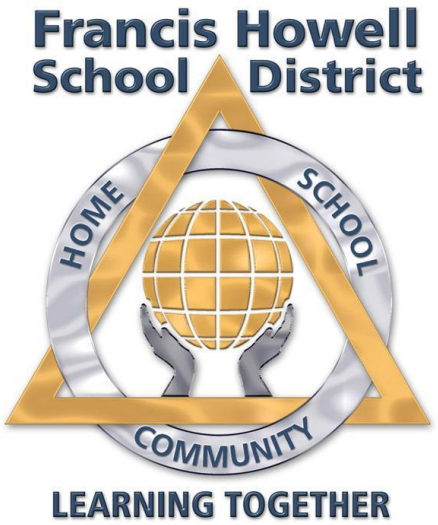
Honors Geometry Curriculum



Board Approved:

Francis Howell School District

Mission Statement

Francis Howell School District is a learning community where all students reach their full potential.

Vision Statement

Francis Howell School District is an educational leader that builds excellence through a collaborative culture that values students, parents, employees, and the community as partners in learning.

Values

Francis Howell School District is committed to:

- Providing a consistent and comprehensive education that fosters high levels of academic achievement for all
- Operating safe and well-maintained schools
- Promoting parent, community, student, and business involvement in support of the school district
- Ensuring fiscal responsibility
- Developing character and leadership

Francis Howell School District Graduate Goals

Upon completion of their academic study in the Francis Howell School District, students will be able to:

1. Gather, analyze and apply information and ideas.
2. Communicate effectively within and beyond the classroom.
3. Recognize and solve problems.
4. Make decisions and act as responsible members of society.

Mathematics Graduate Goals

Upon completion of their Mathematics study in the Francis Howell School District, students will be able to:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Course Rationale

In order to be effective citizens in the 21st century, students need to understand mathematics. Students often encounter problem situations that require reasoning, computation, and communication. Students regularly study the most efficient methods for reaching solutions, but also realize that examining different solution methods help develop more flexible problem solving skills. The instruction and assessment is focused on instilling students with enduring understandings of mathematics. The purpose of geometry is to continue to develop students' skills in spatial visualization, pictorial representation, and application of geometric ideas and concepts to describe, represent, and answer questions about natural, physical, and social phenomena. Geometry allows students to study visual patterns, describe space, and observe relationships in their environment.

Course Description

This course develops understandings in mathematics through work focused on congruence, similarity, and probability. Essential topics include proofs of geometric theorems, constructions, applications of trigonometry, working with circles, conditional probability, and using probability to create models and make decisions. Evaluation, synthesis, and modeling are emphasized.

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Curriculum Committee

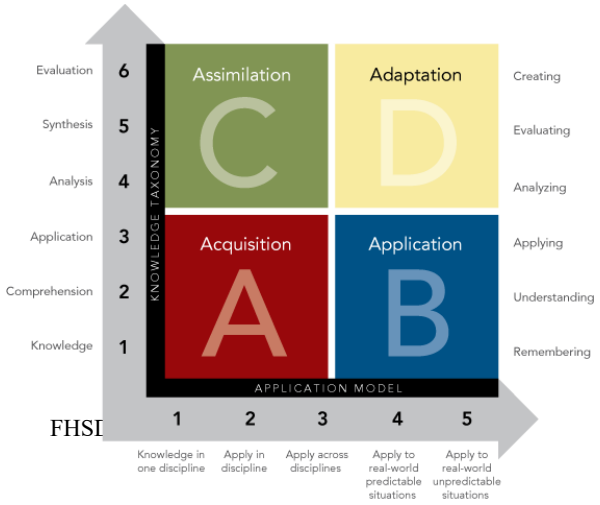
Pam Stratton-Francis Howell North High

Trisha Morrow-Francis Howell Central High

Secondary Math & Science Content Leader	Dr. Heather Ramaglia
Director of Student Learning	Dr. Chris Greiner
Chief Academic Officer	Dr. Mary Hendricks-Harris
Superintendent	Dr. Pam Sloan

Curriculum Notes

All FHSD performance tasks and sample learning activities are aligned not only to understandings and standards, but also the Rigor and Relevance Framework and 21st Century Skills. Information on these two things is provided below or by clicking on the hyperlinks.



Rigor and Relevance Framework

The Rigor/Relevance Framework is a tool developed by the International Center to examine curriculum, instruction, and assessment along the two dimensions of higher standards and student achievement.

The Rigor/Relevance Framework has four quadrants.
Quadrant A represents simple recall and basic understanding of knowledge for its own sake. Examples of

Quadrant A knowledge are knowing that the world is round and that Shakespeare wrote Hamlet.

Quadrant C represents more complex thinking but still knowledge for its own sake. Quadrant C embraces higher levels of knowledge, such as knowing how the U.S. political system works and analyzing the benefits and challenges of the cultural diversity of this nation versus other nations.

A	B	C	D
Students gather and store bits of knowledge and information. Students are primarily expected to remember or understand this knowledge.	Students use acquired knowledge to solve problems, design solutions, and complete work. The highest level of application is to apply knowledge to new and unpredictable situations.	Students extend and refine their acquired knowledge to be able to use that knowledge automatically and routinely to analyze and solve problems and create solutions.	Students have the competence to think in complex ways.

Quadrants B and D represent action or high degrees of application. Quadrant B would include knowing how to use math skills to make purchases and count change. The ability to access information in wide-area network systems and the ability to gather knowledge from a variety of sources to solve a complex problem in the workplace are types of Quadrant D knowledge.

21st Century Skills

These skills have been pared down from 18 skills to what are now called the 4Cs. The components include critical thinking, communication, collaboration, and creativity. Critical thinking is focused, careful analysis of something to better understand and includes skills such as arguing, classifying, comparing, and problem solving. Communication is the process of transferring a thought from one mind to others and receiving thoughts back and includes skills such as choosing a medium (and/or technology tool), speaking, listening, reading, writing, evaluating messages. Collaboration is working together with others to achieve a common goal and includes skills such as delegating, goal setting, resolving conflicts, team building, decision-making, and managing time. Creativity is expansive,

open-ended invention and discovery of possibilities and includes skills such as brainstorming, creating, designing, imagining, improvising, and problem-solving.

Standards

Standards aligned to this course can be found:

Missouri Learning Standards Standards for Math
http://www.corestandards.org/Math/Content/HSA/introduction/

National Educational Technology Standards
http://www.iste.org/STANDARDS

Units & Standards Overview:

Unit 1:	Unit 2:	Unit 3:
Introduction to Geometry and Basic Constructions	Triangle Congruence and Triangle Proofs	Similarity
PE Assessment Description: Based on a description, students will have to draw and identify a segment, ray, and an opposite ray. Students will take on the role of a city engineer to design a map using the postulates and theorems of parallel lines. Students will perform transformations on the coordinate plane and write transformation rules in real-life situations.	PE Assessment Description: Students will list all pairs of corresponding congruent angles and sides given a triangle congruence statement. Students will be given four problems and will determine if the triangles are congruent. If the triangles are congruent, they will provide a postulate to support their answer and write a congruence statement.	PE Assessment Description: Students will be given two pairs of polygons and will determine if the polygons are similar. If they are similar, students will write a similarity ratio and statement. If they are not similar, they will explain why not. Students will apply similar polygons in the context of a real-world problem.
Unit 1 PE	Unit 2 PE	Unit 3 PE
Semester 1 Final Blueprint		

Unit 4:	Unit 5:	Unit 6:	Unit 7:	Unit 8:
Right Triangles	Quadrilaterals and Coordinate Geometry and Proofs	2D vs 3D	Circles and Parabolas	Probability
PE Assessment Description: Students will find missing angles/sides using trig. ratios. Students will apply Pythagorean Theorem in an application problem to find how high a ladder reaches on a house. Students will then have to find how far the base	PE Assessment Description: Students will be given the vertices of a quadrilateral on a coordinate plane and use distance, slope, and/or midpoint formulas to prove the parallelogram is a rectangle and explain why.	PE Assessment Description: Students will find the volume of a pyramid given a picture. Students will find the volume of a composite figure consisting of a rectangular prism and cylinder. Students will determine the volume of	PE Assessment Description: Students will identify the parts of a circle given vocabulary to match to a diagram. Students will use the properties of circle to solve for variables in diagrams. These problems include finding the measure of	PE Assessment Description: Students will be given a set of different outcomes and will identify the correct subset described. Students will determine the probability of an event given a table.

of the ladder must be placed from the house to lower the ladder by two feet. Students will solve an application problem using an angle of elevation.		a sphere given the surface area. Students will determine the height of a cone given the volume and radius.	inscribed angles, arcs, and the length of the radius.	
Unit 4 PE	Unit 5 PE	Unit 6 PE	Unit 7 PE	Unit 8 PE
Semester 2 Final Blueprint				

Course Map

	Unit Description	Unit Timeline	PE Summary	PE Standards
Semester 1 Unit 1: Introduction to Geometry and Basic Constructions	Students will be able to apply basic facts about the undefined terms of geometry,,and analyze and apply transformations to geometric figures. Students will understand the properties that are preserved under transformations. Students will construct basic geometric figures using a variety of tools. Students will be able to use properties of parallel, perpendicular and intersecting lines, and prove the angle relationships created by parallel lines and a transversal. ● Understanding Points, Lines, and Planes ● Measuring and Constructing Segments ● Measuring and Constructing Angles ● Angle Pairs ● Midpoint and Distances	38 days	Based on a description, students will have to draw and identify a segment, ray, and an opposite ray. Students will take on the role of a city engineer to design a map using the postulates and theorems of parallel lines. Students will perform transformations on the coordinate plane and write transformation rules in real-life situations.	**G.CO.1** **G.CO.2** ISTE.1 ISTE.4 ISTE.6

	• Parallel and Perpendicular slopes and writing equations of lines • Algebraic proofs • Segment proofs • Angle proofs • Polygons (naming and central angles) • Reflections • Translations • Rotations • Transversal lines and angles • Parallel lines and transversals • Converse of parallel lines and transversals			
Semester 1 **Unit 2:** **Triangle Congruence and Triangle Proofs**	Students will be able to identify and prove triangles congruent. Students will be able to prove and apply properties of triangles including mid-segment, median, centroid, altitudes, and perpendicular and angle bisectors. • Congruent Triangles • Triangle Congruence: SSS, SAS • Triangle Congruence: AAS, ASA, and HL • Triangle Congruence: CPCTC • Prove Theorems about Triangles (base angles of isosceles triangles are congruent, triangle mid-segment theorem) • Perpendicular and Angle Bisectors • Medians and Altitudes of Triangles • Triangle Mid-segment Theorem	22 days	Students will list all pairs of corresponding congruent angles and sides given a triangle congruence statement. Students will be given four problems and will determine if the triangles are congruent. If the triangles are congruent, they will provide a postulate to support their answer and write a congruence statement.	**G.CO.7** **G.CO.8** ISTE.1 ISTE.4 ISTE.6

Semester 1 **Unit 3:** **Similarity**	Students will be able to determine and prove that polygons are similar/congruent. Students will write similarity statements and identify scale factors. Students will prove triangles are similar using SSS, S SAS and AA similarity, and will be able to use properties of similar triangles to solve problems. ● Dilations ● Ratios in Similar Polygons ● Triangle Similarity: AA, SSS, and SAS ● Prove and Apply Properties of Similar Triangles	8 days	Students will be given two pairs of polygons and will determine if the polygons are similar. If they are similar, students will write a similarity ratio and statement. If they are not similar, they will explain why not. Students will apply similar polygons in the context of a real-world problem: "Maria is 4 ft 2 in. tall. To find the height of a flagpole, she measured her shadow and the pole's shadow. Her shadow is 3 ft and 4 in and the flagpole casts a shadow of 20 feet. Determine the height of the flagpole."	**G.SRT.2** **G.SRT.5** ISTE.1 ISTE.4 ISTE.6
Semester 2 **Unit 4:** **Right Triangles**	Students will be able to solve right triangles in a variety of ways including Pythagorean Theorem, properties of special right triangles, and trigonometry. Students will apply this skill to solve problems of angles of elevation/depression. ● Special Right Triangles ● Trigonometric Ratios	16 days	Students will find missing angles/sides using trig. ratios. Students will apply Pythagorean Theorem in an application problem to find how high a ladder reaches on a house. Students will then have to	**G.SRT.8** ISTE.1 ISTE.4 ISTE.6

