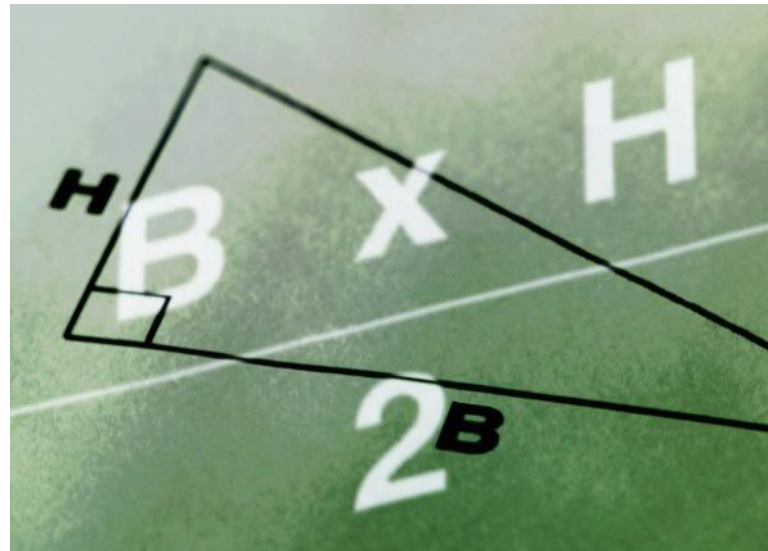


PARK RIDGE SCHOOL DISTRICT

Park Ridge, New Jersey



Plane Geometry Curriculum Guide

Approved by Park Ridge Board of Education – August 27, 2012

Mathematics Curriculum Guide

Grades 9-12 Mathematics Writing Committee

All high school mathematics teachers participated in the high school mathematics curriculum revision process, thereby affording opportunities for teachers to add their knowledge and professional experiences to the process. Teachers on the mathematics writing committee based the curriculum on teacher input and recommendations collected from collaboration efforts. The curriculum writing committee members will act as a resource to their department colleagues. Opportunities to discuss the curriculum implementation, teaching strategies, resources, as well as reflections and concerns will be provided during the 2011-12 school year.

I am grateful to the mathematics curriculum committee members for the many hours and expertise they devoted to writing this curriculum guide. The committee members are commended for their efforts and interest in providing the Park Ridge School District with a thorough high school mathematics curriculum that aligns with the Common Core State Standards for Mathematics.

According to the 2010 Common Core State Standards Initiative, “The Common Core State Mathematical Standards are designed to provide a clear understanding of what students are expected to learn, so teachers and parents know what they need to do to help them. The standards are designed to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers.”

Dr. Cathy Timpone
Director of Curriculum & Instruction

Mathematics Curriculum Guide

High School Mathematics Curriculum Writing Committee:

Lynne Lupfer revised:

Mathematics Prep, Geometry Honors, Algebra II Honors,
Pre-Calculus, Pre-Calculus Honors, SAT Prep Math curriculum guides

Rachel Berger revised:

Pre-Algebra, Algebra II, Algebra II Honors curriculum guides

Erin Havel revised:

Algebra I, Algebra I Honors curriculum guides

Roseanne Wates revised:

Geometry, Statistics curriculum guides

Dana Caine revised:

Statistics curriculum guide

Anna Marie Schoenkopf revised:

Life Skills Math curriculum guide

Debbie Strammiello revised:

Life Skills Math curriculum guides

Debra Aach, Mathematics Supervisor

Administration:

Troy Lederman, Principal, Park Ridge High School
Dr. Cathy Timpone, Director of Curriculum and Instruction
Dr. Robert Gamper, Superintendent

Board Approved August 27, 2012

PARK RIDGE SCHOOL DISTRICT
Park Ridge, NJ

MATHEMATICS DEPARTMENT, 2011-2012

COURSE TITLE/GRADE & SUBJECT: INTERMEDIATE GEOMETRY//GRADES 9,10

COURSE # 2340

PREREQUISITE: ALGEBRA 1 or ALGEBRA 1 A&B

TIME ALLOCATION: 36 WEEKS

TEXTS: Larson, Ron, Laurie Boswell, and Lee Stiff. *Geometry*. Evanston, IL: McDougal Littell, 2004. Print.

COURSE PHILOSOPHY (grades 7-12): Areas of prime importance in this course include nature of proof, parallel line properties, congruency concepts, similarity concepts, ratio and proportion, circle relationships, regular polygon properties and concepts, intuitive solid geometry concepts and a reinforcement of basic Algebra I skills. The course also presents the various types of reasoning and coordinate geometry concepts.

