Summit Public Schools
Summit, New Jersey
Grade Level 9-10 / Content Area: Mathematics
Length of Course: Full Academic Year
Curriculum: Geometry 2

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Submitted January 2012

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Submitted August 2017

Curriculum

Course Description:

This geometry course is based on Euclidean geometry and includes congruence, similarity, parallelism, perpendicularity, area, and volume. Coordinates and transformations in both two and three dimensions are integrated throughout the course. There is a main sequence of proved theorems, with many "originals" for the student to prove. Students are expected to use scientific calculators, and will use additional technology at appropriate times.

Unit 1 – Discovering Points, Lines, Planes, and Angles

Standard G-CO: Congruence Students should be able to define congruence from the perspective of geometric transformation.	
Big Ideas: *Course Objectives / Content Statement(s)* • Experiment with transformations in the plane • Make Geometric Constructions • Prove geometric theorems	
Essential Questions *What provocative questions will foster inquiry, understanding, and transfer of learning?*	**Enduring Understandings** *What will students understand about the big ideas?*
	Students will understand that…
What are the defining characteristics of basic geometric figures?	The terms point, line, and plane are used to define other geometric terms such as angles, segments, and rays.
How are two-column proofs used in justifying properties or theorems?	The first column in a two-column proof lists consecutive statements that lead to a conclusion. The second column provides justification for each statement.
What algebraic formulas can be used to solve problems about geometric figures?	The coordinate plane provides a logical transition from algebra to geometry. The distance formula, midpoint formula, and Pythagorean Theorem can be used to solve problems involving figures on a coordinate plane.

How can we best represent and verify geometric/algebraic relationships?	Geometric properties can be used to construct geometric figures.
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	**Examples, Outcomes, Assessments**
Students will: 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. G-CO-12: Make formal geometric constructions with a variety of tools and methods.	Instructional Focus: 1. Identify and model points, lines, and planes. 2. Solve problems by using formulas. 3. Complete proofs involving segment theorems. 4. Identify angles and classify angles. 5. Determine what information can and cannot be assumed from a diagram. 6. Complete geometric constructions and explain why they work Sample Assessments: EX: Draw and label a figure that satisfies all of the following conditions. Point *C* and line *m* lie in *Q*. Line *m* intersects line *n* at *T*. Line *m* and *C* are coplanar but *m*, *n*, and *C* are not. EX: Find the distance from (1, 2) to (6, 14) using the Pythagorean Theorem. EX: Given M is the midpoint of $\overline{AB}$, prove that $\overline{AM} \cong \overline{MB}$. EX: Use a compass and a straightedge to construct a segment congruent to another segment. 1. Draw a segment XY. 2. Elsewhere on your paper, draw a line and a point on the line. Label the point P. 3. Place a compass at point X and adjust the setting so that the pencil is at point Y. . 4. Using that setting, place the compass and point P and draw an arc that intersects the line. Label the point of intersection Q. **Conclusion:** Since the compass setting used to construct $\overline{PQ}$ is the same as the distance

from X to Y, PQ = XY. Thus, $\overline{PQ} \cong \overline{XY}$.

EX: Construct an angle congruent to a given angle.

1. Draw < P
2. Use a straight edge to draw a ray on your paper. Label its endpoint T.
3. Place the tip of the compass at point P and draw a large arc that intersects both sides of <P. Label the points of intersection Q and R.
4. Using the same compass setting, put the compass at point T and draw a large arc that starts above the ray and intersects the ray. Label the point of intersection S.
5. Place the point of your compass on R and adjust so that the pencil tip is on Q.
6. Without changing the setting, place the compass at point S and draw an arc to intersect the larger arc you drew in Step 4. Label the point of intersection U.
7. Use a straightedge to draw $\overline{TU}$.

Conclusion: m<QPR = m<UTS by construction. Thus, <QPR $\cong < UTS$ by definition of congruent angles.

EX: Construct a line perpendicular *n* and passing through point C on *n*.

1. Place the compass at point C. Using the same compass setting, draw arcs to the right and left of C, intersecting line *n*. Label the points of intersection A and B.
2. Open the compass to a setting greater than AC. Put the compass at point A and draw an arc above line *n*.
3. Using the same compass setting as in Step 2, place the compass at point B and draw an arc intersecting the arc previously drawn. Label the point of intersection D.
4. Use a straightedge to draw $\overleftrightarrow{CD}$.

