Pojoaque Valley Schools

Math CCSS Pacing Guide

Geometry

**Skills adapted from*
Kentucky Department of Education
Math Deconstructed Standards
*** Evidence of attainment/assessment, Vocabulary, Knowledge, Skills and Essential Elements adapted from Wisconsin Department of Education and Standards Insights Computer-Based Program*

Version 3

2014-2015

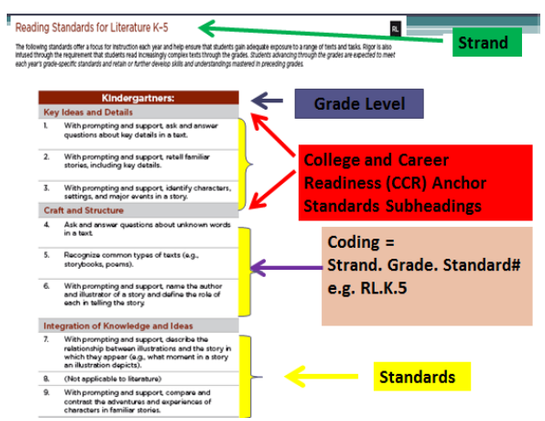
Pojoaque Valley Schools
ELA Common Core Pacing Guide Introduction

The Pojoaque Valley Schools pacing guide documents are intended to guide teachers' use of Common Core State Standards (CCSS) over the course of an instructional school year. The guides identify the **focus standards by quarter.** Teachers should understand that the **focus standards** emphasize deep instruction for that timeframe. However, because a certain quarter does not address specific standards, it should be understood that previously taught standards should be reinforced while working on the focus standards for any designated quarter. Some standards will **recur** across all quarters due to their importance and need to be addressed on an ongoing basis.

The CCSS are not intended to be a check-list of knowledge and skills but should be used as an integrated model of literacy instruction to meet end of year expectations.

The English Language Arts CCSS pacing guides contain the following elements:

- **College and Career Readiness (CCR) Anchor Standard**
- **Strand:** Identify the type of standard
- **Cluster:** Identify the sub-category of a set of standards.
- **Grade Level**: Identify the grade level of the intended standards
- **Standard:** Each grade-specific standard (as these standards are collectively referred to) corresponds to the same-numbered CCR anchor standard. Put another way, each CCR anchor standard has an accompanying grade-specific standard translating the broader CCR statement into grade-appropriate end-of-year expectations.
- **Standards Code:** Contains the strand, grade, and number (or number and letter, where applicable), so that RI.4.3, for example, stands for Reading, Informational Text, grade 4, standard 3
- **Skills and Knowledge:** Identified as subsets of the standard and appear in one or more quarters. Define the skills and knowledge embedded in the standard to meet the full intent of the standard itself.



Version 2 of the Pojoaque Valley School District Pacing guides for Reading Language Arts and Mathematics are based on the done by staff and teachers of the school district using the Kentucky model, and a synthesis of the excellent work done by Wisconsin Cooperative Educational Service Agency 7 (CESA 7) School Improvement Services, Green Bay, WI. (2010), *Standards Insight project.*

Standards Insight was developed to give educators a tool for in depth investigation of the Common Core State Standards (CCSS). The CCSS are "unpacked" or dissected, identifying specific knowledge, skills, vocabulary, understandings, and evidence of student attainment for each standard. *Standards Insight* may be used by educators to gain a thorough grasp of the CCSS or as a powerful collaborative tool supporting educator teams through the essential conversations necessary for developing shared responsibility for student attainment of all CCSS. . . . serves as a high-powered vehicle to help educators examine the standards in a variety of ways.

The Version 2 Pojoaque Valley School District Pacing guides present the standard with levels of detail and then the necessary skills by quarter based on the Kentucky model. On the second page for each standard, the synthesis of the *Standards Insight* project is presented in a way that further defines and refines the standard such that teachers may use the information to refine their teaching practices.

Based on this synthesis of work and the purpose for the unpacking, the following fields were selected as most helpful to aid in understanding of the Common Core Standards that will lead to shifts in instruction:

1. Evidence of Student Attainment: "What could students do to show attainment of the standard?"

2. Vocabulary: "What are key terms in the standard that are essential for interpretation and understanding in order for students to learn the content?"