	● Solving Right Triangles with Trig. ● Applications of Trig.		find how far the base of the ladder must be placed from the house to lower the ladder by two feet. Students will solve an application problem using an angle of elevation: "A surveyor measures the top of a building 50 ft away from him. His angle-measuring device is 4 ft above ground. The angle of elevation to the top of the building is 63^{o}. How tall is the building?"	
Semester 2 Unit 5: Quadrilaterals and Coordinate Geometry and Proofs	Students will be able to identify, classify, and apply properties of special quadrilaterals. They will use geometric and algebraic concepts on a coordinate plane to complete proofs. ● Properties of Parallelograms ● Properties of Quadrilaterals ● Prove Theorems about Parallelograms	15 days	Students will be given the vertices of a quadrilateral on a coordinate plane and use distance, slope, and/or midpoint formulas to prove the parallelogram is a rectangle and explain why.	**G.GPE.4** ISTE.1 ISTE.4 ISTE.6
Semester 2 Unit 6: 2D vs 3D	Students will be able to solve problems using the area and perimeter of two-dimensional polygons. Students will be able to solve problems using the surface area and volume of three-dimensional prisms, cylinders, pyramids, cones, spheres, and similar solids.	18 days	Students will find the volume of a pyramid given a picture. Students will find the volume of a composite figure	**G.GMD.3** ISTE.1 ISTE.4 ISTE.6

	• 2D: Area/Perimeter: Triangles, Quadrilaterals, Circles • 2D: Area: Regular Polygons (also construct them inscribed in a circle) • 2D: Area/Perimeter in the Coordinate Plane • 3D: Identify 3D Figures (nets, properties, & cross sections) • 3D: Surface Area of Prisms and Cylinders • 3D: Surface Area of Pyramids, Cones, and Spheres • 3D: Volume of Prisms, Cylinders, Pyramids, Cones, and Spheres • 3D: Apply Volume to Density and to Solve Design Problems		consisting of a rectangular prism and cylinder. Students will determine the volume of a sphere given the surface area. Students will have to determine the height of a cone given the volume and radius.	
Semester 2 Unit 7: Circles and Parabolas	Students will be able to use arc length and other measurements to determine that all circles are similar. The proportionality of the length of an arc intercepted by an angle to the radius will be discovered. Students will learn the origin of radians and its role as the constant of proportionality. Students will establish the numerical relationship between arcs and angles of a circle and to provide ways of calculating segments related to circles. The area of a sector will be derived. Students will be able to connect the equation of a circle and parabola to the quadratic equation and Pythagorean Theorem. Students will use the coordinate plane to determine if a given point is on a circle.	14 days	Students will identify the parts of a circle given vocabulary to match to a diagram. Students will use the properties of circle to solve for variables in diagrams. These problems include finding the measure of inscribed angles, arcs, and the length of the radius.	**G.C.2** ISTE.1 ISTE.4 ISTE.6

	• Lines that Intersect Circles • Arcs and Chords • Inscribed Angles • Sector Area and Arc Length • Graphing Circles • Completing the Square with Circles • Graphing Parabolas • Parabolas (Focus/Directrix)			
Semester 2 **Unit 8:** **Probability**	Students will be able to identify sample space and subsets using characterizes of the outcomes. Students will be able to determine if two events are independent. Students will calculate and interpret conditional probability. Students will create and interpret two-way tables. Students will be able to apply the multiplication and addition rules. • Sample Space and Subsets • Theoretical Probability • Independent and Dependent Events • Conditional Probability • Compound Events (optional)	6 days	Students will be given a set of different outcomes and will identify the correct subset described. Students will determine the probability of an event given a table.	**S.CP.1** **S.CP.6** ISTE.1 ISTE.4 ISTE.6

Content Area: Mathematics	**Course: Geometry**	**UNIT 1: Introduction to Geometry and Basic Constructions**
Unit Description: Students will be able to apply basic facts about the undefined terms of geometry and analyze and apply transformations to geometric figures. Students will understand the properties that are preserved under transformations. Students will construct basic geometric figures using a	**Unit Timeline:** **38 days**	

variety of tools. Students will be able to use properties of parallel, perpendicular, and intersecting line s and prove the angle relationships created by parallel lines and a transversal.	

DESIRED RESULTS
Transfer Goal - ***Students will be able to independently use their learning to…*** ● Make sense of problems and persevere in solving them ● Reason abstractly and quantitatively ● Construct viable arguments and critique the reasoning of others ● Model with mathematics ● Use appropriate tools strategically ● Attend to precision ● Look for and make use of structure ● Look for and express regularity in repeated reasoning

Understandings – ***Students will understand that… (Big Ideas)***

1. Rotations/Reflections and translations are based on the notions of a point, line, distance along a line and distance around circular arc.
2. Rigid motions and their properties can be used to establish the triangle congruence criteria, which can then be used to prove other theorems.
3. In proving geometric theorems, they need to focus on the validity of the underlying reasoning while exploring a variety of formats for expressing that reasoning.
4. Geometric constructions can be created using a variety of tools.
5. The slope criteria for parallel and perpendicular lines can be used to solve geometric problems.
6. Proportionality can be used in line segments.
7. Relationships are created between the angles formed by two parallel lines and a transversal.

Essential Questions: ***Students will keep considering…***
How are points, lines, rays, and segments related?

How does each pre-image relate to its image? How do transformations relate to congruence? In what ways is it possible to construct different geometric figures? In what ways can congruence be useful? In what ways can you prove lines are parallel? How can parallel lines be used to find angle measures? How can you prove a geometric statement with deductive reasoning?

Students Will Know…	Standard	Students Will Be Able to …	Standard
● Definition of point, line, plane, ray, plane, collinear, coplanar, intersection, opposite rays, segments, endpoint, ray, angle, vertex, perpendicular, parallel, distance, skew, bisector, equidistant, congruent, adjacent, linear pair, complementary and supplementary angles, vertical angles. ● Notation for undefined terms.	**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.1**
● Definition of transformation, rotation, reflection, translation, rotation, dilation, vector, symmetry, congruence, image, pre-image, isometry, glide reflection, and tessellations.	**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.2**
● Definition of rectangle, parallelogram, trapezoid, regular polygon.	G-CO.3	● Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.	G-CO.3

● Definition of rotation, reflection, and translation. ● Draw rotations, reflections, translations of a geometric figure using manipulative.	G-CO.4 G-CO.5	● Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. ● 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.4 G-CO.5
● Recognize and draw compositions of transformations including mapping onto itself.	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. ● Find the translation, rotation or reflection. ● Determine if two figures are congruent. ● Determine the effect of a given rigid motion. ● Transformation figures using geometric descriptions of rigid motion.	G-CO.6
● Alternate interior angles, corresponding angles, transversal, parallel lines, perpendicular lines, perpendicular bisector, equidistance.	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*. ● Apply proven theorems to a variety of problems.	G-CO.9

• How to create constructions using a compass, ruler, protractor, and computer software.	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-CO.12
• Slope, parallel lines, perpendicular lines, slope-intercept form, point-slope form, perpendicular bisector, altitude, and midpoint.	G-GPE.5	• Prove the slope criteria for parallel and perpendicular lines, and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).	G-GPE.5
• Know ratio, distance formula, midpoint formula, proportion, endpoint, line segment, triangle proportionality theorem.	G-GPE.6	• Find the point on a directed line segment between two given points that partitions the segment in a given ratio. • Determine the coordinate of a point on a given line segment in a given ratio: number line, coordinate plane. • Find lengths of segments with proportional relationships: triangles with altitudes, triangles with parallel to a side, 3 parallel lines cut by a transversal.	G-GPE.6
• Graphing calculators and geometric software can model real life events.	ISTE.1	• Creativity and innovation - Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. a.) Apply existing knowledge to generate new ideas, products, or processes b.) Create original works as a means of personal or group expression c.) Use models and	ISTE.1

		simulations to explore complex systems and issues d.) Identify trends and forecast possibilities.	
• Graphing calculators and geometric software can be used to solve real-life problems and simulate real-life situations.	ISTE.4	• Critical thinking, problem solving, and decision making - Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. a.) Identify and define authentic problems and significant questions for investigation b.) Plan and manage activities to develop a solution or complete a project c.) Collect and analyze data to identify solutions and/or make informed decisions d.) Use multiple processes and diverse perspectives to explore alternative solutionsiste.org/standards.	ISTE.4
• Various functions of a graphing calculator and geometric software can be useful in differing contexts.	ISTE.6	• Technology operations and concepts - Students demonstrate a sound understanding of technology concepts, systems, and operations. a.) Understand and use technology systems b.) Select and use applications effectively and productively c.) Troubleshoot systems and applications d.) Transfer current knowledge to learning of new technologies.	ISTE.6

EVIDENCE of LEARNING			
Understanding	Standards	**Unit Performance Assessment:**	**R/R Quadrant & 21st Century:**
1. Apply basic facts about points, parallel lines, perpendicular lines, transversals, segments, rays, planes, and angles.	**G.CO.1** **G.CO.2**	**Description of Assessment Performance Task(s):** *How will students demonstrate their understanding through complex performance?* Based on a description, students will have to draw and identify a segment, ray, and an opposite ray. Students will take on the role of a city engineer to design	A/B Creativity Critical Thinking

2. Properties of geometric figures are preserved by transformations.		a map using the postulates and theorems of parallel lines. Students will perform transformations on the coordinate plane and write transformation rules in real-life situations. **Teacher will assess:** *What criteria will be used in each assessment to evaluate attainment of the desired results?* 1. Students will be assessed on their ability to draw and identify vocabulary terms. 2. Students will draw a map based on their knowledge of parallel lines and their properties. 3. Students will transform points and figures on the coordinate plane and across various situations. **<u>Performance:</u>** **Mastery:** *Students will show that they really understand when they…* 1. Can use properties of parallel lines and a transversal. 2. Apply basic facts about points, parallel lines, perpendicular lines, transversals, segments, rays, planes, and angles. 3. Describe a transformation that maps a preimage to an image. 2. Complete the performance event with at least 75% accuracy. **Scoring Guide:** See "Unit 1 PE Rubric"	

SAMPLE LEARNING PLAN

Pre-assessment: *What pre-assessments will you use to check student's prior knowledge, skill levels, and potential misconceptions?*

Pretest on Google Drive

Warm-ups to pre-assess students' prior knowledge.

After-test questions to pre-assess students' prior knowledge for the next unit.

With their prior knowledge, students should be able to:

- Measure line segments using inches and centimeters.
- Understand how a standard ruler is marked.
- Solve equations in a single variable.
- Simplify expressions by combining like terms.
- Evaluate expressions.
- Plot ordered pairs on a coordinate plane.
- Use a protractor to measure angles.