Conclusion: By construction, $\overleftrightarrow{CD}$ is perpendicular to *n* at C.

	Instructional Strategies: Interdisciplinary Connections The students use a paragraph proof instead of a two-column proof as a writing exercise. 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 Technology Integration Students use the website below to create all constructions. http://www.mathsisfun.com/geometry/constructions.html Students use the website below to create all constructions. http://mathopenref.com/tocs/constructionstoc.html The students use the Geometer's Sketchpad to find the lengths and midpoints of segments, and to draw and measure angle bisectors. The students research the Internet to explore artwork that shows points, lines, and planes. Media Literacy Integration The students will examine the use of various forms of Geometry throughout architecture. Anticipated questions include – why was a particular form used? Was the decision structurally relevant? Culturally relevant? Students will examine and compare structures throughout the world considering both historic and modern constructions.

	Global Perspectives The students will compare the architectural structures of significant buildings throughout the world. Are the chosen structures significant to that particular culture? Sample topics include Chinese/Asian architecture as compared to Greek or Roman architecture. Other samples include a comparison of cathedral architecture throughout history. The students research the work of Wassily Kandinsky, a Russian painter and art theorist. He analyzed the geometrical elements that make up every painting- the point and the line.

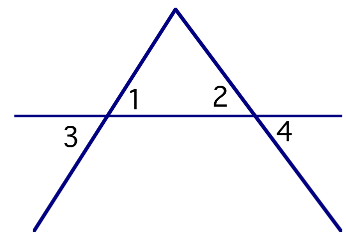
Unit 2 – Connecting Reasoning and Proof

Standard G-CO: Congruence	
Students should be able to prove theorems about triangles, quadrilaterals, and other geometric figures.	
Big Ideas: *Course Objectives / Content Statement(s)* • Prove geometric theorems about lines and angles.	
Essential Questions *What provocative questions will foster inquiry, understanding, and transfer of learning?*	**Enduring Understandings** *What will students understand about the big ideas?*
How is logic used to prove or explain mathematical statements?	Students will understand that… Most statements can be written conditionally, i.e. "if *p*, then *q*". The negation, converse, inverse, and contrapositive are formed using varied forms and orders of *p* and *q*. Once a statement is written conditionally, it can be structured in a two-column proof.

How can angles or pairs of angles be defined?	Angles are classified by their measure: acute for angles measuring less than 90 degrees, obtuse for angles measuring more than 90 degrees, right if an angle measures exactly 90 degrees, and straight for angles that measure exactly 180 degrees. A pair of angles whose measures add to 90 degrees are called complementary; supplementary if the measures add to 180 degrees. Two congruent angles are angles with the same measure. Perpendicular lines form four right angles. Vertical angles are formed by two intersecting lines; vertical angles have a common vertex yet do not share sides. Vertical angles are congruent.

Areas of Focus: Proficiencies (Cumulative Progress Indicators)	**Examples, Outcomes, Assessments**
Students will:	Instructional Focus: 1. Make conjectures. 2. Use the laws of logic to make conclusions. 3. Write algebraic proofs. 4. Write proofs involving segment and angle theorems. Sample Assessments: EX: Write the converse, inverse, and contrapositive of the following statement. *If three points are collinear, then they lie on a straight line.* EX: Prove that if $ST = UV$ then $SU = TV$. 
G-CO-9: Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.	

	EX: Given: $\angle 1 \cong \angle 2$, Prove: $\angle 3 \cong \angle 4$



Instructional Strategies:

Interdisciplinary Connections

The students use a paragraph proof instead of a two-column proof as a writing exercise.

Technology Integration

The students use the Geometer's Sketchpad to draw and measure angles that model the relationships they learn in this unit.

The students use their drawings from the Geometer's Sketchpad to create a PowerPoint presentation reviewing angle classifications and relationships.

Media Literacy Integration

Students will examine the use of Geometric figures in advertising. Questions to be considered include – Is there significance in the figure chosen, either symbolically or figuratively? Was the selection of a particular figure intended to influence the consumer? In what ways might it influence the consumer?

