geometric concepts to model and solve real world problems.G.2.2.1.1 Use properties of angles formed by intersecting lines to find the measures of missing angles. **Keystone Geometry Eligible Content** G.2.1.2.1 Calculate the distance and/or midpoint between two points on a number line or on a coordinate plane. G.1.2.1.4 Identify and/or use properties of regular polygons. G.2.2.2.1 Estimate area, perimeter, or circumference of an irregular figure. G.2.2.2.2 Find the measurement of a missing length, given the perimeter, circumference, or area. G.2.2.2.4 Develop and/or use strategies to estimate the area of a compound/composite figure. G.1.1.1.1 Identify, determine, and/or use the radius, diameter, segment, and/or tangent of a circle. G.2.2.2.2 Find the measurement of a missing length, given the perimeter, circumference, or area. G.1.3.2.1 Write, analyze, complete, or identify formal proofs (e.g., direct and/or indirect proofs/ proofs by contradiction). G.2.2.1.1 Use properties of angles formed by intersecting lines to find the measures of missing angles. G.2.2.1.2 Use properties of angles formed when two parallel lines are cut by a transversal to find the measures of missing angles. G.1.2.1.1 Identify and/or use properties of triangles. G.1.2.1.3 Identify and/or use properties of isosceles and equilateral triangles. G.2.1.2.3 Use slope, distance, and/or midpoint between two points on a coordinate plane to establish properties of a 2-dimensional shape. G.2.2.1.1 Use properties of angles formed by intersecting lines to find the measures of missing angles. G.1.3.1.1 Identify and/or use properties of congruent and similar polygons or solids. G.1.3.2.1 Write, analyze, complete, or identify formal proofs (e.g., direct and/or indirect proofs/ proofs by contradiction)
Enduring Understandings: Experiment with transformations in the plane. Use coordinates to prove simple geometric theorems algebraically. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. Prove geometric theorems. Understand congruence and similarity using physical models, transparencies, or geometry software.
Essential Questions: How can a change in one measurement of a 2- or 3-dimensional figure effect other measurements such as perimeter, area, surface area or volume of that figure. How do you use the ideas of direct and indirect proof, and counter-examples to verify valid conjectures and refute invalid conjectures? How do you use the ideas of direct and indirect proof, and counter-examples to verify valid conjectures and refute invalid conjectures? How can you use coordinates and algebraic techniques to represent, interpret, and verify geometric relationships?

Core Content/Objectives		Instructional Actions	
Concepts What students will know	**Competencies** What students will be able to do	**Activities/Strategies/Material** Learning Activities/Differentiation Interdisciplinary Connections	**Assessment** How learning will be assessed
I. Points, Lines, Planes and Angles A. Points, Lines, and Planes Segments, Rays, Parallel Lines and Planes Measuring Segments	A. 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.	http://www.onlinemathlearning.com/basic-geometry.html Segments, Rays, Parallel and Perpendicular Lines worksheet http://www.onlinemathlearning.com/geometry-math-games.html Lines in Geometry	Formative Assessments -Vocabulary -Daily Homework -Peer-teaching -Problem Solving Activities Summative Assessments -Chapter Tests -Section Quizzes Quarter Projects Classroom Diagnostic Tool
B. Angles Angle Measure Angle Relationships	B. 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.	Angle Measure Angles	
C. Formulas in the Coordinate Plane	C. 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.	Distance and Midpoint formulas Midpoint and Distance Worksheets	

	Find the point on a directed line segment between two given points that partitions the segment in a given ratio. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.		
D. Polygons Perimeter and Area	D. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	Rectangle Area and Perimeter (Coordinate Geometry) and Other Links Perimeter and Area of Polygons	
E. Circles Circumference and Area	E. 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.	Area and Circumference worksheets	
II. Reasoning and Proof			
A. Inductive Reasoning, Patterns and Conjecture		Deductive Reasoning Lesson Working with Related Conditionals practice	
B. Conditional Statements Converse, Inverse, Contrapositive Biconditionals		Examples of Inductive Reasoning Conditional/Biconditional Worksheet	