OVERARCHING ENDURING UNDERSTANDINGS (grade 7-12): The language of geometry is used in every day life. Triangle properties and relationships can be applied to real world situations. We can use the relationships between parallel and perpendicular lines to solve real life problems.

OVERARCHING ESSENTIAL QUESTIONS (grades 7-12): How can the language of geometry be used in every day life? How can geometric properties and relationships be applied to real world situations? How can a compass and a straight edge be used to construct accurate geometric figures?

TABLE OF CONTENTS (UNITS OF STUDY):

Unit 1: The Language of Geometry

Unit 2: Parallel and Perpendicular Lines

Unit 3: Congruent Triangles

Unit 4: Triangle Properties and Relationships

Unit 5: Polygons and Quadrilaterals

Unit 6: Transformations

Unit 7: Similarity

Unit 8: The Pythagorean Theorem and Special Right Triangles

Unit 9: Right Triangle Trigonometry

Unit 10: Properties of Circles

Unit 11: Area, Surface Area, and Volume

UNIT ONE: THE LANGUAGE OF GEOMETRY

UNIT SUMMARY:

As an overview:

1. The purpose for this unit is for students to build a foundation in geometry. Students will be able to apply the concepts of the key terms in the unit and throughout the course.
2. The unit follows a logical progression of topics. Students must first be able to identify key terms and concepts before they can be applied later on in the course.
3. Students should be able to apply the key terms in geometry. In addition, they will develop an understanding of angle and segment relationships.

21ST CENTURY THEMES:

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:

Students will be able to use the key terms in geometry to further understand measurement. This can be applied in art and physics.

STANDARDS

- 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.
- 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, 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, 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.*
- G-MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
- RST.9-10.1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

- RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.
- RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- 9.1.12.A.1 Apply critical thinking and problem-solving strategies during structured learning experiences.

UNIT ESSENTIAL QUESTIONS:

- What are the concepts of point, line, and plane?
- What are the definitions and uses for the key terms in the unit, and how can they be applied?
- How do we identify different angles and their measurements?

UNIT ENDURING UNDERSTANDINGS:

- The language of geometry can be used to accurately describe and analyze many objects in real life.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
	<ul style="list-style-type: none"> • Key Terms: point, line, plane, postulate, axiom, theorem, coordinate, congruent • Segments: collinear, coplanar, line segment, endpoints, ray, initial point, opposite rays, intersect, intersection, distance, length, between, midpoint, bisect, segment bisector, perpendicular • Angles: angle, vertex, interior, exterior, acute angle, right angle, obtuse angle, adjacent angles, straight angles, angle bisector, vertical angles, linear pair, complementary, supplementary <p>G-CO.1,9,12; G-MG.1</p>	<p>Students will be able to</p> <ul style="list-style-type: none"> • Draw, label, identify, and describe all key terms in the unit • Use the understanding of key terms in the unit to solve problems • Identify and classify angles • Measure angles with a protractor • Measure segments with a ruler • Apply algebra within geometry to solve problems • Prove theorems about lines and angles • Make formal constructions of key terms • Apply key terms to describe real life images <p>G-CO.1,9,12; G-MG.1</p>	<p>Formative and Summative Assessments: Quizzes, tests, projects, exit slips</p> <p>Sample Project: Word wall/vocabulary book</p> <p>G-CO.1,9,12; G-MG.1</p>

TEACHER RESOURCES

- Textbook
- Geometers Sketchpad
- Calculator
- SmartBoard
- Rulers, compasses, protractors, scissors, graph paper, paddy paper
- Various websites

WEBSITE (constructions):

www.mathopenref.com/tocs/constructions.html

TEACHER NOTES/REFLECTIONS

UNIT TWO: PARALLEL AND PERPENDICULAR LINES

UNIT SUMMARY:

As an overview:

1. The purpose for this unit is for students to be able to use the properties of parallel and perpendicular lines to solve real life problems. They will also be able to construct parallel and perpendicular lines using a compass and straightedge.
2. The unit follows a logical progression of topics. Students will be able to utilize their knowledge of angle relationships from Unit 1 and apply them to perpendicular and parallel lines.
3. Students need to understand the angle relationships created with parallel and perpendicular lines in order to be able to investigate topics later in the course (congruent triangles, polygons, etc.)