Understanding	Standards	**Major Learning Activities:**	Instructional Strategy:	R/R Quadrant & 21st Century:
7	G.CO.9	• Activity: Special Angle Pairs Discovery • Objective: Students will discover the relationships between the angle pairs created by two parallel lines and transversals. The students will use a protractor to measure the angles on a diagram with two parallel lines and a transversal. The students will classify the special angle pairs and record if they are congruent or supplementary. Appendix Documents: Special Angle Pairs Discovery	Summary and Note-Taking	C Critical Thinking
1, 2, 3, 4, 5, 6, 7	**G.CO.1** **G.CO.2** G.CO.3 G.CO.4 G.CO.5 G.CO.6	2. Activity: Unit 1 Exit Slips • Objective: Students will demonstrate their knowledge of daily learning objectives through these quick daily assessments. The exit slips have the students write the daily objective, rate their level of understanding, and answer a question that addresses that daily learning objective.	Setting Objectives and Providing Feedback	A,B,C,D Creativity Critical Thinking

	G.CO.9 G.CO.12 G.GPE.5 G.GPE.6	Appendix Documents: Unit 1 Exit Slips		
4	G.CO.12	3. Activity: Constructions ● Objective: Teachers will use the "Constructions Examples PowerPoint" to demonstrate to students how to congruent segments and angles, bisect an angle, and create segments with given relationships, such as construct CD=1/2AB. The constructions review worksheet will give students practice with constructions using tools such as a protractor, ruler, and compass. Appendix Documents: Constructions Examples PowerPoint and Constructions Review worksheet	Summarizing and Note-taking Homework and practice	B, C Creativity Critical Thinking
7	G.CO.9	4. Activity: "Add 'em up!" Cooperative Learning Activity for Special Angle Pairs ● Objective: Students will find angle measurements using the relationships created by two parallel lines and a transversal. Students are placed in groups of 4 and each student is assigned a number 1-4. Each table has one worksheet with four questions on it. The students simultaneously solve the problem that corresponds to their number on a separate sheet of paper (ex: person 1 solves question #1 at the same time that person 2 solves question #2, and so on). Each student writes the answer to their question on the recording sheet, then the group adds all four of the answers together. One person from the group brings the recording sheet to the teacher to check the sum of the four answers. If the sum is right, the group moves on to the next round. If the sum is wrong, the student returns to the group with the worksheet and the students round robin to explain how they solved each question.	Cooperative Learning	A Collaboration Communication

		Appendix Documents: Add 'em up for special angle pairs		
6	G.CO.1	5. Activity: Match My Answer Distance and Midpoint Formulas ● Objective: Students will apply distance and midpoint formulas. Students work in pairs of two. Each student is given a worksheet (either A or B) and the worksheets will have the same answer but different questions. The students are to check in with each other after completing each question because the answers are aligned (i.e., #1 on A is the same as #1 on B). If the students have different answers, they need to exchange papers and work together to correct the error. Appendix Documents: Match My Answer Distance and Midpoint Formulas	Cooperative Learning	A, C Collaboration Communication
3	G.CO.9	6. Activity: Quiz-quiz-trade ● Objective: Students are given Quiz-Quiz trade cards with which they are able to engage in justifying the steps in basic algebraic and geometric proofs. Feedback requires students to formally defend and critique each other's conclusions. Appendix Documents: Basic Proofs Quiz-Quiz-Trade	Cooperative Learning Feedback	A Communication Collaboration
1, 3, 4	**G.CO.1** **G.CO.2** ISTE.1 ISTE.4 ISTE.6	7. Activity: Logo Project ● Objective: Students will design a logo for a real or fictitious company that uses the properties of transformations. They will utilize Geometer's Sketchpad or GeoGebra to generate their design, and write a detailed explanation of the transformations and how all the symmetries were constructed. Appendix Documents: Logo Project	Project Based Learning	C, D Critical Thinking Creativity

UNIT RESOURCES
Teacher Resources:

Holt Textbook Chapter 1, 2.5, 2.6, and 3
my.hrw.com
Activities on Google Drive
Learnzillion: http://learnzillion.com/
The Geometer's Sketchpad: http://www.keycurriculum.com/sketchpad-resources
GeoGebra: https://www.geogebra.org/
https://app.studyisland.com
Khan Academy - Common Core Map
Engage NY
http://www.brightstorm.com/math/
https://www.opened.com/

Student Resources:
Glencoe Textbook Chapter 1, 2.6, 2.7, 2.8, 3, 6.1, and 9
http://connected.mcgraw-hill.com/
Kahn Academy
Study Island

Vocabulary:

- Alternate exterior angles: For two lines intersected by a transversal, a pair of nonadjacent angles that lie on opposite sides of the transversal and outside of the other two lines.
- Alternate interior angles: For two lines intersected by a transversal, a pair of nonadjacent angles that lie on opposite sides of the transversal and between the other two lines.
- Angle: A figure formed by two rays with a common endpoint.
- Bisect: To divide into two congruent parts.
- Circle: The set of points in a plane that are a fixed distance from a given point called the center of the circle.
- Circumference: The distance around the circle.
- Collinear: Points that lie on the same line.
- Congruence: having the same size and shape

- Construction: a method of creating a figure that is considered to be mathematically precise. Figures may be constructed by using a compass and straightedge, geometry software, or paper folding.
- Coplanar: points that lie in the same plane
- corresponding angles: For two lines intersected by a transversal, a pair of angles that lie on the same side of the transversal and on the same sides of the other two lines.
- Dilation: A transformation in which the lines connecting every point P with its preimage P' all intersect at a point C known as the center of dilation. A transformation that changes the size of a figure but not its shape.
- Distance: Length. The absolute value of the difference of the coordinates of the points.
- Intersection: A common point
- Line: An undefined term on geometry, a line is a straight path that has no thickness and extends forever
- Opposite rays: Two rays that have a common endpoint and form a line.
- Parallel lines: Lines in the same plane that do not intersect.
- Parallelogram: A quadrilateral with two pairs of parallel sides.
- Perpendicular bisector: a line perpendicular to a segment at the segment's midpoint
- perpendicular lines: lines that intersect at 90 degree angles
- Perpendicular: intersecting to form 90 degree angles
- Plane: an undefined term in geometry, it is a flat surface that has no thickness and extends forever
- Point: an undefined term in geometry, it names a location and has no size
- Ray: A part of a line that starts at an endpoint and extends forever in one direction.
- Rectangle: a quadrilateral with four right angles
- Reflection: a transformation across a line, called the line of reflection, such that the line of reflection is the perpendicular bisector of each segment joining each point and its image.
- regular polygon: a polygon that is both equilateral and equiangular
- Rotation: a transformation about a point P, also known as the center of rotation, such that each point and its image are the same distance from P. All of the angles with vertex P formed by a point and its image are congruent.
- Segment: A part of a line consisting of two endpoints and all points between them.
- Symmetry: in the transformation of a figure such that the image coincides with the preimage, the image, and preimage have symmetry.
- Transformation: a change in the position, size, or shape of a figure or graph.
- Translation: a transformation that shifts or slides every point of a figure of graph the same distance in the same direction.

- Transversal: A line that intersects two coplanar lines at two different points.
- Trapezoid: a quadrilateral with exactly one pair of parallel sides.
- Vector: a quantity that has both magnitude and direction.
- Vertex: the common endpoint of the sides of an angle.
- Vertical angles: the nonadjacent angles formed by two intersecting lines.

Content Area: Mathematics	**Course: Geometry**	**UNIT 2: Triangle Congruence and Triangle Proofs**
Unit Description: Students will be able to identify and prove triangles congruent. Students will be able to prove and apply properties of triangles including midsegment, median, centroid, altitudes, and perpendicular and angle bisectors.	**Unit Timeline:** 22 days	

DESIRED RESULTS

Transfer Goal - ***Students will be able to independently use their learning to…***

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Understandings – ***Students will understand that… (Big Ideas)***

1. Rigid motions and their assumed properties can be used to establish the usual triangle congruence criteria, which can then be used to prove other theorems.
2. In proving geometric theorems, they need to focus on the validity of the underlying reasoning while exploring a variety of formats for expressing that reasoning.

Essential Questions: ***Students will keep considering…***

What processes are valid to prove two triangles are congruent?
What can you conclude about two triangles that are congruent?
How do you use prior knowledge to prove a new idea?
How do algebraic concepts relate to the segments and angles within a triangle?
How can the coordinate plane be used to prove properties of triangles?

Students Will Know…	Standard	Students Will Be Able to …	Standard

● Know congruence, angles, rigid motion, corresponding angles.	**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.** ● **Verify two triangles are congruent.** ● **Show that the triangles are congruent given triangles that have been transformed.**	**G.CO.7**
● ASA, SAS, SSS theorems. ● Congruence ● Distance formula.	**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.** ● **Use the definition of congruence, based on rigid motion, to develop and explain the triangle congruence criteria.** ● **Complete proofs involving ASA, SAS, and SSS.**	**G.CO.8**
● Isosceles triangles, midpoint, median.	G.CO.10	● Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point*. ● Apply proven theorems to a variety of problems.	G.CO.10
● Definitions of incenter, angle bisector, perpendicular bisector, cirumcenter.	G.C.3	● Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. ● Use incenter to construct inscribed circles of a triangle.	G.C.3

● How to calculate inscribed angles given intercepted arcs. ● How to use a compass and straightedge. ● Graphing calculators and geometric software can model real life events.	ISTE.1	● Creativity and innovation - Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. a.) Apply existing knowledge to generate new ideas, products, or processes b.) Create original works as a means of personal or group expression c.) Use models and simulations to explore complex systems and issues d.) Identify trends and forecast possibilities.	ISTE.1
● Graphing calculators and geometric software can be used to solve real-life problems and simulate real-life situations.	ISTE.4	● Critical thinking, problem solving, and decision making - Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. a.) Identify and define authentic problems and significant questions for investigation b.) Plan and manage activities to develop a solution or complete a project c.) Collect and analyze data to identify solutions and/or make informed decisions d.) Use multiple processes and diverse perspectives to explore alternative solutionsiste.org/standards.	ISTE.4
● Various functions of a graphing calculator and geometric software can be useful in differing contexts.	ISTE.6	● Technology operations and concepts - Students demonstrate a sound understanding of technology concepts, systems, and operations. a.) Understand and use technology systems b.) Select and use applications effectively and productively c.) Troubleshoot systems and applications d.) Transfer current knowledge to learning of new technologies.	ISTE.6

EVIDENCE of LEARNING

Understanding	Standards	Unit Performance Assessment:	R/R Quadrant & 21st Century:
1. Rigid motions and their assumed properties can be used to establish the usual triangle congruence criteria, which can then be used to prove other theorems. 2. Determine if triangles are congruent using ASA, SAS, and SSS.	**G.CO.7** **G.CO.8**	**Description of Assessment Performance Task(s):** *How will students demonstrate their understanding through complex performance?* Students will list all pairs of corresponding congruent angles and sides given a triangle congruence statement. Students will be given four problems and will determine if the triangles are congruent. If the triangles are congruent, they will provide a postulate to support their answer and write a congruence statement. **Teacher will assess:** *What criteria will be used in each assessment to evaluate attainment of the desired results?* Students will list all pairs of corresponding congruent angles and sides given a triangle congruence statement. Students will have to determine if triangles are congruent, provide a justification using a postulate, and write a congruence statement. **Performance:** **Mastery:** *Students will show that they really understand when they…* 1. Can identify congruent triangles and support their answer with a postulate. 2. Complete the performance event with at least 75% accuracy. **Scoring Guide:** See "Unit 2 PE Rubric"	C Creativity

SAMPLE LEARNING PLAN
Pre-assessment: *What pre-assessments will you use to check student's prior knowledge, skill levels, and potential misconceptions?* Pretest on Google Drive Warm-ups to pre-assess students' prior knowledge. After-test questions to pre-assess students' prior knowledge for the next unit.

With their prior knowledge, students should be able to:

- Connect words and algebra.
- Basic properties of triangles, such as triangle classification.
- Draw conclusions from a given statement.
- Determine when a conclusion drawn is an incorrect conclusion.