C. Deductive Reasoning Laws of Detachment and Syllogism		Who Made the Mess? activity	
D. Proofs Postulates and Theorems Algebraic Proofs Geometric Proofs Direct and Indirect	D. 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.	How to Write a Good Proof	
III. Parallel and Perpendicular Lines A. Properties of Parallel Lines		Angle Pairs within Parallel Lines	
B. Angle Pairs within Parallel Lines Proving Lines Parallel	B. (Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line,	Parallel Lines and Transversals worksheet	

	and give an argument in terms of transversals why this is so.		
C. Polygons Classifying Angle Sums		Sum of Polygon Angles Video	
D. Lines in the Coordinate Plane Slopes Equations of Lines Perpendicular Lines	D. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).	Parallel/Perpendicular Lines and Slope	
IV. Triangles			
A. Classifying	A.Use and 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.	Classifying Triangles worksheets	
B. Angles of Triangles	B. Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel	http://www.onlinemathlearning.com/geometry-math-games.html	

	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. Use and 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. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.	http://www.onlinemathlearning.com/geometry-math-games.html	

C. Isosceles and Equilateral Triangles	C. Use and 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. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.	Isosceles and Equilateral Triangles worksheet	
D. Congruence Corresponding Parts Proving Congruence SSS, SAS, ASA, AAS and CPCTC	D. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a	Proving Triangles Congruent Lesson Congruence and Triangles worksheets	

	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. Use and 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. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.		

Quarter 2
Targeted Standard(s): PA Core 2.3. HS.A.3Verify and apply geometric theorems as they relate to geometric figures. 2.3. HS.A.5Create justifications based on transformations to establish similarity of plane figures. 2.3. HS.A.7Apply trigonometric ratios to solve problems involving right triangles. 2.3. HS.A.14Apply geometric concepts to model and solve real world problems.G.1.2.1.1 Identify and/or use properties of triangles. **Keystone Geometry Eligible Content** G.1.2.1.3 Identify and/or use properties of isosceles and equilateral triangles. G.1.2.1.4 Identify and/or use properties of regular polygons. G.1.3.1.1 Identify and/or use properties of congruent and similar polygons or solids. G.1.3.1.2 Identify and/or use proportional relationships in similar figures. G.1.3.2.1 Write, analyze, complete, or identify formal proofs (e.g., direct and/or indirect proofs/ proofs by contradiction). G.2.1.1.1 Use the Pythagorean theorem to write and/or solve problems involving right triangles. G.2.1.1.2 Use trigonometric ratios to write and/or solve problems involving right triangles.
Enduring Understandings: Prove geometric theorems. Prove theorems involving similarity. Understand congruence and similarity using physical models, transparencies, or geometry software. Define trigonometric ratios and solve problems involving right triangles.
Essential Questions: How can a change in one measurement of a 2- or 3-dimensional figure effect other measurements such as perimeter, area, surface area or volume of that figure? How do you use the ideas of direct and indirect proof, and counter-examples to verify valid conjectures and refute invalid conjectures? How can you explain the relationship between congruence and similarity in both 2- and 3-dimensional figures? How can you use coordinates and algebraic techniques to represent, interpret, and verify geometric relationships?

Core Content/Objectives		Instructional Actions	
Concepts What students will know	**Skills** What students will be able to do	**Activities/Strategies/Materials** Learning Activities/Differentiation Interdisciplinary Connections	**Assessment** How learning will be assessed
V. Relationships within A. Bisectors, Medians, Midsegments and Altitudes, Points of Concurrency	A. 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. 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. Use and Prove theorems about triangles.	Concurrent Lines of a Triangle Circumscribed and Inscribed Circles	Formative Assessments -Vocabulary -Daily Homework -Peer-teaching -Problem Solving Activities Summative Assessments -Chapter Tests -Section Quizzes Quarter Projects Classroom Diagnostic Tool

	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.		
B. Inequalities in Triangles	B. 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. Use and Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are	Triangle Inequality Theorem activity	

	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.		
VI. Proportions and Similarity A. Ratios and Proportions		http://www.ixl.com/math/geometry/ratios-and-proportions	
B. Similar Polygons Perimeter of Similar Figures	B. 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. Use and Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of	Similar Polygons worksheet	

	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. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so. 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.		