3. Knowledge: "What does the student need to know in order to aid in attainment of this standard?"

4. Skills and Understanding: "What procedural skill(s) does the student need to demonstrate for attainment of this standard?", and "What will students understand to attain the standard?"

The following fields are included in Version 2:

Evidence of Student Attainment: This field describes what the standard may look like in student work. Specific expectations are listed in performance terms showing what students will say or do to demonstrate attainment of the standard.

Standards Vocabulary: This field lists words and phrases specific to each standard. Shared interpretation and in depth understanding of standards vocabulary are essential for consistent instruction across and within grade levels and content areas.

Knowledge: The knowledge field lists what students will need to know in order to master each standard (facts, vocabulary, definitions).

Skills and Understanding: The skills field identifies the procedural knowledge students apply in order to master each standard (actions, applications, strategies), as well as the overarching understanding that connects the standard, knowledge, and skills. Understandings included in *Standards Insight* synthesize ideas and have lasting value.

Instructional Achievement Level Descriptors: This field lists, by level what a teacher can expect to see in a student who achieves at a particular level. Additionally teachers can use this filed to differentiate instruction to provide further growth for student's in moving from one level to another. This field can be used to provide specific teaching approaches to the standard in question.

A Note About High School Standards: The high school standards are listed in conceptual categories. Conceptual categories portray a coherent view of high school instruction that crosses traditional course boundaries. We have done everything possible, with teacher input, to link individual standards to the appropriate pacing guides,

References to Tables: References to tables within the standards in the *Standards Insight* tool refer to Tables 1-5 found in the glossary of the Mathematics Common Core State Standards document found at www.corestandards.org.

Quarterly View of Standards **Geometry Pacing Guide** **Quarter**	**1**	**2**	**3**	**4**
G.CO.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment based on the undefined notions of a point, line and distance along a line and distance around a circular arc.	**X**			**X**
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)	**X**			
G.CO.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.	**X**			
G.CO.4 Develop definitions of rotations, reflections and translations in terms of angles, circles, perpendicular lines, parallel lines and line segments.	**X**			
G.CO.5 Given a geometric figure and a rotation, reflection or translation, draw the transformed figure using, e.g. graph paper, tracing paper or geometry software. Specify a sequence of transformations that will carry a given figure onto another.	**X**			
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.	**X**			
G.CO.8 Explain how the criteria for triangle congruence (ASA, SAS, SSS) follow from the definition of congruence in terms of rigid motions.	**X**			
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.*	**X**			
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.	**X**			
G.CO.11. Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.*		**X**		
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.*	**X**	**X**	**X**	**X**
Quarter	**1**	**2**	**3**	**4**
G.CO.13 Construct an equilateral triangle, a square and a regular hexagon inscribed in a circle.				**X**
G.SRT.1a Verify experimentally the properties of dilations given by a center and a scale factor. a. A dilation takes a line not passing through the center of the		**X**		

dilation to a parallel line, and leaves a line passing through the center unchanged.				
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.		**X**		
G.SRT.1b Verify experimentally the properties of dilations given by a center and a scale factor. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.		**X**		
G.SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.		**X**		
G.SRT.4 Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.		**X**		
G.SRT.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.		**X**		
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.		**X**		
G.SRT.7 Explain and use the relationship between the sine and cosine of complementary angles.		**X**		
G.SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.		**X**		
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).* (*Modeling Standard)		**X**		
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).* (*Modeling Standard)				**X**
G.MG.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).*(*Modeling Standard)		**X**		
G.SRT.9 (+) Derive the formula A = 1/2 ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.		**X**		
G.SRT.10 (+) Prove the Laws of Sines and Cosines and use them to solve problems.		**X**		
Quarter	**1**	**2**	**3**	**4**
G.SRT.11 (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).		**X**		