Understanding	Standards	Major Learning Activities:	Instructional Strategy:	R/R Quadrant & 21st Century:
1, 2	**G.CO.7** **G.CO.8** G.CO.10 G.C.3	1. Activity: Unit 2 Exit Slips ● Objective: Students will demonstrate their knowledge of daily learning objectives through these quick daily assessments. The exit slips have the students write the daily objective, rate their level of understanding, and answer a question that addresses that daily learning objective. Appendix Documents: Unit 2 Exit Slips	Setting Objectives and Providing Feedback	A, B, C, D Creativity Critical Thinking
2	**G.CO.8**	● Activity: Triangle Congruence Rally Coach ● Objective: Students will determine if two triangles are congruent. If they are congruent, they will give the postulate (SSS, SAS, ASA, AAS, HL) and write a congruence statement. Students are in pairs of two. The students will share one worksheet that will be passed back and forth. One student will do one problem and the other will offer praise or help. The worksheet will be passed to the other student who will do one problem. Encourage students to write in different colors to easily identify who did which problem. Appendix Documents: "rally coach all triangle congruences"	Cooperative Learning	B, C Communication Collaboration
2	**G.CO.8**	● Activity: Triangle Congruence Proofs Mix-Pair-Share ● Objective: Students will prove that triangles are congruent using SSS, SAS, ASA, AAS, and/or HL. The students are given time to complete the proofs. Once all the	Cooperative Learning	C, D Critical Thinking Creativity

		students are done, they will walk around the room to find someone to pair up with (music is optional). The students will compare answers and return to their seats once they reach consensus. Appendix Documents: "Geo Triangle Congruence Mini Qz Proofs"		Communication Collaboration
2	**G.CO.8** G.CO.10	● Activity: Triangle Proofs Mix-Pair-Share ● Objective: Students will write triangle proofs. The students are given time to complete the proofs. Once all the students are done, they will walk around the room to find someone to pair up with (music is optional). The students will compare answers and return to their seats once they reach consensus. Appendix Documents: Triangle Proofs Mix-Pair-Share	Cooperative Learning	C, D Critical Thinking Creativity Communication Collaboration
1,2	**G.CO.7** **G.CO.8** G.C.3	● Activity: Construction Labs ● Objective: Students will conduct lab investigations using Geometer's Sketchpad or GeoGebra around constructions that help lead to proof statements. Appendix Documents: Lab 1, Lab 2, Lab 3	Cooperative Learning Investigations	C Critical Thinking Communication Collaboration

UNIT RESOURCES
Teacher Resources: Glencoe Textbook Chapter 4 and 5 http://connected.mcgraw-hill.com/ Activities on Google Drive Learnzillion: http://learnzillion.com/ The Geometer's Sketchpad: http://www.keycurriculum.com/sketchpad-resources Geogebra: https://www.geogebra.org/ https://app.studyisland.com

Khan Academy - Common Core Map
Engage NY
http://www.brightstorm.com/math/
https://www.opened.com/

Student Resources:
Holt Textbook Chapter 4 and 5
my.hrw.com
Kahn Academy
Study Island

Vocabulary:

- Altitude: a perpendicular segment from a vertex to the line containing the opposite side.
- Angle bisector: a ray that divides an angle into two congruent angles.
- Centroid: the point of concurrency of the three medians of a triangle.
- corresponding parts: sides and angles in the same position in two different similar/congruent polygons
- Equilateral: a triangle with three congruent sides.
- Isosceles: a triangle with at least two congruent sides.
- Median: a segment whose endpoints are a vertex of the triangle and the midpoint of the opposite side.
- Midsegment: a segment that joins the midpoints of two sides of the triangle.
- Parallel lines: Lines in the same plane that do not intersect.
- Perpendicular bisector: a line perpendicular to a segment at the segment's midpoint
- Perpendicular: intersecting to form 90 degree angles
- Rigid motion: a transformation that does not change the size or shape of a figure.
- Scalene: a triangle with no congruent sides

Content Area: Mathematics	Course: Geometry	UNIT 3: Similarity
Unit Description: Students will be able to determine and prove that polygons are similar/congruent. Students will write similarity statements and identify scale factors. Students will prove triangles are similar using SSS, SAS and AA similarity, and will be able to use properties of similar triangles to solve problems.	**Unit Timeline:** 8 days	

DESIRED RESULTS

Transfer Goal - ***Students will be able to independently use their learning to…***

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Understandings – ***Students will understand that… (Big Ideas)***

1. A dilation is an enlargement or reduction of a pre-image through a center point.
2. Similar figures have congruent corresponding sides and proportional slides.
3. Triangles can be similar by various theorems.
4. Two pairs of congruent angles are sufficient to prove two triangles are similar (AA).
5. Similarity if used to prove theorems about triangles.
6. Non-triangular geometric figures can be shown to be congruent or similar in the same way triangles are.
7. Solve problems using congruence and similarity criteria.

Essential Questions: ***Students will keep considering…***

How do you prove triangles or polygons similar?
What are the differences between similar and congruent figures?
How might the features of one figure be useful when solving problems about similar figures?

Students Will Know…	Standard	Students Will Be Able to …	Standard
• Dilation, scale factor, center of dilation, enlargement, reduction. • How to find scale factor between pre-image and image.	G-SRT.1	• Verify experimentally the properties of dilations given by a center and a scale factor: • A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.	G-SRT.1

● The relationship between a pre-image, image, and center. ● Determine the scale factor given a figure and its dilation. ● Determine the dilation given a figure and a scale factor. ● Find the center of dilation given a figure and its dilation. ● Draw a dilation given a figure and a center of dilation.		● The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	
● Definition of similar, proportions, and corresponding parts of changes.	**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.** ● **Identify whether corresponding parts are similar by proportional sides and congruent angles.** ● **Identify the scale factor between two similar changes.** ● **Write a similarity statement.**	**G-SRT.2**
● Know Triangle Angle Sum Theorem. ● Derive the Third Angles Theorem.	G-SRT.3	● Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. ● Show that the triangles are similar given two pairs of congruent angles in two triangles.	G-SRT.3
● Properties of proportions.		● Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two*	G-SRT.4

● Recognize the 3 similar triangles when an altitude is drawn from the right angle of a right triangle.	G-SRT.4	*proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.* ● Show that the split sides are proportional given a line parallel to one side of a triangle that intersects the triangle. ● Find any other segment length given a right triangle with an altitude drawn from the right angle and 2 segment lengths. ● Find the geometric mean between two numbers.	
● Congruent figures are similar with a scale factor of 1.	**G-SRT.5**	● **Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.** ● **Prove triangles are congruent or similar using similarity and congruency theorems (SSS, SAS, ASA, AAS, HL, AA~, SAS~, SSS~).** ● **Prove geometric figures are similar and/or congruent using the criteria found from triangles.** ● **Show all sides proportional and all angles congruent.**	**G-SRT.5**
● Formula for circumference. ● Radius and diameter of a circle. ● Similarity, ratio, proportion.	G.C.1	● Prove that all circles are similar.	G.C.1
● Graphing calculators and geometric software can model real life events.	ISTE.1	● Creativity and innovation - Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. a.) Apply existing knowledge to generate new ideas, products, or processes b.) Create original works as a means of personal or group expression c.) Use models and	ISTE.1

● Graphing calculators and geometric software can be used to solve real-life problems and simulate real-life situations. ● Various functions of a graphing calculator and geometric software can be useful in differing contexts.	ISTE.4 ISTE.6	simulations to explore complex systems and issues d.) Identify trends and forecast possibilities. ● Critical thinking, problem solving, and decision making - Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. a.) Identify and define authentic problems and significant questions for investigation b.) Plan and manage activities to develop a solution or complete a project c.) Collect and analyze data to identify solutions and/or make informed decisions d.) Use multiple processes and diverse perspectives to explore alternative solutionsiste.org/standards. ● Technology operations and concepts - Students demonstrate a sound understanding of technology concepts, systems, and operations. a.) Understand and use technology systems b.) Select and use applications effectively and productively c.) Troubleshoot systems and applications d.) Transfer current knowledge to learning of new technologies.	ISTE.4 ISTE.6

EVIDENCE of LEARNING			
Understanding	Standards	**Unit Performance Assessment**: **Description of Assessment Performance Task(s):** *How will students demonstrate their understanding through complex performance?*	**R/R Quadrant & 21st Century:**
1. Similar figures have congruent corresponding sides and	**G.SRT.2** **G.SRT.5**	Students will be given two pairs of polygons and will determine if the polygons are similar. If they are similar, students will write a similarity ratio and statement If they are not similar, they will explain why not. Students will apply similar polygons in the context of a real-world problem:	B

proportional slides. 2. Triangles can be similar by various theorems. 3. Solve problems using congruence and similarity criteria.		"Maria is 4 ft 2 in. tall. To find the height of a flagpole, she measured her shadow and the pole's shadow. Her shadow is 3 ft and 4 in and the flagpole casts a shadow of 20 feet. Determine the height of the flagpole." **Teacher will assess:** *What criteria will be used in each assessment to evaluate attainment of the desired results?* The teacher will assess the student's ability to identify similar polygons, and write similarity ratios and statements. Students will be able to apply similar polygons in the context of a real-world problem by drawing a pair of similar polygons and solving. **Performance:** **Mastery:** *Students will show that they really understand when they…* 1. Can identify polygons as similar and provide a similarity ratio/statement. 2. Can explain why two polygons are not similar. 3. Solve an application problem using properties of similar polygons. 4. Complete the performance event with at least a 75% accuracy. **Scoring Guide:** See "Unit 3 PE Rubric"	Critical Thinking

SAMPLE LEARNING PLAN
Pre-assessment: *What pre-assessments will you use to check student's prior knowledge, skill levels, and potential misconceptions?* Pretest on Google Drive Warm-ups to pre-assess students' prior knowledge. After-test questions to pre-assess students' prior knowledge for the next unit. With their prior knowledge, students should be able to: ● Identify equivalent fractions. ● Write ratios. ● Name a polygon by the number of its sides.

● Find the perimeter of a figure.				
Understanding	**Standards**	**Major Learning Activities:**	**Instructional Strategy:**	**R/R Quadrant & 21st Century:**
2	**G-SRT.2**	1. Activity: Unit 3 Exit Slips ● Objective: Students will demonstrate their knowledge of daily learning objectives through these quick daily assessments. The exit slips have the students write the daily objective, rate their level of understanding, and answer a question that addresses that daily learning objective. Appendix Documents: Unit 3 Exit Slips	Setting Objectives and Providing Feedback	B, C Creativity Critical Thinking
1, 2, 3, 4	**G- SRT.2** **G - SRT.5** G - SRT.1	2. Activity: Students will create a figure using AA, SAS, and SSS similarity. ● Objective: Students will define each of the triangle similarities (AA, SSS, SAS). They will describe the difference between triangle similarity and triangle congruence, describe what happens to your new triangles when they multiply the original triangle by a scale factor less than one and greater than one, explain why the calculations of proportions and the sum of angle measurements might not be exact, and explain any difficulties that many have had with this project and if this project helped solidify understanding of triangle similarity. Appendix Documents: Similar Triangles Project	Cooperative Learning Identifying Similarity and Differences	C Creativity Critical Thinking Collaboration

2, 7	**G-SRT.2** G-SRT.3 G-SRT.4 **G-SRT.5**	3. Activity: Bingo ● Objective: Students will demonstrate their knowledge of solving problems using the properties of similarity using this Bingo game. Each student will have a bingo card and the teacher will read the answers to the game as students fill in their cards. The teacher will project one slide at a time and students will work to complete the questions on that slide. As students complete the problem, their bingo card serves as an answer bank to provide feedback. Appendix Documents: Bingo	Providing Feedback Reinforcing Effort and Providing Recognition	A, B, C Creativity Critical Thinking
2	G.SRT.2	4. Activity: Similar Figures ● Objective: *S*tudents will determine if plane figures are similar and write proportions to express relationships between the corresponding sides. Appendix Documents: Similar Figures	Cooperative Learning	A Collaboration
1, 2	G-SRT.1 G-SRT.2	5. Activity: What Are Similarity Transformations, and Why Do We Need Them? ● Objective: Students define a similarity transformation as the composition of basic rigid motions and dilations. Students define two figures to be similar if there is a similarity transformation that takes one to the other. Students can describe a similarity transformation applied to an arbitrary figure (i.e., not just triangles) and can use similarity to distinguish between figures that resemble each other versus those that are actually similar. Appendix Documents: Unit 3 Activity	Cooperative learning Identifying similarities and differences	C Critical thinking Communication
2, 3	G-SRT.1 ISTE. 1,2,4	6. Activity: Fundamental Theorem of Similarity Activity	Cooperative Learning	A, B, C

		• Objective: Students will apply their knowledge of dilation and similarity in real-world applications by using shadow lengths and a known height to find the height of trees, the distance across a lake, and the height of a flagpole. Appendix Documents: Similarity Module Engage NY		Communication, collaboration

UNIT RESOURCES
Teacher Resources: Glencoe Textbook Chapter 7 http://connected.mcgraw-hill.com/ Activities on Google Drive Learnzillion: http://learnzillion.com/ The Geometer's Sketchpad: http://www.keycurriculum.com/sketchpad-resources GeoGebra: https://www.geogebra.org/ https://app.studyisland.com Khan Academy - Common Core Map Engage NY http://www.brightstorm.com/math/ https://www.opened.com/
Student Resources: Holt Textbook Chapter 7 my.hrw.com Kahn Academy Study Island
Vocabulary: • Altitude: a perpendicular segment from a vertex to the line containing the opposite side. • Corresponding parts: sides and angles in the same position in two different similar/congruent polygons • Dilation: A transformation in which the lines connecting every point P with its preimage P' all intersect at a point C known as the center of dilation. A transformation that changes the size of a figure but not its shape.