C. Similar Triangles Indirect Measurement Proportions in Triangles Proportions using Geometric Mean	C. 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. Use and 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. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. Use informal arguments to establish facts about the angle sum and exterior angle of	http://www.cliffsnotes.com/math/geometry/similarity/similar-triangles	

	triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.		
VII. Right Triangles and Trigonometry			
A. Pythagorean Theorem	A. Use and 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.	Pythagoras' Theorem - Proofs and Examples http://www.onlinemathlearning.com/pythagoras-word-problem.html	
B. Special Right Triangles	B. Use and Prove theorems about	Special Right Triangles word problems	

	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.	Special Right Triangles worksheet	
C. Trig Ratios Angles of Elevation and Depression	C. Use and 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. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for	Right Triangle Solver http://hotmath.com/help/gt/genericalg1/section_12_6.html	

	acute angles. Explain and use the relationship between the sine and cosine of complementary angles. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.		

Quarter 3
Targeted Standard(s): PA Core 2.3. HS.A.8Apply geometric theorems to verify properties of circles. 2.3. HS.A.9Extend the concept of similarity to determine arc lengths and areas of sectors of circles. 2.3. HS.A.13Analyze relationships between two-dimensional and three-dimensional objects. 2.3. HS.A.14Apply geometric concepts to model and solve real world problems.G.1.1.1.1 Identify, determine, and/or use the radius, diameter, segment, and/or tangent of a circle. **Keystone Geometry Eligible Content** G.1.1.1.3 Use chords, tangents, and secants to find missing arc measures or missing segment measures. G.1.2.1.2 Identify and/or use properties of quadrilaterals. G.1.2.1.4 Identify and/or use properties of regular polygons. G.1.3.2.1 Write, analyze, complete, or identify formal proofs (e.g., direct and/or indirect proofs/ proofs by contradiction). G.2.1.1.1 Use the Pythagorean theorem to write and/or solve problems involving right triangles. G.2.1.2.2 Relate slope to perpendicularity and/or parallelism (limit to linear algebraic equations). G.2.1.2.3 Use slope, distance, and/or midpoint between two points on a coordinate plane to establish properties of a 2-dimensional shape. G.2.2.1.2 Use properties of angles formed when two parallel lines are cut by a transversal to find the measures of missing angles. G.2.2.2.1 Estimate area, perimeter, or circumference of an irregular figure. G.2.2.2.2 Find the measurement of a missing length, given the perimeter, circumference, or area. G.2.2.3.1 Describe how a change in the linear dimension of a figure affects its perimeter, circumference, and area (e.g., How does changing the length of the radius of a circle affect the circumference of the circle?). G.2.2.2.2 Find the measurement of a missing length, given the perimeter, circumference, or area. G.2.2.3.1 Describe how a change in the linear dimension of a figure affects its perimeter, circumference, and area (e.g., How does changing the length of the radius of a circle affect the circumference of the circle?). G.2.1.2.1 Calculate the distance and/or midpoint between two points on a number line or on a coordinate plane. G.2.2.2.4 Develop and/or use strategies to estimate the area of a compound/composite figure. G.2.2.2.2 Find the measurement of a missing length, given the perimeter, circumference, or area. G.2.2.2.3 Find the side lengths of a polygon with a given perimeter to maximize the area of the polygon. G.2.2.2.4 Develop and/or use strategies to estimate the area of a compound/composite figure. G.2.2.3.1 Describe how a change in the linear dimension of a figure affects its perimeter, circumference, and area (e.g., How does changing the length of the radius of a circle affect the circumference of the circle?). G.2.2.4.1 Use area models to find probabilities.
Enduring Understandings: Prove geometric theorems. Use coordinates to prove simple geometric theorems algebraically. Prove geometric theorems. Understand and apply theorems about circles.