21ST CENTURY THEMES:

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:

Students will be able to apply their knowledge of perpendicular and parallel lines in physics and art, as well as developing an understanding of direction.

STANDARDS

- 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, 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, 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.*
- 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-MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
- RST.9-10.1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of

explanations or descriptions.

- RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- 9.1.12.A.1 Apply critical thinking and problem-solving strategies during structured learning experiences.

UNIT ESSENTIAL QUESTIONS:

- How do we determine the measures of angles formed by parallel lines and a transversal?
- How do we use angle measurements formed by two lines and a transversal to determine if the two lines are parallel?
- How can we construct parallel and perpendicular lines using a compass and straight edge?

UNIT ENDURING UNDERSTANDINGS:

- When two or more parallel lines are cut by a transversal, the angles formed have special properties. These properties can be used to solve real world problems.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
	<ul style="list-style-type: none"> • Key terms: Parallel lines, skew lines, parallel planes, transversal, alternate interior angles, alternate exterior angles, linear pair, corresponding angles, same-side interior angles (consecutive interior angles), same-side exterior angles, parallel postulate. <p style="text-align: center;">G-CO.9, 12, G-GPE.5, G-MG.1</p>	<p>Students will be able to</p> <ul style="list-style-type: none"> • Understand the concepts of the key terms in the unit • Construct parallel and perpendicular lines • Determine the measures of angle pairs formed by parallel lines and a transversal • Determine if two lines cut by a transversal are parallel. <p style="text-align: center;">G-CO.9, 12, G-GPE.5, G-MG.1</p>	<p>Formative and Summative Assessments: Quizzes, tests, projects, exit slips, board work, etc.</p> <p>Sample Project: “How to” book on parallel lines, parallel lines in real life poster</p> <p style="text-align: center;">G-CO.9, 12, G-GPE.5, G-MG.1</p>

TEACHER RESOURCES

- Textbook
- Geometers Sketchpad
- Calculator
- SmartBoard
- Rulers, compasses, protractors, scissors, graph paper, paddy paper
- Various websites

TEACHER NOTES/REFLECTIONS

UNIT THREE: CONGRUENT TRIANGLES

UNIT SUMMARY:

As an overview:

1. The purpose for this unit is for students to be able to use given sides and/or angles to determine congruency in triangle pairs.
2. The unit follows a logical progression of topics. Students will be able to utilize their knowledge of parallel lines and angle pair relationships to determine if angle pairs in two triangles are congruent. Students will apply their understanding of congruent parts to whole triangles.
3. The purpose of this unit is for students to be able to apply triangle congruence criteria (ASA, SAS, and SSS) to prove theorems about triangles, quadrilaterals, and other geometric figures.

21ST CENTURY THEMES:

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:

Students will be able to apply their knowledge of congruent triangles in physics (cables for bridges, etc.)

STANDARDS

- 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: Measure 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.
- G-MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
- RST.9-10.1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

- RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- 9.1.12.A.1 Apply critical thinking and problem-solving strategies during structured learning experiences.
- 9.1.12.B.1 Present resources and data in a format that effectively communicates the meaning of the data and its implications for solving problems, using multiple perspectives.

<p>UNIT ESSENTIAL QUESTIONS:</p> <ul style="list-style-type: none"> ▪ How do we determine the congruence of two triangles by using one of the five congruence techniques (SSS, SAS, ASA, AAS, HL)? ▪ How do we identify corresponding parts of congruent triangles? 	<p>UNIT ENDURING UNDERSTANDINGS:</p> <ul style="list-style-type: none"> ▪ Criteria for congruent triangles can be used to prove theorems about triangles, quadrilaterals, and other geometric figures.
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TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
	<ul style="list-style-type: none"> • Key terms: SSS postulate, SAS postulate, ASA postulate, AAS postulate, HL postulate, hypotenuse, corresponding parts of congruent triangles, two column proof, paragraph proof, flow chart proof. <p style="text-align: center;">G-CO.7,8,10, G-SRT.5, G- MG.1</p>	<p>Students will be able to</p> <ul style="list-style-type: none"> • Write a basic proof • Determine the congruence of two triangles using the definition as well as one of the five congruence techniques • Identify corresponding parts of congruent triangles. <p style="text-align: center;">G-CO.7,8,10, G-SRT.5, G- MG.1</p>	<p>Formative and Summative Assessments: Quizzes, tests, projects, exit slips, board work, etc.</p> <p style="text-align: center;">Sample Project: Proof packet</p> <p style="text-align: center;">G-CO.7,8,10, G-SRT.5, G- MG.1</p>