- Proportion: a statement that two ratios are equal.
- Ratio: a comparison of two quantities by division.
- Scale factor: the multiplier used on each dimension to change one figure into a similar figure.
- Similar: two figures are similar if they have the same shape but not necessarily the same size.
- Similar polygons: two polygons whose corresponding angles are congruent and whose corresponding sides are proportional.
- Similarity ratio: the ratio of two corresponding linear measurements in a pair of similar figures.
- Similarity statement: a statement that indicates that polygons are similar by listing the vertices in the order of correspondence.

Content Area: Mathematics	Course: Geometry	UNIT 4: Right Triangles
Unit Description: Students will be able to solve right triangles in a variety of ways including Pythagorean Theorem, properties of special right triangles, and trigonometry. Students will apply this skill to solve problems of angles of elevation/depression.	**Unit Timeline:** 16 days	

DESIRED RESULTS
Transfer Goal - ***Students will be able to independently use their learning to…*** ● Make sense of problems and persevere in solving them ● Reason abstractly and quantitatively ● Construct viable arguments and critique the reasoning of others ● Model with mathematics ● Use appropriate tools strategically ● Attend to precision ● Look for and make use of structure ● Look for and express regularity in repeated reasoning

Understandings – ***Students will understand that… (Big Ideas)***

1. Similar right triangles are used to generate ratios between sides, leading to trigonometric functions.
2. The sine and cosine of complementary angles are equivalent.
3. Six parts of right triangles are interdependent.
4. All missing parts of a right triangle can be found using trigonometric ratios and/or Pythagorean Theorem.
5. Apply trigonometric ratios and/or Pythagorean Theorem to solve real-world application problems.

Essential Questions: ***Students will keep considering…***

How does the measure of one acute angle relate to the ratio of two side measures in any right triangle?
How do trigonometric ratios relate to similar right triangles?
How are missing side lengths and angle measures found in a right or oblique triangle?
What strategies can be used to find missing parts of triangles and how can they be used to apply to real world problems?
Can trigonometry be used to find the area of a triangle?

Students Will Know…	Standard	Students Will Be Able to …	Standard
• Similar triangles, right triangles, ratio, proportion. • Define the trigonometric ratios (sine, cosine, and tangent).	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. • Discover the relationships in special right triangles. • Use a corresponding angle to show the three side ratios are the same given the lengths of the sides of two similar right triangles.	G-SRT.6
• Sine, cosine, complementary.	G-SRT.7	• Explain and use the relationship between the sine and cosine of complementary angles. • Express a sine ratio in terms of a cosine ratio. • Express a cosine ratio in terms of a sine ratio. • Show that the sine of an angle is equal to the cosine of the angle's complement.	G-SRT.7
• Right triangles, sohcahtoa, Pythagorean theorem, square roots, inverse trigonometry, opposite and	**G-SRT.8**	• **Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.**	**G-SRT.8**

adjacent legs, hypotenuse, angle of elevation and depression. ● Identify missing parts and choose appropriate trigonometry ratio or Pythagorean Theorem to find missing sides.	G.SRT.9+	● **Draw a triangle from a word problem.** ● **Solve equation to find a missing part.** ● **Identify missing parts and choose appropriate trigonometry ratio or Pythagorean Theorem to find missing sides.** ● **Use the trig ratios and Pythagorean Theorem to solve right triangles in applied problems.**	G.SRT.9+
● Definition of oblique triangles, sine. ● Formula for the area of a triangle. ● The area of oblique (non-right) triangles can be found by A=1/2 ab sin C.	G.SRT.10+	● Apply formula A = ½ ab sin C to find area of oblique triangles. ● Derive A = ½ ab sin C from basic area formula (A = ½bh).	G.SRT.10+
● Sine, cosine, when to use Law of Sines vs. Law of Cosines vs. SOH CAH TOA. ● The Law of Sines and Law of Cosines are used to find missing pieces of oblique (non-right) triangles.	G.SRT.11+	● Prove the Law of Sines and Law of Cosines. ● Use Law of Sines and Law of Cosines to solve oblique triangles.	G.SRT.11+
● Law of Sines, Law of Cosines, when to use the Law of Sines vs. the Law of Cosines. ● The Law of Sines and Cosines can be used in applied problems to find missing sides and angles of any type of triangle.	ISTE.1	● Use Law of Sines and Cosines to find unknown measures of right and oblique triangles in real-world problems.	ISTE.1
● Graphing calculators and geometric software can model real life events.		● Creativity and innovation - Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. a.) Apply existing knowledge to generate new ideas, products, or processes b.) Create original works as a means of personal or group expression c.) Use models	

● Graphing calculators and geometric software can be used to solve real-life problems and simulate real-life situations. ● Various functions of a graphing calculator and geometric software can be useful in differing contexts.	ISTE.4 ISTE.6	and simulations to explore complex systems and issues d.) Identify trends and forecast possibilities. ● Critical thinking, problem solving, and decision making - Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. a.) Identify and define authentic problems and significant questions for investigation b.) Plan and manage activities to develop a solution or complete a project c.) Collect and analyze data to identify solutions and/or make informed decisions d.) Use multiple processes and diverse perspectives to explore alternative solutionsiste.org/standards. ● Technology operations and concepts - Students demonstrate a sound understanding of technology concepts, systems, and operations. a.)Understand and use technology systems b.) Select and use applications effectively and productively c.) Troubleshoot systems and applications d.) Transfer current knowledge to learning of new technologies.	ISTE.4 ISTE.6

EVIDENCE of LEARNING			
Understanding 1. All missing parts of a right triangle can be found using trigonometric ratios and/or Pythagorean Theorem. 2. Apply trigonometric ratios and/or Pythagorean Theorem to solve real-world application problems.	Standards **G.SRT.8**	**Unit Performance Assessment:** **Description of Assessment Performance Task(s):** *How will students demonstrate their understanding through complex performance?* Students will find missing angles/sides using trig. ratios. Students will apply Pythagorean Theorem in an application problem to find how high a ladder reaches on a house. Students will then have to find how far the base of the ladder must be placed from the house to lower the ladder by two feet. Students will solve an application problem using an angle of elevation: "A surveyor measures the top of a building 50 ft away from him. His angle-measuring device is 4 ft above ground. The angle of elevation to the top of the building is 63°. How tall is the building?" **Teacher will assess:** *What criteria will be used in each assessment to evaluate attainment of the desired results?* Students will be evaluated on their ability to set up and solve trig. ratios in simple application problems. Students will also have to apply the Pythagorean Theorem and trig. in real-life context problems. Teachers will evaluate the student's ability to set up the problem and solve using the correct method. **Performance:** **Mastery:** *Students will show that they really understand when they…* 1. Can apply trig. ratios to complete triangles. 2. Can set up and apply Pythagorean Theorem and trig in real-world problems. 3. Complete the performance event with at least 75% accuracy. **Scoring Guide:** See "Unit 4 PE Rubric"	**R/R Quadrant & 21st Century:** B/C Critical Thinking

SAMPLE LEARNING PLAN

Pre-assessment: *What pre-assessments will you use to check student's prior knowledge, skill levels, and potential misconceptions?*

Pretest on Google Drive

Warm-ups to pre-assess students' prior knowledge.

After-test questions to pre-assess students' prior knowledge for the next unit.

With their prior knowledge, students should be able to:

- Find the square roots of numbers.
- Write numbers in simplest radical form.
- Identify similar figures.
- Solve equations with a single variable.
- Solve proportions.
- Round or estimate a number.

Understanding	Standards	**Major Learning Activities:**	Instructional Strategy:	R/R Quadrant & 21st Century:
3, 4, 5	G.SRT.6 G.SRT.7 G.SRT.8	1. Activity: Unit 4 Exit Slips ● Objective: Students will demonstrate their knowledge of daily learning objectives through these quick daily assessments. The exit slips have the students write the daily objective, rate their level of understanding, and answer a question that addresses that daily learning objective. Appendix Documents: Unit 4 Exit Slips	Setting Objectives and Providing Feedback	A,B,C Critical Thinking Creativity
4, 5	G-SRT.8	2. Activity: Fencing Your Property ● Objective: Students will use the Pythagorean Theorem to find the distance around a given property. Students will also calculate the cost of the fencing. Appendix Documents: Building a Fence	Cooperative Learning	B and D Critical Thinking, Communication, Collaboration
5	G.SRT.8	3. Activity: Pythagorean Theorem Game	Cooperative learning	C

		● Objective: Players roll two die and substitute their numbers into Pythagorean Theorem. To finish the game, a player must answer question cards correctly. The first person around the board wins. ● Appendix Documents: Pythagorean Theorem Game		Collaboration, Critical thinking
4	G.SRT.8	4. Activity: Match My Answer-Trig ● Objective: Students will solve triangles using trigonometric ratios. Students work in pairs of two. The worksheet is cut in half so one student has all of the odd problems and one student has all of the even problems. The worksheets will have the same answer but different questions. The students are to check in with each other after completing each question because the answers are aligned (i.e., #1 on A is the same as #1 on B). If the students have different answers, they need to exchange papers and work together to correct the error. ● Appendix Documents: Match My Answer-Trig	Cooperative learning	A Collaboration, Communication
1, 2	G-SRT.6 G-SRT.7	5. Activity: Trig. Sort ● Objective: Students work with a partner to establish the 3 trig equations for triangles. They will discover the relationship between sine and cosine of complementary angles. Appendix Documents: Trig. Sort	Homework and practice Cooperative learning Identifying Similarities and differences	A Collaboration,
2	G-SRT.8	6. Activity: Right Triangle Pile Up ● Objective: Students will apply trigonometric ratios and/or Pythagorean Theorem to create a design puzzle.	Homework and practice	C Creativity,

		Appendix Documents: Triangle Pile Up Trig project		Critical Thinking
1,2,3,4,5	G.SRT.10+	7. Activity: Discover Law of Sines ● Objective: Students will work in collaborative groups to discover the Law of Sines and its attributes. Appendix Documents: Law of Sines Discover	Cooperative Learning	C Critical Thinking Collaboration
1,2,3,4,5	G.SRT.11+	8. Activity: Use Law of Sines and Cosines ● Objective: Students will apply their understandings in order to use the Law of Sines and Cosines in given situations. Appendix Documents: Apply Law of Sines and Cosines	Cooperative Learning Think Pair Share	C Critical Thinking Collaboration Communication
1,2,3,4,5	G.SRT.9+ ISTE.1 ISTE.4 ISTE.6	9. Activity: Derive the Area ● Objective: Students will use geometric software to derive the Law of Sines from the area of a triangle. Appendix Documents: Derive the Area	Cooperative Learning Problem Based Learning	C Critical Thinking Collaboration Communication

UNIT RESOURCES
Teacher Resources: Glencoe Textbook Chapter 8 http://connected.mcgraw-hill.com/ Activities on Google Drive Learnzillion: http://learnzillion.com/ The Geometer's Sketchpad: http://www.keycurriculum.com/sketchpad-resources Geogebra: https://www.geogebra.org/

https://app.studyisland.com
Khan Academy - Common Core Map
Engage NY
http://www.brightstorm.com/math/
https://www.opened.com/

Student Resources:
Holt Textbook Chapter 5.7, 5.8, 8
my.hrw.com
Kahn Academy
Study Island

Vocabulary:

- Angle of Depression: The angle formed by a horizontal line and a line of sight to a point below
- Angle of Elevation: The angle formed by a horizontal line and a line of sight to a point above.
- Complementary: two measures whose angles have a sum of 90 degrees
- Cosine: In a right triangle, the cosine of angle A is the ratio of the length of the side adjacent to angle A to the length of the hypotenuse. It is the reciprocal of the secant function.
- Inverse Cosine: the measure of an angle who cosine ratio is known.
- Inverse Sine: the measure of an angle who sine ratio is known.
- Inverse Tangent: the measure of an angle who tangent ratio is known.
- Pythagorean triple: a set of three nonzero whole numbers a, b, and c such that $a^2 + b^2 = c^2$
- Sine: In a right triangle, the ratio of the length of the side opposite A to the length of the hypotenuse.
- Tangent: In a right triangle, the ratio of the length of the side opposite A to the length of the leg adjacent to A.
- Trigonometry Ratio: a ratio of two sides of a right triangle.
- Trigonometry: the study of the measurement of triangles and trigonometric functions and their applications.