Find arc lengths and areas of sectors of circles.
Find arc lengths and areas of sectors of circles.
Prove geometric theorems.
Define trigonometric ratios and solve problems involving right triangles.
Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Essential Questions:

How can a change in one measurement of a 2- or 3-dimensional figure effect other measurements such as perimeter, area, surface area or volume of that figure?
How do you use the ideas of direct and indirect proof, and counter-examples to verify valid conjectures and refute invalid conjectures?
How can you explain the relationship between congruence and similarity in both 2- and 3-dimensional figures?
How can you explain the relationship between congruence and similarity in both 2- and 3-dimensional figures?
How can you use coordinates and algebraic techniques to represent, interpret, and verify geometric relationships?

Core Content/Objectives		Instructional Actions	
Concepts What students will know	**Skills** What students will be able to do	**Activities/Strategies/Materials** Learning Activities/Differentiation Interdisciplinary Connections	**Assessment** How learning will be assessed
VIII.Quadrilaterals A. Classifying Quadrilaterals	A.Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).	Quizlet Flashcards, Games, etc.	Formative Assessments -Vocabulary -Daily Homework -Peer-teaching -Problem Solving Activities Summative Assessments -Chapter Tests -Section Quizzes Quarter Projects Classroom Diagnostic Tool
B.Parallelograms Properties of Rectangles, Rhombuses and Squares	B 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. 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	Types of Quadrilaterals Diagonals of a Quadrilateral	

	equidistant from the segment's endpoints. Use and 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.		
C. Trapezoids and Kites	C. 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. 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.	Trapezoids and Kites worksheet	

IX.Circles A. Circumference and Area	A. Prove that all circles are similar. 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.	http://www.onlinemathlearning.com/circle-worksheets.html Circles Worksheets	
B.Chords, Arcs and Angles	B. 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.	Chords, Arcs and Angles worksheet	
C. Tangent Lines and Secant Lines	C. Prove that all circles are similar. 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	Tangent Lines and Secant Lines worksheet	

	circle is perpendicular to the tangent where the radius intersects the circle. 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.		
D. Special Angle Measures and Segment Lengths	D. Prove that all circles are similar. 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. 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.	Angle Measures and Segment Lengths worksheet	

E. Equations of Circles	E. Prove that all circles are similar. 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. 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.	http://www.mathsisfun.com/algebra/circle-equations.html	
X.Area			
A. Areas of Parallelograms	A. Corollary Direct Proof Indirect Proof Proof by Contradiction Theorem Analytic Geometry Coordinate Plane Distance Between Points Midpoint Ordered Pair Origin Plotting Points	Interactive Area Tool Change in Linear Dimension-Change in Area	
B. Areas of Triangles	B. Corollary Direct Proof Indirect Proof Proof by	Area of a Triangle:Examples and Practice	

	Contradiction Theorem Analytic Geometry Coordinate Plane Distance Between Points Midpoint Ordered Pair Origin Plotting Points		
C. Areas of Trapezoids, Rhombuses and Kites	C. Corollary Direct Proof Indirect Proof Proof by Contradiction Theorem Analytic Geometry Coordinate Plane Distance Between Points Midpoint Ordered Pair Origin Plotting Points	Areas and Perimeters of Triangles and Special Quadrilaterals	
D.Areas of Regular Polygons	D. Corollary Direct Proof Indirect Proof Proof by Contradiction Theorem Analytic Geometry Coordinate Plane Distance Between Points Midpoint Ordered Pair Origin Plotting Points	Sizing Up the Area of a Polygon	
E. Geometric Probability	E. Prove that all circles are similar. 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	Probability & Geometry Problems	

	tangent where the radius intersects the circle.		