TEACHER RESOURCES

- Textbook
- Geometers Sketchpad
- Calculator
- SmartBoard
- Rulers, compasses, protractors, scissors, graph paper, paddy paper
- Various websites

TEACHER NOTES/REFLECTIONS

UNIT FOUR: TRIANGLE PROPERTIES AND RELATIONSHIPS

UNIT SUMMARY:

As an overview:

1. The purpose for this unit is for students to be able to apply triangle properties and relationships to real world situations.
2. The unit follows a logical progression of topics. Students can utilize their knowledge of proof and triangle congruence to further their understanding of the properties of triangles.
3. The purpose of this unit is for students to be able to use the properties of triangles to further their understanding of geometric figures. Such properties will be utilized in similar triangles, polygons, area, etc.

21ST CENTURY THEMES:

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:

Students will be able to use the properties of triangles for calculate the area of different geometric figures. In addition, the properties will allow students to determine distances. This can be used in physics as well as sports.

STANDARDS

- 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, 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.10 Prove theorems about triangles: *Theorems include: Measure 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.*
- RST.9-10.1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

<p>UNIT ESSENTIAL QUESTIONS:</p> <ul style="list-style-type: none"> ▪ How and when do we investigate, justify, and apply the isosceles triangle theorem? ▪ How and when do we investigate, justify, and apply theorems about the sum of the measures of the interior angles of a triangle? ▪ How and when do we investigate, justify, and apply theorems about geometric inequalities using the exterior angle theorem? ▪ How and when do we investigate, justify, and apply the triangle inequality theorem? ▪ What are the relationships between the sides of a triangle and its angles? ▪ What are the properties of the perpendicular bisectors, medians, altitudes, and angle bisectors of a triangle, and how can they be applied? 	<p>UNIT ENDURING UNDERSTANDINGS:</p> <ul style="list-style-type: none"> ▪ The properties of triangles will help students to develop an understanding of relationships within geometric figures.
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TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
	<ul style="list-style-type: none"> • Key Terms: Equilateral, isosceles, scalene, acute, obtuse, right triangles; legs, equiangular, adjacent sides, vertex of an isosceles triangle, base of an isosceles triangle, interior angle, exterior angle, base angles, corresponding, converse, isosceles triangle theorem, exterior angle theorem, triangle inequality theorem, perpendicular bisector, median, altitude, angle bisector, <p style="text-align: center;">G-CO.9, G-CO.10</p>	<p>Students will be able to</p> <ul style="list-style-type: none"> • Identify and classify triangles by their sides and angles. • Find the missing sides and angles of triangles with given properties. • Determine the longest side of a triangle given the three angles. • Determine the largest angle of a triangle given the three sides of a triangle. • Apply properties of altitude and midsegment <p style="text-align: center;">G-CO.9, G-CO.10</p>	<p>Formative and Summative Assessments: Quizzes, tests, projects, exit slips</p> <p>Sample Project: Triangular Book of Triangles, investigating triangles using Geometer’s Sketchpad</p> <p style="text-align: center;">G-CO.9, G-CO.10</p>

TEACHER RESOURCES

- Textbook
- Geometers Sketchpad
- Calculator
- SmartBoard
- Rulers, compasses, protractors, scissors, graph paper, paddy paper
- Various websites

TEACHER NOTES/REFLECTIONS

UNIT FIVE: POLYGONS AND QUADRILATERALS

UNIT SUMMARY:

As an overview:

1. The purpose for this unit is for students to be able to apply the properties of quadrilaterals in real world problems.
2. The unit follows a logical progression of topics. Students can apply what they have learned about proofs and triangles to discover the properties of quadrilaterals and polygons.
3. Students should be able to apply the properties of quadrilaterals (parallelogram, rectangle, rhombus, square, etc.) to solve real world applications.

21ST CENTURY THEMES:

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:

Students will be able to apply the properties of quadrilaterals in art and the sciences. Geometric shapes are also often utilized in the construction of buildings.

STANDARDS

- G-CP.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.*
- 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 $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point $(0,2)$.*
- G-MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
- RST.9-10.1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

- 9.1.12.A.1 Apply critical thinking and problem-solving strategies during structured learning experiences.