Unit 3 – Using Perpendicular and Parallel Lines

Standard G-CO: Congruence **Standard G-GPE: Expressing Geometric Properties with Equations** Students should be able to apply and prove theorems about parallel lines. Students should be able to apply and prove the slope criteria for parallel and perpendicular lines.	
Big Ideas: *Course Objectives / Content Statement(s)* Prove geometric theorems. Use coordinates to prove simple geometric theorems algebraically.	
Essential Questions *What provocative questions will foster inquiry, understanding, and transfer of learning?*	**Enduring Understandings** *What will students understand about the big ideas?*
Explain the slope criteria for parallel and perpendicular lines. How can two lines be proved parallel?	Students will understand that… Parallel lines have equal slopes. Slopes of perpendicular lines are opposite reciprocals. Two lines are parallel if any of the following are true: 1. Alternate interior angles are congruent. 2. Alternate exterior angles are congruent. 3. Corresponding angles are congruent. 4. Consecutive interior angles are supplementary. 5. Consecutive exterior angles are supplementary. 6. If two lines in the same plane are perpendicular to the same line, then the lines are parallel.
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	**Examples, Outcomes, Assessments**
Students will: 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	Instructional Focus: 1. Name angles formed by a pair of lines and a transversal. 2. Find the measures of angles formed by two parallel lines and a transversal. 3. Use slope to identify parallel and perpendicular lines.

<table>
<tr><td>line, and distance around a circular arc.</td><td rowspan="4">

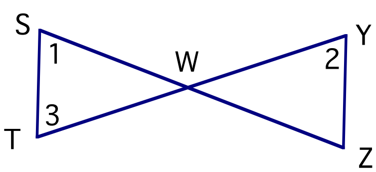
4. Prove two lines are parallel based on given angle relationships.
5. Recognize and use distance relationships among points, lines, and planes.
6. Find the distance between a point and a line.

Sample Assessments:

EX: Find the slopes of the lines parallel and perpendicular to the line through the points (7, -2) and (1, -3).

EX: Name all the ways to show two lines are parallel.

EX: Given: $\angle 2 \cong \angle 1$, $\angle 1 \cong \angle 3$
Prove: $\overline{ST} \parallel \overline{YZ}$



EX: Find the distance from the point (2, 6) to the line $2x - y = 3$.

Instructional Strategies:

Interdisciplinary Connections

The students research road maps of cities that are “grids” to use as examples of parallel and perpendicular lines in a real-life application.

Technology Integration

The students use a graphing calculator to draw parallel and perpendicular lines.

The students visit the following website as a preview to angle relationships:
http://www.mathwarehouse.com/geometry/angle/parallel-lines-cut-transversal.php#
The teacher will prepare a worksheet for the students to fill in as they explore the site.

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<tr><td>G-CO-9: Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment’s endpoints.</td></tr>
<tr><td>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).</td></tr>
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Unit 4 – Identifying Congruent Triangles

<table>
<tr><th colspan="2">Standard G-CO: Congruence

Students should be able to define congruence from the perspective of geometric transformation.

Students should be able to prove triangles are congruent.</th></tr>
<tr><td colspan="2">Big Ideas: Course Objectives / Content Statement(s)

• Understand Congruence in terms of rigid motions

• Prove geometric theorems about triangles</td></tr>
<tr><th>Essential Questions
What provocative questions will foster inquiry, understanding, and transfer of learning?</th><th>Enduring Understandings
What will students understand about the big ideas?</th></tr>
<tr><td>

What are congruent figures?

How can two triangles be proved congruent?

If two triangles are congruent, how can additional congruency statements be developed?</td><td>Students will understand that…

Congruent figures are figures that have exactly the same size and shape. All pairs of corresponding parts are congruent.

There are three postulates (ASA, SAS, and SSS) and one theorem (AAS) that can be used to prove triangles congruent.