Content Area: Mathematics	Course: Geometry	UNIT 5: Quadrilaterals and Coordinate Geometry and Proofs
Unit Description: Students will be able to identify, classify, and apply properties of special quadrilaterals. They will use geometric and algebraic concepts on a coordinate plane to complete proofs.	**Unit Timeline:** 15 days	

DESIRED RESULTS
Transfer Goal - ***Students will be able to independently use their learning to…*** ● Make sense of problems and persevere in solving them ● Reason abstractly and quantitatively ● Construct viable arguments and critique the reasoning of others ● Model with mathematics ● Use appropriate tools strategically ● Attend to precision ● Look for and make use of structure ● Look for and express regularity in repeated reasoning

Understandings – ***Students will understand that… (Big Ideas)***

1. In proving geometric theorems, they need to focus on the validity of the underlying reasoning while exploring a variety of formats and expressing that reasoning.
2. Algebra can be applied to geometric proofs.

Essential Questions: ***Students will keep considering…***

How can you use your prior knowledge to derive and apply properties of special quadrilaterals?
How can the coordinate plane used to measure, model, and calculate area and perimeter of polygons?

Students Will Know…	Standard	Students Will Be Able to …	Standard
● Slope, distance formula, midpoint formula, coordinate plane. ● Theorems on quadrilaterals and triangles. ● Classify and name quadrilaterals and triangles. ● Definitions of rectangle, square, kite, rhombus, trapezoid, parallelogram, circle, and triangle. ● Know congruent, angles, parallelograms, bisector, rectangle, diagonals. ● Graphing calculators and geometric software can model real life events. ● Graphing calculators and geometric software can be used to solve real-life problems and simulate real-life situations.	**G.GPE 4** G-CO.11 ISTE.1 ISTE.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, √3) lies on the circle centered at the origin and containing the point (0, 2).* ● 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*. ● Apply proven theorems to a variety of problems ● Creativity and innovation - Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. a.) Apply existing knowledge to generate new ideas, products, or processes b.) Create original works as a means of personal or group expression c.) Use models and simulations to explore complex systems and issues d.) Identify trends and forecast possibilities. ● Critical thinking, problem solving, and decision making - Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make	**G.GPE 4** G-CO.11 ISTE.1 ISTE.4

• Various functions of a graphing calculator and geometric software can be useful in differing contexts.	ISTE.6	informed decisions using appropriate digital tools and resources. a.) Identify and define authentic problems and significant questions for investigation b.) Plan and manage activities to develop a solution or complete a project c.) Collect and analyze data to identify solutions and/or make informed decisions d.) Use multiple processes and diverse perspectives to explore alternative solutionsiste.org/standards. • Technology operations and concepts - Students demonstrate a sound understanding of technology concepts, systems, and operations. a.) Understand and use technology systems b.) Select and use applications effectively and productively c.) Troubleshoot systems and applications d.) Transfer current knowledge to learning of new technologies.	ISTE.6

EVIDENCE of LEARNING			
Understanding 1. In proving geometric theorems they need to focus on the validity of the underlying reasoning while	Standards **G.GPE.4**	**Unit Performance Assessment:** **Description of Assessment Performance Task(s):** *How will students demonstrate their understanding through complex performance?* "Given vertices A(-3, 3), B(-2, 0), C(4, 2), and D(3, 5), use distance slope, and/or midpoint formulas to prove the parallelogram is a rectangle. Explain why ABCD is a rectangle." **Teacher will assess:** *What criteria will be used in each assessment to evaluate attainment of the desired results?* Students will have to show calculations to justify their reasoning. They will have to explain why the parallelogram is a rectangle using their calculations and precise vocabulary. **Performance:**	**R/R Quadrant & 21st Century:** C Critical Thinking Creativity

exploring a variety of formats and expressing that reasoning.		**Mastery:** *Students will show that they really understand when they…* 1. Use distance, slope, and midpoint formulas to classify quadrilaterals. 2. Complete the performance event with an accuracy of 75% or better. **Scoring Guide:** See "Unit 5 PE Rubric"	

SAMPLE LEARNING PLAN				
Pre-assessment: *What pre-assessments will you use to check student's prior knowledge, skill levels, and potential misconceptions?* Pretest on Google Drive Warm-ups to pre-assess students' prior knowledge. After-test questions to pre-assess students' prior knowledge for the next unit. With their prior knowledge, students should be able to: ● Draw conclusions from a given statement. ● Determine when a conclusion drawn is an incorrect conclusion. ● Plot ordered pairs on a coordinate plane to determine what kind of quadrilateral a four-sided polygon is. ● Use the Triangle Sum Theorem to find the measures of missing angles. ● Find the measure of angles using special angle pair relationships. ● Find the length of a side of a special right triangle. ● Find the slope.				
Understanding	**Standards**	**Major Learning Activities:**	**Instructional Strategy:**	**R/R Quadrant & 21st Century:**
1, 2	G.GPE.4 G.CO.11	1. Activity: Unit 5 Exit Slips ● Objective: Students will demonstrate their knowledge of daily learning objectives through these quick daily assessments. The exit slips have the students write the daily objective, rate their level of understanding, and answer a question that addresses that daily learning objective. Appendix Documents: Unit 5 Exit Slips	Setting Objectives and Providing Feedback	A,B,C Critical Thinking Creativity
2	G.GPE.4 ISTE.1 ISTE.4 ISTE.6	2. Activity: Proving Parallelograms Algebraically ● Objective: Prove algebraically using distance, midpoint, slopes a quadrilateral is a parallelogram by using one of four properties. Appendix Documents: Proving Parallelograms Algebraically	Providing Feedback, Cooperative Learning	C Collaboration

1	G-CO.11	3. Activity: Create a "family tree" of quadrilaterals. ● Objective: Students will create a family tree to represent the relationship between the special types of quadrilaterals. Students will identify the similarity and differences between the quadrilaterals. Appendix Documents: Quad family tree story	Identifying Similarities and Differences Non-linguistic Representation	A Critical Thinking, Creativity
1	G-CO.11	4. Activity: Quadrilaterals Notes ● Objective: Students fill out a booklet of notes on the properties of specific quadrilaterals. They will draw pictures and write about the properties. This will help them to distinguish which quadrilateral has each property. Appendix Documents: Chapter 6 Polygons-NOTES	Summarizing and note-taking Identifying similarities and differences	A Creativity
1	G.GPE.4	5. Activity: Quadrilateral Dominoes ● Objective: Students will use their knowledge of shapes and properties of quadrilaterals to play a game of dominoes. Appendix Documents: Quadrilateral Dominoes	Cooperative Learning	A, C Collaboration

UNIT RESOURCES
Teacher Resources: Glencoe Textbook Chapter 6 http://connected.mcgraw-hill.com/ Activities on Google Drive Learnzillion: http://learnzillion.com/ The Geometer's Sketchpad: http://www.keycurriculum.com/sketchpad-resources GeoGebra: https://www.geogebra.org/

https://app.studyisland.com
Khan Academy - Common Core Map
Engage NY
http://www.brightstorm.com/math/
https://www.opened.com/

Student Resources:
Holt Textbook Chapter 6 and 4.7
my.hrw.com
Kahn Academy
Study Island

Vocabulary:

- Area: The number of nonoverlapping unit squares of a given size that will exactly cover the interior of a plane figure.
- Coordinate plane: A plane that is divided into four regions by a horizontal line called the x-axis and a vertical line called the y-axis.
- Diagonal: a segment connecting two nonconsecutive vertices of a polygon.
- Distance: Length. The absolute value of the difference of the coordinates of the points.
- Isosceles trapezoid: a trapezoid in which the legs are congruent.
- Kite: a quadrilateral with exactly two pairs of congruent consecutive sides.
- Midpoint: the point that divides a segment into two congruent segments.
- Parallel lines: Lines in the same plane that do not intersect.
- Parallelogram: a quadrilateral with two pairs of parallel sides.
- Perimeter: the sum of the side lengths of a closed plane figure.
- Perpendicular: intersecting to form 90 degree angles
- Polygon: a closed plane figure formed by three or more segments such that each segment intersects exactly two other segments only at their endpoints and no two segments with a common endpoint are collinear.
- Quadrilateral: a four-sided closed plane figure
- Ratio: a comparison of two quantities by division.
- Rectangle: a quadrilateral with four right angles
- Rhombus: a quadrilateral with four congruent sides
- Slope: a measure of the steepness of a line.

- Square: A quadrilateral with four congruent sides and four right angles.
- Trapezoid: A quadrilateral with exactly one pair of parallel sides.
- Triangle: a three-sided polygon.

Content Area: Mathematics	**Course: Geometry**	**UNIT 6: 2D vs. 3D**
Unit Description: Students will be able to solve problems using the area and perimeter of two-dimensional polygons. Students will be able to solve problems using the surface area and volume of three-dimensional prisms, cylinders, pyramids, cones, spheres, and similar solids.	**Unit Timeline:** 18 days	

DESIRED RESULTS
<u>Transfer Goal</u> - *Students will be able to independently use their learning to…* ● Make sense of problems and persevere in solving them ● Reason abstractly and quantitatively ● Construct viable arguments and critique the reasoning of others ● Model with mathematics ● Use appropriate tools strategically ● Attend to precision

- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Understandings – ***Students will understand that… (Big Ideas)***

2. Real life objects can be modeled using two dimensional and three dimensional geometric shapes.
3. There is a relationship between two and three dimensional shapes.
4. Perimeter, area and volume of two dimensional and three dimensional shapes can be derived.
5. Volume formulas are useful for solving real-world problems.
6. Volume formulas can be used to solve for multiple variables.
7. Geometric constructions can be created using a variety of tools.
8. Density utilizes concepts of the area and volume of two dimensional and three dimensional figures.
9. The area or perimeter of a figure can be found by applying geometric concepts to points on a coordinate plane.

Essential Questions: ***Students will keep considering…***

How can two-dimensional figures be used to understand three-dimensional objects?
Where did area and volume formulas come from?
How can geometric figures be used in real-life area and volume situations?