UNIT ESSENTIAL QUESTIONS:

- How and when do we investigate, justify, and apply theorems about the sum of the measures of the interior and exterior angles of polygons?
- How and when do we investigate, justify, and apply theorems about each interior and exterior angle measure of regular polygons?
- How and when do we investigate, justify, and apply theorems about parallelograms (including rectangle, rhombus, square), trapezoids, and kites?

UNIT ENDURING UNDERSTANDINGS:

- Each quadrilateral has its own set of specific properties. These properties can be used to solve real world problems.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
	<ul style="list-style-type: none"> Key Terms: Polygon, exterior angle, interior angle, regular, center, radius of a polygon, sides of a polygon, vertices, diagonal, convex, concave, triangle, quadrilateral, pentagon, hexagon, heptagon, octagon, nonagon, decagon, dodecagon, n-gon, parallelogram, rectangle, rhombus, square, trapezoid, isosceles trapezoid, kite, bases of a trapezoid, legs of a trapezoid, diagonals, medians, opposite angles, consecutive angles, hierarchy Formulas: sum of the interior angles of a polygon, measure of one exterior angle of a regular polygon, measure of one interior angle of a polygon, etc. 	<p>Students will be able to</p> <ul style="list-style-type: none"> Classify polygons. Find the sum of the interior angles of a polygon. Calculate the interior angle of a regular polygon. Calculate the exterior angle of a regular polygon. Explain why a polygon is convex or concave. Classify quadrilaterals based on given information. Use the properties of quadrilaterals to solve for missing measurements. Calculate the measure of a midsegment of a trapezoid. Prove theorems about quadrilaterals. <p>G-CP.11, G-GPE.4, G-MG.1</p>	<p>Formative and Summative Assessments: Quizzes, tests, projects, exit slips</p> <p>Sample Project: Quadrilateral Hierarchy</p> <p>G-CP.11, G-GPE.4, G-MG.1</p>

TEACHER RESOURCES	TEACHER NOTES/REFLECTIONS
<ul style="list-style-type: none">▪ Textbook▪ Geometers Sketchpad▪ Calculator▪ SmartBoard▪ Rulers, compasses, protractors, scissors, graph paper, paddy paper▪ Various websites	

UNIT SIX: TRANSFORMATIONS

UNIT SUMMARY:

As an overview:

1. The purpose for this unit is for students to be able to manipulate geometric figures.
2. The unit follows a logical progression of topics. Students can now apply what they have learned about triangles, congruence, and polygons in the plane utilizing rotations, reflections, translations, and glide reflections.
3. The concepts of congruence, similarity, and symmetry can be understood through the perspective of geometric transformation.

21ST CENTURY THEMES:

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:

- Art

STANDARDS

- 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).
- 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.
- 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.

- RST.9-10.1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- 9.1.12.A.1 Apply critical thinking and problem-solving strategies during structured learning experiences.
- 9.1.12.B.1 Present resources and data in a format that effectively communicates the meaning of the data and its implications for solving problems, using multiple perspectives.

UNIT ESSENTIAL QUESTIONS:

- How do we define, investigate, justify and apply isometries in the plane (rotations, reflections, translations, glide reflections)?
- How and when do we investigate, justify and apply the properties that remain invariant under translations, rotations, reflections, and glide reflections?

UNIT ENDURING UNDERSTANDINGS:

- Students can experiment with transformations in the plane to understand congruence in terms of rigid motions, prove geometric theorems, and make geometric constructions.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
	<ul style="list-style-type: none"> ● Key Terms: image, pre-image, transformation, isometry, reflection, line of reflection, reflection theorem, line of symmetry, rotation, center of rotation, angle of rotation, rotation theorem, rotational symmetry, translation, glide reflection, frieze pattern, border pattern, composition, rigid motion. <p style="text-align: center;">G-CO.2-8</p>	<p>Students will be able to</p> <ul style="list-style-type: none"> ● Understand the connection between transformations and geometric figures. ● Define, investigate, justify, and apply isometries in the plane (rotations, reflections, translations, glide reflections). <p style="text-align: center;">G-CO.2-8</p>	<p>Formative and Summative Assessments: Quizzes, tests, projects, exit slips</p> <p>Sample Project: Teach a lesson on transformations; Geometer’s Sketchpad discovery activity</p>

TEACHER RESOURCES

- Textbook
- Geometers Sketchpad
- Calculator
- SmartBoard
- Rulers, compasses, protractors, scissors, graph paper, paddy paper
- Various websites

TEACHER NOTES/REFLECTIONS

UNIT SEVEN: SIMILARITY

UNIT SUMMARY:

As an overview:

1. The purpose for this unit is for students to be able to apply the properties of proportionality to geometric figures.
2. The unit follows a logical progression of topics. Students will now be able to compare geometric figures that are proportional.
3. Proportional relationships can be identified in many geometric figures.