The CPCTC principle states corresponding parts of congruent triangles are congruent.</td></tr>
<tr><th>Areas of Focus: Proficiencies
(Cumulative Progress Indicators)</th><th>Examples, Outcomes, Assessments</th></tr>
<tr><td>Students will:</td><td rowspan="2">Instructional Focus:

1. Decide if two figures are congruent.
2. Given two congruent figures, solve for unknown measures.
3. Prove two triangles are congruent using</td></tr>
<tr><td>G-CO-6: Use the definition of congruence in terms of rigid motions to decide if they are congruent.</td></tr>
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<td>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.</td>
<td>postulates SAS, SSS, and ASA and theorem AAS.
4. Prove additional congruencies using CPCTC.</td>
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<td>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.</td>
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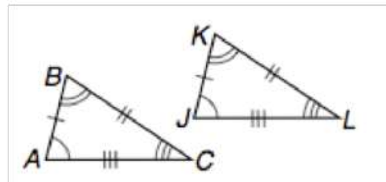
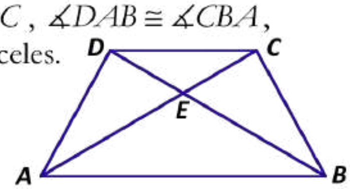
Sample Assessments:

EX: Decide if the figures are congruent. If so, write a congruency statement.



EX: Given $\Delta NEW \cong \Delta CAR$, $EN = 11$, $AR = 2x - 4y$, $NW = x + y$, $CA = 4x + y$, $EW = 10$. Find CR.

EX: Given $\overline{AD} \cong \overline{BC}$, $\measuredangle DAB \cong \measuredangle CBA$, prove ΔABE is isosceles.



Instructional Strategies:

Interdisciplinary Connections

Congruent triangles are used in engineering.

Technology Integration

The students use the Geometer's Sketchpad to create congruent triangles

Global Perspectives

Following an examination of the flag of the United States of America, students will select the flag of a particular nation. The student will

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<td>G-CO-10: Prove theorems about triangles.</td>
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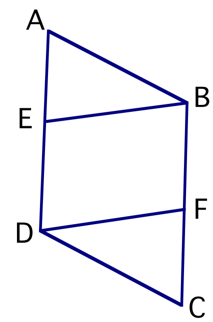
	discuss the geometric applications used within the flag and discuss the cultural significance of those choices. Questions to consider – does the flag convey a particular meaning or emotion of that nation? Are the figures chosen symbolically or historically significant to that nation? Are the color choices significant?

Unit 5 – Exploring Quadrilaterals

Standard G-CO: Congruence	
Students should be able to formally prove statements involving quadrilaterals.	
Big Ideas: *Course Objectives / Content Statement(s)* Students will prove geometric theorems and statements involving quadrilaterals.	
Essential Questions *What provocative questions will foster inquiry, understanding, and transfer of learning?*	**Enduring Understandings** *What will students understand about the big ideas?*
	Students will understand that…
What is the definition of a parallelogram?	A parallelogram is a quadrilateral with both pairs of opposite sides parallel.
What are the properties of a parallelogram?	Opposite sides and angles of a parallelogram are congruent. Consecutive angles of a parallelogram are supplementary. The diagonals of a parallelogram bisect each other.
What are the special quadrilaterals and how are they defined?	The special quadrilaterals are parallelograms, rectangles, squares, rhombi, kites, trapezoids, and isosceles trapezoids. They are defined by the properties of their sides, angles, and sometimes diagonals.
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	**Examples, Outcomes, Assessments**
Students will:	Instructional Focus: 1. Prove that a quadrilateral is a parallelogram. 2. Prove that a quadrilateral is a rectangle, square, or rhombus. 3. Recognize and apply the properties of trapezoids.
G-CO-11: Prove theorems about parallelograms.	

Sample Assessments:

EX: Given: *ABCD* is a parallelogram and $\overline{AE} \cong \overline{CF}$. Prove: Quadrilateral *EBFD* is a parallelogram.



EX: Determine whether quadrilateral *KLMN* is a parallelogram, rectangle, rhombus, or square if K(4, 8), L(0, 9), M(-2, 1), and N(2, 0).

EX: *STUV* is a trapezoid with bases $\overline{ST}$ and $\overline{UV}$. What is the measure of the median of *STUV* if *ST*=23 and *UV*=19?

Instructional Strategies:

Interdisciplinary Connections

The students use a paragraph proof instead of a two-column proof as a writing exercise.

Technology Integration

The students use the Geometer's Sketchpad to construct a parallelogram, and then use the measurement features to discover its properties.