Students Will Know…	Standard	Students Will Be Able to …	Standard
● Know two and three dimensional shapes properties. ● Recognize two dimensional and three dimensional shapes in real life situations.	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.1
● Two and three dimensional area and volume formulas. ● Know proportions, density, and unit analysis. ● Calculate area and volume of two-dimensional and three-dimensional shapes, and apply it to density problems.	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-MG.2
● Calculate surface area and lateral area.		● Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical	G-MG.3

	G-MG.3	constraints or minimize cost; working with typographic grid systems based on ratios).	
● Formulas for area, surface area, and volume of two-dimensional and three-dimensional shapes, and apply them in real-world contexts.	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*. ● Use Cavalieri's principles with cross sections of cylinders, pyramid, and cones to compare the volumes.	G-GMD.1
● Volume and area formulas. ● Volume formulas for cylinders, pyramids, spheres, cones. ● Area formulas for rectangles, circles, and triangles.	**G-GMD. 3**	● **Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.** ● **Use volume formulas to solve problems in a real-world context.** ● **Solve for a missing variable in a formula given the volume.**	**G-GMD. 3**
● Names of two and three dimensional shapes. ● Definition of cross-section and rotation.	G-GMD.4	● Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. ● Draw/visualize the cross-sections created when two-dimensional shapes intersect three-dimensional shapes. ● Determine the different cross-sections created when cutting the three-dimensional shape at various angles. ● Identify the three dimensional objects generated by rotations of two dimensional objects.	G-GMD.4

• Know equilateral triangles, square, regular hexagon, inscribed angles, and circle. • Formulas for distance, area formulas, and perimeter. • Simplify radicals. • Identify polygons. • Graphing calculators and geometric software can model real life events. • Graphing calculators and geometric software can be used to solve real-life problems and simulate real-life situations.	G.CO.13 G-GPE.7 ISTE.1 ISTE.4 ISTE.6	• Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle. • Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. • Creativity and innovation - Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. a.) Apply existing knowledge to generate new ideas, products, or processes b.) Create original works as a means of personal or group expression c.) Use models and simulations to explore complex systems and issues d.) Identify trends and forecast possibilities. • Critical thinking, problem solving, and decision making - Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. a.) Identify and define authentic problems and significant questions for investigation b.) Plan and manage activities to develop a solution or complete a project c.) Collect and analyze data to identify solutions and/or make informed decisions d.) Use multiple processes and diverse perspectives to explore alternative solutions.	G.CO.13 G-GPE.7 ISTE.1 ISTE.4

• Various functions of a graphing calculator and geometric software can be useful in differing contexts.		• Technology operations and concepts - Students demonstrate a sound understanding of technology concepts, systems, and operations. a.) Understand and use technology systems b.) Select and use applications effectively and productively c.) Troubleshoot systems and applications d.) Transfer current knowledge to learning of new technologies.	ISTE.6

EVIDENCE of LEARNING			
Understanding 1. Volume formulas can be used to solve for multiple variables.	Standards **G.GMD.3**	**Unit Performance Assessment:** **Description of Assessment Performance Task(s):** *How will students demonstrate their understanding through complex performance?* Students will find the volume of a pyramid given a picture. Students will find the volume of a composite figure consisting of a rectangular prism and cylinder. Students will determine the volume of a sphere given the surface area. Students will have to determine the height of a cone given the volume and radius. **Teacher will assess:** *What criteria will be used in each assessment to evaluate attainment of the desired results?* The teacher will assess if the students are able to set up the formulas and calculate volume correctly. **Performance:** **Mastery:** *Students will show that they really understand when they…* 1. Become fluent in using the volume formulas including being able to solve problems where they must work backwards. 2. Complete the performance event with an accuracy of 75% or better. **Scoring Guide:**	**R/R Quadrant & 21st Century:** C Critical Thinking

		See "Unit 6 PE Rubric"	

SAMPLE LEARNING PLAN				
Pre-assessment: *What pre-assessments will you use to check student's prior knowledge, skill levels, and potential misconceptions?* Pretest on Google Drive Warm-ups to pre-assess students' prior knowledge. After-test questions to pre-assess students' prior knowledge for the next unit. With their prior knowledge, students should be able to: ● Solve equations for a given variable. ● Convert units of measure. ● Find the length of the hypotenuse of a right triangle.				
Understanding	**Standards**	**Major Learning Activities:**	**Instructional Strategy:**	**R/R Quadrant & 21st Century:**
1, 2, 4, 5	G-MG.1 G-MG.2 G-MG.3 G-GMD.1 **G-GMD.3** G-G.MD.4 G.CO.13 G-GPE.7	1. Activity: Unit 6 Exit Slips ● Objective: Students will demonstrate their knowledge of daily learning objectives through these quick daily assessments. The exit slips have the students write the daily objective, rate their level of understanding, and answer a question that addresses that daily learning objective. Appendix Documents: Unit 6 Exit Slips	Setting Objectives and Providing Feedback	A,B,C Critical Thinking Creativity
1, 2 ,4	G.GMD.3	2. Activity: Popcorn, Anyone? ● Objective: Students will discover the relationship between dimension and volume using rectangles and cylinders. Appendix Documents: Popcorn-AS Comparing Cylinders Popcorn-AS Cylinders	Cooperative learning	B Creavity, critical thinking Collaboration, Communication

		Popcorn-AK Cylinders		
1,2,4,5,7	G-MG.1 G - MG.2 G - MG.3 ISTE.1 ISTE.4 ISTE.6	3. Activity: How big is the Guatemalan sinkhole? ● Objective: Students will: ○ Recognize volume of solid figure ○ Understand concepts of volume measurement. ○ Use geometric shapes and their properties to describe objects. ○ Use formula for volume of cylinder to solve real world problems. Appendix Documents: How big is the 2010 Guatemalan sinkhole?	Generating and Testing Hypothesis, Summarizing and Notetaking	B, D Critical Thinking, Communication, Collaboration
1, 2, 4	G-MG.3; G-GMD.3 ISTE.1 ISTE.4 ISTE.6	● Activity: Geometry Juice Box Container ● Objective: Students will work with a partner. They are in charge of designing containers for a new brand of juice. "Your company wants you to compare different container shapes, so you and your partner will come up with separate designs on your own. You will then compare the two to determine which juice container is the best to present to your company. The container must be a reasonable size, but can be any three-dimensional shape." This project includes research online, drawing a net, using dimensions to calculate surface area and volume, and typing an explanation. Appendix Documents: Geometry Juice Box Container.docx	Generating and Testing Hypotheses; Cooperative learning	D Creativity; Collaboration; Communication; Critical thinking
1, 4	G.GMD.3	● Activity: Castle Problem ● Objective: Students will apply surface area and volume formulas for cylinders, pyramids, cones and spheres to solve a real world problem. Appendix Documents: Castle Problem	Critical Thinking	B Critical Thinking

UNIT RESOURCES
Teacher Resources: Glencoe Textbook Chapter 1.7 Lab, 11.1, 11.2, 11.4, 12 http://connected.mcgraw-hill.com/ Activities on Google Drive Learnzillion: http://learnzillion.com/ The Geometer's Sketchpad: http://www.keycurriculum.com/sketchpad-resources GeoGebra: https://www.geogebra.org/ https://app.studyisland.com Khan Academy - Common Core Map Engage NY http://www.brightstorm.com/math/ https://www.opened.com/
Student Resources: Holt Textbook Chapter 10 my.hrw.com Kahn Academy Study Island
Vocabulary: ● Cone: A three-dimensional figure with a circular base and a curved lateral surface that connects the base to a point called the vertex. ● Cylinders: A three-dimensional figure with two parallel circular bases and a curved lateral surface that connects the bases. ● Prism: A polyhedron formed by two parallel congruent polygonal bases connected by lateral faces that are parallelograms. ● Pyramid: A polyhedron formed by a polygonal base and triangular lateral faces that meet at a common vertex. ● similar solids: solids with the same shape, but not necessarily the same size. ● spheres: The set of points in space that are a fixed distance from a given point called the center of the sphere. ● Surface area: The total area of all faces and curved surfaces of a three-dimensional figure. ● Volume: The number of non-overlapping unit cubes of a given size that will exactly fill the interior of a three-dimensional figure.

Content Area: Mathematics	Course: Geometry	UNIT 7: Circles and Parabolas
Unit Description: Students will be able to use arc length and other measurements to determine that all circles are similar. The proportionality of the length of an arc intercepted by an angle to the radius will be discovered. Students will learn the origin of radians and its role as the constant of proportionality. Students will establish the numerical relationship between arcs and angles of a circle and to provide ways of calculating segments related to circles. The area of a sector will be derived. Students will be able to connect the equation of a circle and parabola to the quadratic equation and Pythagorean Theorem. Students will use the coordinate plane to determine if a given point is on a circle.	**Unit Timeline:** 14 days	

DESIRED RESULTS
<u>Transfer Goal</u> - *Students will be able to independently use their learning to…* ● Make sense of problems and persevere in solving them

- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Understandings – ***Students will understand that… (Big Ideas)***

1. Circles are similar and therefore, useful ratios are created.
2. Segments drawn in circles create relationships between arcs and angles.
3. Polygons can be constructed in and around circles.
4. The equation of a circle can be derived from Pythagorean Theorem and that they can change from standard form to vertex form by completing the square.
5. Given a focus and directix they can derive the equation of a parabola.

Essential Questions: ***Students will keep considering…***

Why are all circles similar?
How can the arc length and area of sector formulas be derived using similarity?
What are radians and how were they derived?
What are the relationships between parts of a circle?
Can those relationships be used to find unknown parts of a circle?
How can the equations of circles and parabolas be derived using the Pythagorean Theorem?
How can coordinate geometry be used to solve real-life problems?

Students Will Know…	Standard	Students Will Be Able to …	Standard

● Definitions of chords, tangent, arc measure, inscribed angle, central angle, diameter, secant, and arc length. ● Find arc measure and arc length.	**G-C.2**	● **Identify and describe relationships among inscribed angles, radii, and chords.** ***Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*** ● **Use relationships between diameter, radii, chords, tangents, and secants to find angles and arcs.** ● **Find measure of inscribed, central, and circumscribed angles and their intercepted arcs.** ● **Use relationships to find segments lengths.**	**G-C.2**
● Find circumference and area of a circle. ● Definition of arc, arc length, and sector.	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. ● Find arc length of a sector. ● Measure several radii and arc lengths and compare their proportionality. ● Compare full circle to part of a circle. ● Derive the formula for the area of a sector. ● Apply area of a sector to a wide variety of problems.	G-C.5
		● Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to	

● Formulas for distance and Pythagorean Theorem. ● Properties of radicals. ● Completing the square to find the center and radius of a circle. ● Factoring	G-GPE.1	find the center and radius of a circle given by an equation. ● Manipulate the equations of circles from vertex to standard form. ● Derive and find the equation of a parabola given a focus and directrix. ● Creativity and innovation - Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. a.) Apply existing knowledge to generate new ideas, products, or processes b.) Create original works as a means of personal or group expression c.) Use models and simulations to explore complex systems and issues d.) Identify trends and forecast possibilities. ● Critical thinking, problem solving, and decision making - Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. a.) Identify and define authentic problems and significant questions for investigation b.) Plan and manage activities to develop a solution or complete a project c.) Collect and analyze data to identify solutions and/or make informed decisions d.) Use multiple processes and diverse perspectives to explore alternative solutions.	G-GPE.1 G-GPE.2 ISTE.1 ISTE.4
● Standard form and vertex form.	G-GPE.2		
● Graphing calculators and geometric software can model real life events.	ISTE.1		
● Graphing calculators and geometric software can be used to solve real-life problems and simulate real-life situations.	ISTE.4		

● Various functions of a graphing calculator and geometric software can be useful in differing contexts.	ISTE.6	● Technology operations and concepts - Students demonstrate a sound understanding of technology concepts, systems, and operations. a.) Understand and use technology systems b.) Select and use applications effectively and productively c.) Troubleshoot systems and applications d.) Transfer current knowledge to learning of new technologies.	ISTE.6

<table>
<tr><th colspan="4">EVIDENCE of LEARNING</th></tr>
<tr>
<td>Understanding
1. Segments drawn in circles create relationships between arcs and angles.</td>
<td>Standards
G.C.2</td>
<td><u>Unit Performance Assessment</u>:
Description of Assessment Performance Task(s):
How will students demonstrate their understanding through complex performance?
Students will identify the parts of a circle given vocabulary to match to a diagram. Students will use the properties of circles to solve for variables in diagrams. These problems include finding the measure of inscribed angles, arcs, and the length of the radius.

Teacher will assess:
What criteria will be used in each assessment to evaluate attainment of the desired results?
The teacher will assess if students can correctly identify the parts of a circle such as the radius, diameter, chord, tangent line, secant, inscribed angle, and central angle. The teacher will evaluate the student's ability to set up and solve formulas using the properties of circles.

<u>Performance:</u>
Mastery:
Students will show that they really understand when they…
1. Correctly identify the parts of a circle.
2. Solve for variables in circle diagrams using the properties of circles and relationships between angles and arcs.
3. Ccomplete the performance event with an accuracy of 75% or better.