21ST CENTURY THEMES:

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:

- Similarity is seen in art: scale drawings.
- Similarity is also seen in computer design – models, etc.

STANDARDS

- G-SRT.1 Verify experimentally the properties of dilations given a center and a scale factor:
 - a) A dilation takes a line not passing through the center of a dilation to a parallel line, and leaves a line passing through the center unchanged.
 - b) The dilation of a line segment is no 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.
- G-SRT.3 Use the properties of similarity transformations to establish 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.
- G-C.1 Prove that all circles are similar.
- G-GPE.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
- G-MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
- G-MG.3 Apply geometric methods to solve design problems (e.g. designing an object or structure to satisfy physical constraints or

- minimize cost; working with typographic grid systems based on ratios).
- RST.9-10.1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
 - RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
 - RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
 - 9.1.12.A.1 Apply critical thinking and problem-solving strategies during structured learning experiences.

<p>UNIT ESSENTIAL QUESTIONS:</p> <ul style="list-style-type: none"> ▪ When do we establish similarity of triangles, using the following theorems: AA, SAS, and SSS? ▪ How and when do we investigate, justify, and apply theorems about similar triangles? ▪ How and when do we investigate, justify, and apply theorems about proportional relationships within a triangle? ▪ How and when do we investigate, justify, and apply theorems about proportional relationships within a right triangle that are created by the altitude to the hypotenuse? 	<p>UNIT ENDURING UNDERSTANDINGS:</p> <ul style="list-style-type: none"> ▪ Similarity is applied to polygons that are the same shape but different sizes. ▪ Proportional relationships can be identified in many geometric figures.
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TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
	<ul style="list-style-type: none"> • Key Terms: Similarity, SSS similarity theorem, AA similarity theorem, SAS similarity theorem, proportional segments, corresponding angles, ratio, proportion, extremes, means, geometric mean, similar polygons, scale factor, cross product, extended ratio, triangle proportionality theorem, converse of the triangle proportionality theorem 	<p>Students will be able to</p> <ul style="list-style-type: none"> • Simplify ratios • Solve proportions • Identify similar polygons • Find missing sides of similar polygons • Prove that two triangles are similar • Solve problems by using the proportionality theorems • Solve problems using the midsegment theorem 	<p>Formative and Summative Assessments: Quizzes, tests, projects, exit slips</p> <p>Sample Project: Model drawing of a room in your house.</p> <p>G-SRT.1-6; G-C.1; G-GPE.6; G-MG.1,3</p>

	<p>G-SRT.1-6; G-C.1; G-GPE.6; G-MG.1,3</p>	<ul style="list-style-type: none"> • Use the definition of similarity in terms of transformations to identify if two figures are similar. G-SRT.1-6; G-C.1; G-GPE.6; G-MG.1,3 	
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<p>TEACHER RESOURCES</p> <ul style="list-style-type: none"> ▪ Textbook ▪ Geometers Sketchpad ▪ Calculator ▪ SmartBoard ▪ Rulers, compasses, protractors, scissors, graph paper, paddy paper ▪ Various websites 	<p>TEACHER NOTES/REFLECTIONS</p>

UNIT EIGHT: THE PYTHAGOREAN THEOREM AND SPECIAL RIGHT TRIANGLES

UNIT SUMMARY:

As an overview:

1. The purpose for this unit is for students to be able to prove and apply the properties of right triangles.
2. The unit follows a logical progression of topics. Students will now have another method for calculating the sides of right triangles.
3. Students must first develop an understanding of the Pythagorean Theorem before they can apply right triangle trigonometry.

21ST CENTURY THEMES:

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:

Students will be able to use the Pythagorean theorem in physics, using right triangles to understand direction, velocity, etc.

STANDARDS

- 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-MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
- RST.9-10.1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- 9.1.12.A.1 Apply critical thinking and problem-solving strategies during structured learning experiences.