The students create different diagrams illustrating the properties of special quadrilaterals.

Unit 6 – Connecting Proportion and Similarity

Standard G-SRT Similarity, Right Triangles, and Trigonometry Students should be able to recognize that similarity transformations define similarity between two or more figures. Students should also understand that the criterion for triangle similarity includes having two pairs of congruent, corresponding angles.	
Big Ideas: *Course Objectives / Content Statement(s)* Students will understand similarity in terms of similarity transformations. Students will prove pairs of triangles similar. Students will prove theorems and other true statements involving similarity.	
Essential Questions *What provocative questions will foster inquiry, understanding, and transfer of learning?*	**Enduring Understandings** *What will students understand about the big ideas?*
	Students will understand that…
What are similar figures?	Similar figures are figures that have the same shape but not necessarily the same size.
How can two polygons be proved similar?	Similar polygons are polygons in which the ratios of the measures of corresponding sides are equal and corresponding angles are congruent. For triangles, it is common to use the following theorems: AA~, SSS~, and SAS~.
If two triangles are similar, how can additional statements (similarity, congruency, and equality) be developed?	The following theorems can be used if two triangles are similar: 1. The ratio of the perimeters of two similar polygons equals the ratio of any pair of corresponding sides. 2. If a line is parallel to one side of a triangle and intersects the other two sides, it divides those two sides proportionally.
What special segments of similar triangles are proportional to the corresponding sides?	Special segments that are proportional include the altitudes, angle bisectors, and medians. An angle bisector in a triangle separates the opposite side into segments that have the same ratio as the other two sides.

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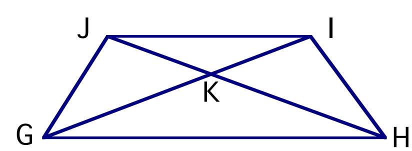
<tr><th>Areas of Focus: Proficiencies
(Cumulative Progress Indicators)</th><th>Examples, Outcomes, Assessments</th></tr>
<tr><td>Students will:</td><td rowspan="6">Instructional Focus:

1. Recognize and use ratios and proportions.
2. Identify similar figures.
3. Solve problems involving similar figures.
4. Identify similar triangles.
5. Use similar triangles to solve problems.
6. Use proportional parts of triangles to solve problems.
7. Recognize and use the proportional relationships of corresponding perimeters, altitudes, angle bisectors, and medians of similar triangles.

Sample Assessments:

EX: Solve the proportion: $\frac{k+3}{4} = \frac{5k-2}{9}$

EX: Given: Quadrilateral $GHIJ$ with $\angle JIG \cong \angle IGH$. Prove: $GK \cdot JK = IK \cdot HK$.
</td></tr>
<tr><td>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</td></tr>
<tr><td>G-SRT-3: Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.</td></tr>
<tr><td>G-SRT-4: Prove theorems about triangles.</td></tr>
<tr><td>G-SRT-5: Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.</td></tr>
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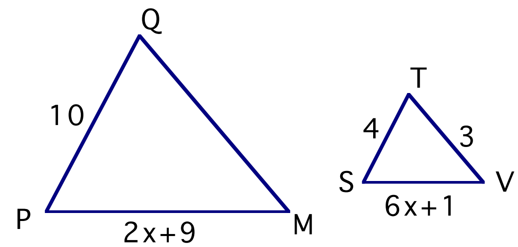
EX: If $\Delta STV \sim \Delta PQM$, find the perimeter of ΔPQM.



Instructional Strategies:

Interdisciplinary Connections

The students create models of real-life objects. They should include a summary of the ratio of parts on the original to the model.

Technology Integration

The students use the dilations feature on the Geometer's Sketchpad to create dynamic sketches. They use the measurement tools to demonstrate the proportionality of similar figures.

The students research the Sierpinski Triangle, and write a short report explaining how it relates to similar figures.