Scoring Guide:
See "Unit 7 PE Rubric"</td>
<td><u>R/R Quadrant & 21st Century:</u>

A
Creativity</td>
</tr>
</table>

SAMPLE LEARNING PLAN				
Pre-assessment: *What pre-assessments will you use to check student's prior knowledge, skill levels, and potential misconceptions?* Pretest on Google Drive Warm-ups to pre-assess students' prior knowledge. After-test questions to pre-assess students' prior knowledge for the next unit. With their prior knowledge, students should be able to: ● Solve equations for a given variable. ● Solve quadratic equations by taking the square root.				
Understanding	**Standards**	**Major Learning Activities:**	**Instructional Strategy:**	**R/R Quadrant & 21st Century:**
2	**G-C.2**	1. Activity: Unit 7 Exit Slips ● Objective: Students will demonstrate their knowledge of daily learning objectives through these quick daily assessments. The exit slips have the students write the daily objective, rate their level of understanding, and answer a question that addresses that daily learning objective. Appendix Documents: Unit 7 Exit Slips	Setting Objectives and Providing Feedback	B,C Critical Thinking Creativity
5	G.C.2 ISTE.1 ISTE.4 ISTE.6	2. Activity: Exploring The Parabola ● Objective: Write the equation of a parabola with the vertex at (h,k) and axis of symmetry x= h, or y=k and graph it. Derive the equation of any parabola using the focus-directrix definition. Appendix Documents: Exploring The Parabola_Teacher.pdf	Cooperative learning	B Collaboration, communication
1,3	G-C.5	3. Activity: Applications of Sectors and Arc Length	Similarities and Differences	B, C Critical Thinking

		• Objective: Students will apply their knowledge of sectors and arc length to solve real world problems. Appendix Documents: Applications	Homework and Practice	
2	G.C.2	4. Activity: What is the difference? • Objective: Students will compare and contrast the differences between the measure and lengths of the arcs of circles. Students will compare and contrast the differences between the measure of an arc given a central angle and an inscribed angle. The teacher will assign cooperative learning roles for the students to share their answers. Appendix Documents: What is the difference PowerPoint	Identifying Similarities and Differences Cooperative Learning	C Communication Critical Thinking
2	G.C.2 ISTE.1 ISTE.4 ISTE.6	5. Activity: Circles Geogebra Lab • Objective: Students will discover tangent lines perpendicular to the radius and congruent segments from a point outside a circle to the tangent points on a circle using geometry software. Appendix Documents: Circles Geogebra Lab	Summarizing and Note-Taking	C Communication Critical Thinking

UNIT RESOURCES
Teacher Resources: Glencoe Textbook Chapter 11.3, 10 http://connected.mcgraw-hill.com/ Activities on Google Drive Learnzillion: http://learnzillion.com/ The Geometer's Sketchpad: http://www.keycurriculum.com/sketchpad-resources GeoGebra: https://www.geogebra.org/

https://app.studyisland.com
Khan Academy - Common Core Map
Engage NY
http://www.brightstorm.com/math/
https://www.opened.com/

Student Resources:
Holt Textbook Chapter 11
my.hrw.com
Kahn Academy
Study Island

Vocabulary:

- Adjacent arcs- Two arcs of the same circle that intersect at exactly one point.
- Arc- An unbroken part of a circle consisting of two points on the circle, called the endpoints, and all the points on the circle between them.
- Arc Length- The distance along an arc measured in linear units.
- central angle- An angle whose vertex is the center of a circle.
- Chord- A segment whose endpoints lie on a circle.
- Conic- A plane figure formed by the intersection of a double right cone and a plane. Examples include circles, ellipses, hyperbolas, and parabolas.
- Diameter- A segment that has endpoints on the circle and that passes through the center of the circle.
- Directrix- A fixed line used to define a parabola. Every point on the parabola is equidistant from the directrix and a fixed point called the focus.
- Ellipse- The set of all points P in a plane such that the sum of the distances from P to two fixed points F1 and F2, called the foci, is constant.
- Focus- A fixed point used with a directrix to define a parabola.
- inscribed angle- an angle whose vertex is on a circle and whose sides contain chords of the circle.
- major arc- An arc of a circle whose points are on or in the exterior of a central angle.
- minor arc- An arc of a circle whose points are on or in the interior of a central angle.
- Parabola- The shape of the graph of a quadratic function. Also, the set of points equidistant from the focus and directrix.

- Radius- A segment whose endpoints are the center of a circle and a point on the circle; the distance from the center of a circle to any point on the circle.
- secant- A line that intersects a circle at two points.
- Sector- A region inside a circle bounded by two radii of the circle and their intercepted arc.
- Segment- A region inside a circle bounded by a chord and an arc.
- Semicircle- An arc of a circle whose endpoints lie on a diameter.
- Tangent- A line that is in the same plane as a circle and intersects the circle at exactly one point.

Content Area: Mathematics	**Course: Geometry**	**UNIT 8: Probability**
Unit Description: Students will be able to identify sample space and subsets using characterizes of the outcomes. Students will be able to determine if two events are independent. Students will calculate and interpret conditional probability. Students will create and interpret two-way tables. Students will be able to apply the addition rule of probability.	**Unit Timeline: 6 days**	

DESIRED RESULTS
Transfer Goal - ***Students will be able to independently use their learning to…***
• Make sense of problems and persevere in solving them
• Reason abstractly and quantitatively
• Construct viable arguments and critique the reasoning of others

- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Understandings – ***Students will understand that… (Big Ideas)***

1. Independence and conditional probability can be used to interpret data.
2. Different probability formulas can be used to calculate and interpret real world problems.

Essential Questions: ***Students will keep considering…***

What is a sample space and how do you represent it?
When do you use permutations and combinations with probability?
What does it mean to be independent, dependent, and mutually exclusive?

Students Will Know…	Standard	Students Will Be Able to …	Standard
• Appropriate symbols of union, intersection and complement. • Union (“or”) of an event, intersection (“and”) of two events. • Find the complement (“not”) of an event. • Identify sample space and events within a sample space. • Identify subsets from within the sample space.	**S-CP.1**	• **Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").**	**S-CP.1**
• Definitions of independent events and conditional probability. • Recognize and explain the concepts of conditional probability and independence in a real life setting.	**S-CP.2**	• **Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.** • **Determine if two events are independent.**	**S-CP.2**
• Apply the multiplication principle.	S-CP.3	• Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P*(*B*), and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*. • Use multiplication principle to calculate conditional probabilities.	S-CP.3
		• Construct and interpret two-way frequency tables of data when two categories are associated with each object	

● Definitions of disjoint events, mutually exclusive events. ● Define conditional probability and independence.	S-CP.4 S-CP.5 **S-CP.6**	being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.* ● Calculate probabilities from two-way tables. ● Use probabilities from two-way tables. ● Use probabilities from the table to evaluate interdependence. ● Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.* ● **Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model.** ● **Calculate and interpret conditional probability formula.** ● Apply the Addition Rule, P(A or B) = P(A) + P(B) - P(A and B), and interpret the answer in terms of the model. ● Calculate and interpret probabilities using addition rule of probability.	S-CP.4 ISTE.1 S-CP.5 **S-CP.6**

• **Calculate conditional probability and explain.** • Addition rule of probability. • Multiplication rule of probability, conditional probability, independent events. • Different probability formulas can use be used to calculate and interpret real world phenomena. • Factorials, combination, permutation. • Formulas to calculate probabilities of a combination, permutation. • Different probability formulas can use be used to calculate and interpret real world phenomena. • Definition of random. • How to use a random number generator.	S-CP.7 S-CP.8+ S-CP.9+ S-MD.6+ S-MD.7+	• Calculate and interpret a probability using the multiplication rule. • Determine the difference between a permutation and a combination. • Calculate probabilities using the appropriate permutation or combination formula. • Understand factors that make decisions fair and random (toss a die, flip a coin, use a spinner). • Use multiplication rule to find the intersection of independent events $P(A \cap B)=P(A) \bullet P(B)$. • Use addition rule to find probabilities (with Venn diagrams for example) of AND and OR events. • Analyze decisions and strategies using probability concepts. • Creativity and innovation - Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. a.) Apply existing knowledge to generate new ideas, products, or processes b.) Create original works as a means of personal or group expression c.) Use models and simulations to explore complex systems and issues d.) Identify trends and forecast possibilities.	S-CP.7 S-CP.8+ S-CP.9+ S-MD.6+ S-MD.7+ ISTE.1 ISTE.4

● Graphing calculators and geometric software can model real life events. ● Graphing calculators and geometric software can be used to solve real-life problems and simulate real-life situations. ● Various functions of a graphing calculator and geometric software can be useful in differing contexts.	ISTE.1 ISTE.4 ISTE.6	● Critical thinking, problem solving, and decision making - Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. a.) Identify and define authentic problems and significant questions for investigation b.) Plan and manage activities to develop a solution or complete a project c.) Collect and analyze data to identify solutions and/or make informed decisions d.) Use multiple processes and diverse perspectives to explore alternative solutions. ● Technology operations and concepts - Students demonstrate a sound understanding of technology concepts, systems, and operations. a.) Understand and use technology systems b.) Select and use applications effectively and productively c.) Troubleshoot systems and applications d.) Transfer current knowledge to learning of new technologies.	ISTE.6

EVIDENCE of LEARNING			
Understanding	Standards	**Unit Performance Assessment:** **Description of Assessment Performance Task(s):** *How will students demonstrate their understanding through complex performance?* 1. Given a set of different outcomes students will need to identify the correct subset described. 2. Students will determine the probability of an event given a table. **Teacher will assess:** *What criteria will be used in each assessment to evaluate attainment of the desired results?* 1. The teacher will assess if students can pick out a subset from a given set. 2. The teacher will assess if students can determine the total set and partial set from given data and calculate the percent correctly. **Performance:** **Mastery:** *Students will show that they really understand when they…* Complete the performance event with an accuracy of 75% or better. **Scoring Guide:** See "Unit 8 PE Rubric"	**R/R Quadrant & 21st Century:** B Critical Thinking
1.Independence and conditional probability can be used to interpret data. 2. Different probability formulas can be used to calculate and interpret real world problems.	**S.CP.1** **S.CP.6**		

SAMPLE LEARNING PLAN
Pre-assessment: *What pre-assessments will you use to check student's prior knowledge, skill levels, and potential misconceptions?* Pretest on Google Drive Warm-ups to pre-assess students' prior knowledge. After-test questions to pre-assess students' prior knowledge for the next unit. With their prior knowledge, students should be able to: ● Determine percentages from a table of data. ● Create a table of data and determine percentages for various categories of the data. ● Express experimental probability as a fraction, decimal, and percent.

Understanding	Standards	**Major Learning Activities:**	Instructional Strategy:	R/R Quadrant & 21st Century:
1	S.CP.1	1. Activity: Conditional Probability Activity ● Objective: Students predict the probability of drawing out two items of the same color in a row. Appendix Documents: Conditional Probability Activity	Cooperative learning	A Collaboration
1,2	S- CP.1, S-CP.3	2. Activity: M&M, Coin and Dice activity ● Objective: Students will determine the sample space and probability using a variety of experiments. Appendix Documents: Probability, M&M and dice activity	Cooperative Learning, Summarizing and Notetaking	A, B Communication, Collaboration
1	S.CP.1 ISTE.1 ISTE.4 ISTE.6	3. Activity: Interactive Conditional Probability & Probability of simultaneous Events ● Objective: Students will take a closer look at conditional probability and learn the formula for probability of simultaneous independent events using interactive software. Appendix Documents: Interactive Conditional Probability & Probability of simultaneous Events	cooperative learning	A Collaboration

UNIT RESOURCES
Teacher Resources: Glencoe Textbook Chapter 13 http://connected.mcgraw-hill.com/ Activities on Google Drive

Learnzillion: http://learnzillion.com/
The Geometer's Sketchpad: http://www.keycurriculum.com/sketchpad-resources
GeoGebra: https://www.geogebra.org/
https://app.studyisland.com
Khan Academy - Common Core Map
Engage NY
http://www.brightstorm.com/math/
https://www.opened.com/

Student Resources:
Kahn Academy
Study Island

Vocabulary:

- Compound Event- An event made up of two or more simple events.
- Conditional Probability- The probability of event *B*, given that event *A* has already occurred or is certain to occur; used to find probability of dependent events.
- Dependent Events- Events for which the occurrence or nonoccurrence of one event affects the probability of the other event.
- Independent Events- Events for which the occurrence or non-occurrence of one event does not affect the probability of the other event.
- Sample Space- The set of all possible outcomes of a probability experiment.
- Theoretical Probability- The ratio of the number of equally likely outcomes in an event to the total number of possible outcomes.