Quarter 4
Targeted Standard(s): PA Core 2.3. HS.A.10 Translate between the geometric description and the equation for a conic section. 2.3. HS.A.11 Apply coordinate geometry to prove simple geometric theorems algebraically. **Keystone Geometry Eligible Content** G.1.1.1.4 Identify and/or use parts of circles and segments associated with circles, spheres, and cylinders. G.1.2.1.5 Identify and/or use properties of pyramids and prisms. G.2.3.1.1 Calculate the surface area of prisms, cylinders, cones, pyramids, and/or spheres. Formulas are provided on a reference sheet. G.2.3.1.2 Calculate the volume of prisms, cylinders, cones, pyramids, and/or spheres. Formulas are provided on a reference sheet. G.2.3.1.3 Find the measurement of a missing length, given the surface area or volume.
Enduring Understandings: Explain volume formulas and use them to solve problems. Visualize relationships between two-dimensional and three- dimensional objects. Apply geometric concepts in modeling situations. Understand and apply theorems about circles. Explain volume formulas and use them to solve problems. Visualize relationships between two-dimensional and three- dimensional objects. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. Explain volume formulas and use them to solve problems. Visualize relationships between two-dimensional and three- dimensional objects. Explain volume formulas and use them to solve problems. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. Understand congruence in terms of rigid motions. Understand similarity in terms of similarity transformations.
Essential Questions: How can a change in one measurement of a 2- or 3-dimensional figure effect other measurements such as perimeter, area, surface area or volume of that figure? How do you use the ideas of direct and indirect proof, and counter-examples to verify valid conjectures and refute invalid conjectures? How can you explain the relationship between congruence and similarity in both 2- and 3-dimensional figures? How can you explain the relationship between congruence and similarity in both 2- and 3-dimensional figures? How can you use coordinates and algebraic techniques to represent, interpret, and verify geometric relationships?

Core Content/Objectives		Instructional Actions	
Concepts What students will know	**Skills** What students will be able to do	**Activities/Strategies/Materials** Learning Activities/Differentiation Interdisciplinary Connections	**Assessment** How learning will be assessed
XI.Surface Area A. Space Figures and Nets	A. 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, Cavalier's principle, and informal limit arguments.	http://www.sadlier-oxford.com/math/enrichment/gr4/EN0411b/EN0411b.htm	Formative Assessments -Vocabulary -Daily Homework -Peer-teaching -Problem Solving Activities Summative Assessments -Chapter Tests -Section Quizzes
B. Prisms and Cylinders	B.Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). B. 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,	Surface areas of Prisms and Cylinders Practice Problems Exploring Volumes of Cylinders	Quarter Projects Classroom Diagnostic Tool

	Cavalier's principle, and informal limit arguments. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).		
C. Pyramids and Cones	C. 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, Cavalier's principle, and informal limit arguments. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	Surface Area of Pyramids and Cones worksheet	

	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).		
D. Spheres	D. 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, Cavalier's principle, and informal limit arguments. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	Surface Area of Spheres problems	
XII.Volume A. Prisms and Cylinders	A. Use volume formulas for cylinders, pyramids,	Volumes of Prisms and Cylinders Practice Problems	

	cones, and spheres to solve problems.		
B. Pyramids and Cones	B. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	Volume Word Problems	
C. Spheres	C. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems	Area and Volume of Similar Solids worksheet	
D. Congruent and Similar Solids	D. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems		
XIII. Transformations A. Reflections	A. 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). Given a rectangle,	Interactive Transformations Reflections	

	parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. Develop definitions of rotations,		
B. Translations	B. 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). Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. Develop definitions of rotations	Translations	
C. Rotations	C. Represent transformations in the plane using, e.g., transparencies and	Rotations	

	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). Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. Develop definitions of rotations		
D. Tessellations	D. 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). Given a rectangle,	Tessellations	

	parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. Develop definitions of rotations		
E. Dilations	E. Verify experimentally the properties of dilations given by a center and a scale factor: 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. The dilation of a line segment is longer or shorter in the ratio given by the scale factor. 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.	Dilations	

	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.		
XIV Constructions			
A. Making Constructions with a Variety of Tools	A. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.	Geometry Construction Reference Bisect an Angle	

XV. Applications and Extensions A. Making Constructions with a Variety of Tools XV.Applications and Extensions A. Area and Volume	A. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle. A. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	Modeling a Ferris Wheel * most textbook websites have extra resources	

B. Derivations	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). B.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. Derive the equation of a parabola given a focus and directrix. Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol	*Geometer Sketchpad www.geogebra.org www.illuminations.nctm.org	