Global Perspectives

The students can read the article, "Proportionality in Similar Triangles: A Cross-Cultural Comparison," which compares the Greek and Chinese approach to similarity. They can write a journal entry to reflect on the article.

http://mathdl.maa.org/mathDL/46/?pa=content&sa=viewDocument&nodeId=1618

Unit 7 – Applying Right Triangles and Trigonometry

Standard G-SRT: Similarity, Right Triangles, and Trigonometry Students should be able to discover and use properties of right triangles, including basic right triangle trigonometry.	
Big Ideas: *Course Objectives / Content Statement(s)* Students will understand and apply the Pythagorean Theorem. Students will apply special right triangle rules to solve problems. Students will define trigonometric ratios and solve problems involving right triangles. Students will apply trigonometry to general triangles.	
Essential Questions *What provocative questions will foster inquiry, understanding, and transfer of learning?*	**Enduring Understandings** *What will students understand about the big ideas?*
	Students will understand that…
How is the Pythagorean Theorem used?	In a right triangle, the sum of the squares of the leg is equal to the square of the hypotenuse. This equation can be used to solve for missing side lengths of a right triangle.
How are special right triangles used to solve problems?	If the acute angles of a right triangle measure 30 degrees and 60 degrees, the sides have ratio $1:\sqrt{3}:2$. If the acute angles of a right triangle measure 45 degrees, the sides have ratio $1:1:\sqrt{2}$. Missing side lengths can be found using proportions with these ratios.
How can basic right triangle trigonometry be used to solve problems?	The sine ratio is defined as the measure of the side opposite the reference angle to the measure of the hypotenuse. The cosine ratio is defined as the measure of the side adjacent to the reference angle to the measure of the hypotenuse. The tangent ratio is defined as the measure of the opposite side to the measure of the adjacent side. To solve problems, students can use proportions and inverse trigonometric functions.

Areas of Focus: Proficiencies (Cumulative Progress Indicators)	Examples, Outcomes, Assessments

Areas of Focus: Proficiencies (Cumulative Progress Indicators)

Students will:

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-8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

G-SRT-11: Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles.

Examples, Outcomes, Assessments

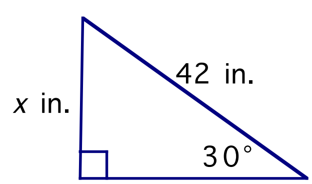
Instructional Focus:

1. Apply the Pythagorean Theorem and its converse.
2. Find the geometric mean between two numbers.
3. Solve problems involving relationships between parts of a triangle and the altitude to its hypotenuse.
4. Use the properties of 45°-45°-90° and 30°-60°-90° triangles.
5. Solve problems using trigonometric ratios.
6. Use the Law of Sines and the Law of Cosines to solve triangles.

Sample Assessments:

EX: Determine if the measures 19, 24, and 30 are measures of the sides of a right triangle. Show work to support your answer.

EX: Find the value of x.



EX: The top of a lighthouse is 120 meters above sea level. The angle of depression from the top of the lighthouse to the ship is 23°. How far is the ship from the foot of the lighthouse?

EX: Solve Triangle ABC if $a = 4.2$, $b = 6.8$, and $m\angle B = 22$. Round measures to the nearest tenth.

	Instructional Strategies: Interdisciplinary Connections Trigonometry has many applications in Physics. Technology Integration The students use the Geometer's Sketchpad to construct a right triangle. Then, they change the measures of the legs to illustrate possible measures of side lengths. Media Literacy Integration The students will research the proof by construction of the Pythagorean Theorem. They will include an explanation of the proof and accompanying drawings if necessary. Students will examine the historical and cultural significance of the Pythagorean Theorem and its influence on the mathematics world at that time.

Unit 8 – Analyzing Circles

Standard G-C: Circles Students should be able to recognize parts of circles, solve problems involving circles, and write proofs involving circles.
Big Ideas: *Course Objectives / Content Statement(s)* Students will identify parts of circles. Students will understand and apply theorems about circles. Students will find arc lengths and areas of sectors of circles.

Essential Questions *What provocative questions will foster inquiry, understanding, and transfer of learning?*	**Enduring Understandings** *What will students understand about the big ideas?*
How are parts of a circle related to one another?	Students will understand that… Every circle has a center. By joining the center and any point on the circle, a radius is drawn. By joining any two points on a circle, a chord is drawn. The longest chord (the diameter) can be constructed by passing through the center of the circle. Chords, diameters, and radii create arcs, central angles, and inscribed angles. Radii and diameters are also useful in computing and discussing area, circumference, arc length and other related measures.
What relationships are found in circles when tangents, secants, tangent segments, and secant segments, and chords are draw to and in a circle?	After constructing special segments to and in circles, many theorems can be defined, discussed, and proven.