UNIT ESSENTIAL QUESTIONS:

UNIT ENDURING UNDERSTANDINGS:

<ul style="list-style-type: none"> ▪ How and when do we investigate, justify, and apply the Pythagorean Theorem and its converse? ▪ How and when do we investigate, justify, and apply relationships in special right triangles? 	<ul style="list-style-type: none"> ▪ The relationship between the legs and the hypotenuse of a right triangle is used in every day life. ▪ The ratios of the sides in a special right triangle are used in every day life.
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TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
	<ul style="list-style-type: none"> • Key Terms: Pythagorean theorem, converse of the Pythagorean theorem, right triangle, legs of a right triangle, hypotenuse, Pythagorean triples, special right triangles, radical 	<p>Students will be able to</p> <ul style="list-style-type: none"> • Apply the Pythagorean theorem to find a missing side of a right triangle. • Recognize Pythagorean triples. • Use the Pythagorean theorem to solve word problems. <p>** Special Right Triangles for SAT</p>	<p>Formative and Summative Assessments: Quizzes, tests, projects, exit slips</p> <p>Sample Project: Word problems packet.</p> <p>G-SRT.4, G-MG.1</p>

	G-SRT.4, G-MG.1	G-SRT.4, G-MG.1	
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TEACHER RESOURCES	TEACHER NOTES/REFLECTIONS
<ul style="list-style-type: none">▪ Textbook▪ Geometers Sketchpad▪ Calculator▪ SmartBoard▪ Rulers, compasses, protractors, scissors, graph paper, paddy paper▪ Various websites	

UNIT NINE: RIGHT TRIANGLE TRIGONOMETRY

UNIT SUMMARY:

As an overview:

1. The purpose for this unit is for students to be able to use the relationships between the sides and angles of a right triangle to determine missing measurements.
2. The unit follows a logical progression of topics. Students are able to determine the missing measures of sides and angles in special right triangles. Now, they will be able to utilize right triangle trigonometry to calculate missing measures in any right triangle.
3. Students will be able to apply right triangle trigonometry to solve real world problems, such as distance across a river or height of a building.

21ST CENTURY THEMES:

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:

- Art: Students can use right triangle trigonometry to ensure that their artwork is to scale.
- Engineering: Students will be able to use right triangle trig to calculate great distances and heights.

STANDARDS

- 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-MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
- G-MG.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
- RST.9-10.1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

- 9.1.12.A.1 Apply critical thinking and problem-solving strategies during structured learning experiences.

UNIT ESSENTIAL QUESTIONS:

- How do we evaluate the sine, cosine, and tangent of a given angle?
- How do we use trigonometric ratios to solve right triangle word problems?

UNIT ENDURING UNDERSTANDINGS:

- The relationships between the angles and sides of a right triangle can be used to determine missing measurements within the triangle.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
	<ul style="list-style-type: none"> • Key Terms: right triangle, trigonometric ratio, sine, cosine, tangent, angle of elevation, angle of depression, solve a right triangle <p style="text-align: center;">G-SRT.6,7,8; G-MG.1,2</p>	<p>Students will be able to</p> <ul style="list-style-type: none"> • Evaluate the sine, cosine, and tangent of a given angle. • Apply SOH CAH TOA to solve a triangle. • Use trigonometric ratios to solve right triangle word problems. <p style="text-align: center;">G-SRT.6,7,8; G-MG.1,2</p>	<p>Formative and Summative Assessments: Quizzes, tests, projects, exit slips</p> <p>Sample Project: Real life applications through word problems.</p> <p style="text-align: center;">G-SRT.6,7,8; G-MG.1,2</p>

TEACHER RESOURCES

- Textbook
- Geometers Sketchpad
- Calculator
- SmartBoard
- Rulers, compasses, protractors, scissors, graph paper, paddy paper
- Various websites

TEACHER NOTES/REFLECTIONS

UNIT TEN: PROPERTIES OF CIRCLES	

UNIT SUMMARY:

As an overview:

1. The purpose for this unit is for students to be able to understand and apply properties of circles.
2. The unit follows a logical progression of topics. Students can now use the properties of triangles and polygons to apply the properties of circles.
3. Students should be able to apply the properties of circles, particularly area, in real life situations.

21ST CENTURY THEMES:

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:**STANDARDS**

- G-CO.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
- G-C.1 Prove that all circles are similar.
- G-C.2 Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationships 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.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-MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
- RST.9-10.1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

- RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- 9.1.12.A.1 Apply critical thinking and problem-solving strategies during structured learning experiences.