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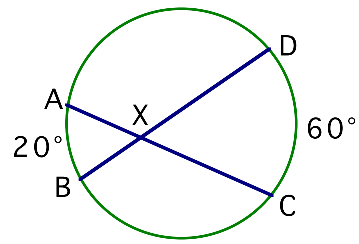
<tr><th>Areas of Focus: Proficiencies
(Cumulative Progress Indicators)</th><th>Examples, Outcomes, Assessments</th></tr>
<tr><td>Students will:</td><td rowspan="6">Instructional Focus:

1. Find the degree and linear measures of arcs.
2. Find the measures of angles in circles.
3. Solve problems by making circle graphs.
4. Use properties of chords, tangents, and secants to solve problems.
5. Write equations of circles.

Sample Assessments:

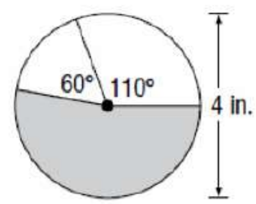
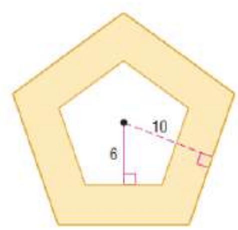
EX: Suppose a 24-centimeter chord of a circle is 32 centimeters from the center of the circle. Find the length of the radius.</td></tr>
<tr><td>G-C-2: Identify and describe relationships among inscribed angles, radii, and chords.</td></tr>
<tr><td>G-C-3: Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.</td></tr>
<tr><td>G-C-4: Construct a tangent line from a point outside a given circle to the circle.</td></tr>
<tr><td>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.</td></tr>
<tr><td>G-GPE-10: 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.</td></tr>
</table>

	EX: Find the measure of angle DXC.  EX: Write the equation of a circle with center (-4, 3) and a radius of 6.

Unit 9 – Exploring Polygons and Area

Standard 7.G Geometry Students should be able to compute the area of polygons.	
Big Ideas: *Course Objectives / Content Statement(s)* Students will find the measures of angles in polygons. Students will find the area of regular polygons and special quadrilaterals. Students will solve problems involving area. Students will calculate geometric probability.	
Essential Questions *What provocative questions will foster inquiry, understanding, and transfer of learning?*	**Enduring Understandings** *What will students understand about the big ideas?*
How do you find the measures of angles in polygons?	Students will understand that… If a convex polygon has n sides and S is the sum of the measures of its interior angles, then $S = 180(n-2)$. The sum of the measures of the exterior angles, one at each vertex, is 360.

How can area be computed? How can we construct a regular polygon inscribed in a circle?	Formulas for area include a. triangle - $A = \frac{1}{2}bh$ b. rectangles and parallelograms – $A = bh$ c. squares – $A = s^2$ d. trapezoid - $A = \frac{1}{2}(b_1 + b_2)h$ e. regular polygon - $A = \frac{1}{2}aP$ Geometric properties can be used to construct geometric figures
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	**Examples, Outcomes, Assessments**
Students will: 7.G.6: 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. G-CO-13: Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle	Instructional Focus: 1. Identify and name polygons. 2. Find measures of interior and exterior angles of polygons. 3. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle using a compass and a straight edge. 4. Find areas of polygons and circles. 5. Solve problems using geometric probability Sample Assessments: EX: A regular polygon has 20 sides. Find the measure of an interior angle and an exterior angle of the polygon. EX: The area of parallelogram *ABCD* is 134.19 square inches. If the base is 18.9 inches long, find the height. EX: A rhombus has a diagonal 8.6 centimeters long and an area of 54.18 square centimeters. What is the length of each side? EX: Find the area of a regular hexagon with sides 64 millimeters long to the nearest tenth.

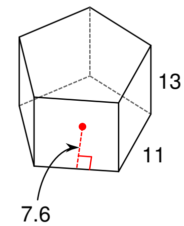
	EX: Find the circumference and area of a circle with radius 19 inches to the nearest tenth. EX: Using a compass and a straight edge, construct an equilateral triangle, a square, and a regular hexagon inscribed in the circle. EX: A point is chosen randomly on line segment AD where points A, B, C and D are co- linear, find the probability of each event. a) The point is on AC b) the point is not on AB and c) the point is on AB or CD. EX: Find the area of the shaded region. Then find the probability that a point chosen at random is in the shaded region. Assume all inscribed polygons are regular. Show all work. Round to the nearest tenth if necessary. 1.)  2.)  Instructional Strategies: Interdisciplinary Connections The students design a room in a house given the dimensions and area of the room and furniture.

	Technology Integration The students complete the online "self-check quizzes" as alternative assessments. http://glencoe.mcgraw-hill.com/sites/0078738181/student_view0/chapter11/lesson3/self-check_quizzes.html Interactive practice applying geometric probability: http://www.classzone.com/cz/books/geometry_2007_na/resources/applications/animations/geom07_ch11_pg771.html Students use the website below to create all necessary constructions: http://mathopenref.com/tocs/constructionstoc.html Media Literacy Integration The students research other area formulas, such as Walter's Theorem and Morgan's Theorem. Global Perspectives The students research the history of pi, first approximated by the Ancient Babylonians and Ancient Egyptians. They will create a timeline of their findings. They will discuss the historical significance of these discoveries.

Unit 10– Investigating Surface Area and Volume

Standard G-GMD: Geometric Measurement and Dimension	
Students should be able to define variables in surface area and volume formulas. Students should also be able to apply these formulas.	
Big Ideas: *Course Objectives / Content Statement(s)* Students will explain volume formulas and use them to solve problems. Students will visualize relationships between two-dimensional and three-dimensional objects.	
Essential Questions *What provocative questions will foster inquiry, understanding, and transfer of learning?*	**Enduring Understandings** *What will students understand about the big ideas?*
How are formulas for surface area of three-dimensional figures derived? How are formulas for volume of three-dimensional figures derived?	Students will understand that… The surface area of a three-dimensional figure is the sum of the areas of each surface that forms the exterior of the figure. The volume of a prism or cylinder is the product of the area of the base of the figure and the height of the figure. The volume of a pyramid or cone is one-third this same product.
Areas of Focus: Proficiencies (Cumulative Progress Indicators)	**Examples, Outcomes, Assessments**
Students will:	Instructional Focus: 1. Describe and draw cross sections and other slices of three-dimensional figures. 2. Make two-dimensional nets for three-dimensional solids. 3. Find lateral areas, surface areas, and volumes of solids. 4. Identify and state properties of congruent or similar solids. Sample Assessments: EX: Find the lateral area and surface area of
G-GMD-1: Given an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.	
G-GMD-2: Given an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.	
G-GMD-3: Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	
G-GMD-4: Identify the shapes of two-dimensional cross-sections of three-dimension objects, and identify three-dimensional objects generates by rotations of two-dimensional objects.	

the regular prism.



EX: Find the volume of a right cylinder if its diameter is 10 feet and its height is 13 feet.

EX: The circumference of the base of a right cone is 62.8 millimeters. The cone has a height of 15 millimeters. Find the volume of the cone.

EX: The radius of the moon is approximately 1080 miles. Find its surface area.

Instructional Strategies:

Interdisciplinary Connections

Volume has important applications in Chemistry.

Technology Integration

The students complete the online "self-check quizzes" as alternative assessments.

The students create an iMovie about how to find the surface area and volume of different three-dimensional figures.

Media Literacy Integration

The students will examine choices made by manufacturers about the container for a particular product. Students will consider why a cylinder or rectangular prism (box) was chosen for the product. Students will

	make comparison among the volume and surface area of potential containers. Students will discuss a comparison between the need for volume (holding the product) and surface area (advertising or providing information for the product) Global Perspectives The largest water tank in the world is the Water Spheroid in Edmond, Oklahoma. Its diameter is 218 feet. How much water can it hold? Why did certain cultures use particular geometric figures in their structures? Topics include Greek and Roman columns and temples and Egyptian pyramids.

Texts and Resources:

Glencoe/McGraw-Hill, Geometry: Integration, Applications, Connections

New Jersey Student Learning Standards for Mathematics
or http://www.state.nj.us/education/cccs/2016/math/standards.pdf