UNIT ESSENTIAL QUESTIONS:

- How can we apply the theorems regarding segments, chords, tangents, and secants within a circle?
- How can we utilize angle-arc relationships within a circle?
- How do we calculate the length of an arc?

UNIT ENDURING UNDERSTANDINGS:

- Properties of segments and lines inside, outside, and on a circle can be used to determine missing measurements within the circle.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
	<ul style="list-style-type: none"> • Key Terms: circle, center, arc, major arc, minor arc, radius, chord, diameter, tangent, secant, point of tangency, central angle, inscribed angle, inscribed polygon, tangent circles, concentric circles, interior of a circle, exterior of a circle, semicircle, congruent arcs, intercepted arc, external segment, arc addition postulate 	<p>Students will be able to</p> <ul style="list-style-type: none"> • Describe a circle and its related terms. • Recognize inscribed and circumscribed figures. • Prove theorems about circles (all circles similar, etc.) • Define and apply properties of segments within circles. • Define and apply angle-arc relationships within circles. 	<p>Formative and Summative Assessments: Quizzes, tests, projects, exit slips</p> <p>Sample Project: Circle word wall.</p>

	G-CO.13, G-C.1,2,3,5; G-MG.1	G-CO.13, G-C.1,2,3,5; G-MG.1	G-CO.13, G-C.1,2,3,5; G-MG.1
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TEACHER RESOURCES	TEACHER NOTES/REFLECTIONS
<ul style="list-style-type: none"> ▪ Textbook ▪ Geometers Sketchpad ▪ Calculator ▪ SmartBoard ▪ Rulers, compasses, protractors, scissors, graph paper, paddy paper ▪ Various websites 	

UNIT ELEVEN: AREA, SURFACE AREA, AND VOLUME	

UNIT SUMMARY:

As an overview:

1. The purpose for this unit is for students to apply properties of geometry and geometric figures to calculate area, perimeter, surface area, and volume.
2. The unit follows a logical progression of topics. Students now have the foundation in geometry to calculate area, perimeter, surface area, and volume of various 2-D and 3-D figures.
3. Students can now apply their knowledge of geometry in a real world setting.

21ST CENTURY THEMES:

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy

PRIMARY INTERDISCIPLINARY CONNECTIONS:

Physics and Art: Calculating dimensions of a figure or space.
Business: Using area to determine cost for paint, carpeting, wood, etc.

STANDARDS

- 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-GPE.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.
- G-GPE.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.*
- G-GPE.4 Identify the shapes for 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 (e.g., modeling a tree trunk or a human torso as a cylinder).
- G-MG.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
- 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.*

- G-GMD.3 Use formulas for cylinders, pyramids, cones, and spheres to solve problems.
- G-MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
- G-MG.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
- RST.9-10.1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- 9.1.12.A.1 Apply critical thinking and problem-solving strategies during structured learning experiences.
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UNIT ESSENTIAL QUESTIONS:

- How and when do we investigate and apply theorems and formulas for area, surface area, and volume of geometric figures?
- How can we use area, surface area, and volume to solve word problems?
- How can we calculate the area of a shaded region?

UNIT ENDURING UNDERSTANDINGS:

- The dimensions of geometric figures can be utilized to determine the area, surface area, and volume. Similarly, the area, surface area, and volume of a figure can be used to determine dimensions of the figure.

TIME ALLOTMENT	CONTENT	SKILLS	ASSESSMENT
	<ul style="list-style-type: none"> • Key Terms: area, surface area, perimeter, volume, apothem, central angle 	<p>Students will be able to</p> <ul style="list-style-type: none"> • Understand and apply the formulas for area, surface area, and volume of various geometric figures. • Apply the formulas for area, surface area, and volume to solve word problems. • Calculate the area of a shaded region. 	<p>Formative and Summative Assessments: Quizzes, tests, projects, exit slips</p> <p>Sample Project: Find the volume and surface area of your favorite foods.</p>

	G-C.5, G-GPE.1,4,7; G-MG.1,2; G-GMD.1	G-C.5, G-GPE.1,4,7; G-MG.1,2; G-GMD.1	G-C.5, G-GPE.1,4,7; G-MG.1,2; G-GMD.1
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TEACHER RESOURCES	TEACHER NOTES/REFLECTIONS
<ul style="list-style-type: none"> ▪ Textbook ▪ Geometers Sketchpad ▪ Calculator ▪ SmartBoard ▪ Rulers, compasses, protractors, scissors, graph paper, paddy paper ▪ Various websites 	