G.GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.*(*Modeling Standard)			**X**	
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.			**X**	
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).*(*Modeling Standard)			**X**	
G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).			**X**	
G.GPE.7 Use coordinates to compute perimeters of polygons and area of triangles and rectangles, e.g., using the distance formula.*(*Modeling Standard)			**X**	
G.GPE.2 Derive the equation of a parabola given a focus and directrix.				**X**
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).			**X**	
G.C.1 Prove that all circles are similar.				**X**
G.GPE.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.			**X**	
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.				**X**
G.C.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.				**X**
G.C. 4 (+) Construct a tangent line from a point outside a given circle to the circle.				**X**
G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0,2).*				**X**
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.				**X**
Quarter	**1**	**2**	**3**	**4**
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”). Statistics and Probability is a Modeling Conceptual Category.				**X**

G.GPE.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.				**X**
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).*(*Modeling Standard)				**X**
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. Statistics and Probability is a Modeling Conceptual Category.				**X**
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. Statistics and Probability is a Modeling Conceptual Category.				**X**
S.CP. 4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *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 10^{th} grade. Do the same for other subjects and compare the results. Statistics and Probability is a Modeling Conceptual Category.*				**X**
S.CP.5 Recognizeandexplaintheconceptsofconditionalprobabilityandindependenceineverydaylanguageand 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. Statistics and Probability is a Modeling Conceptual Category.*				**X**
S.CP.6 Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A and interpret the answer in terms of the model. Statistics and Probability is a Modeling Conceptual Category.				**X**
S.CP.7 Apply the Additional Rule, P(A or B) = P(A) + P(B) – P(A and B) and interpret the answer in terms of the model. Statistics and Probability is a Modeling Conceptual Category.				**X**
S.CP.8 (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model. Statistics and Probability is a Modeling Conceptual Category.				**X**
Quarter	**1**	**2**	**3**	**4**
S.CP.9 (+) Use permutations and combinations to compute probabilities of compound events and solve problems. Statistics and Probability is a Modeling Conceptual Category.				**X**
S.MD.6 (+) Use probabilities to make fair decisions (e.g. drawing by lots, using a random number generator.) *This unit sets the stage for work in Algebra II, where*				**X**

the ideas of statistical inference are introduced. Evaluating the risks associated with conclusions drawn from sample data (i.e. incomplete information) requires an understanding of probability concepts. Statistics and Probability is a Modeling Conceptual Category.				
S.MD.7 (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game.) Statistics and Probability is a Modeling Conceptual Category.				**X**

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 1</td></tr>
<tr><td colspan="8">Standard: G.CO.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment based on the undefined notions of a point, line and distance along a line and distance around a circular arc.</td></tr>
<tr><td colspan="2">Domain: Congruence</td><td colspan="6">Cluster: Experiment with transformations in the plane.</td></tr>
<tr><td colspan="2">Quarter 1:

Describe the undefined terms: point, line, and distance along a line in a plane.

Define perpendicular lines, parallel lines, line segments, and angles.</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Define circle and the distance around a circular arc.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given undefined notions of point, line, distance along a line, and distance around a circular arc, Develop precise definitions of angle, circle, perpendicular line, parallel line, and line segment, Identify examples and non-examples of angles, circles, perpendicular lines, parallel lines, and line segments.		Students know: Undefined notions of point, line, distance along a line, and distance around a circular arc, Properties of a mathematical definition, i.e. the smallest amount of information and properties that are enough to determine the concept. (Note: may not include all information related to concept).	Students understand/are able to: Use known and developed definitions and logical connections to develop new definitions. Geometric definitions are developed from a few undefined notions by a logical sequence of connections that lead to a precise definition, A precise definition should allow for the inclusion of all examples of the concept, and require the exclusion of all non-examples.	**Level IV Students will:** **EEG-CO.1.** Compare attributes of perpendicular lines, parallel lines, line segments, angles, and circles. Ex. Draw examples of perpendicular lines, parallel lines, and line segments, angles, and circles. Ex. How are lines and line segments different? Ex. How are lines and circles similar? **Level III Students will:** **EEG-CO.1.** Know the attributes of perpendicular lines, parallel lines, and line segments, angles, and circles. Ex. How are parallel and perpendicular lines similar? How are they different? Ex. Given two examples, which of these is a(n) ____? Ex. Which is perpendicular? + || O Ex. Given a grid on a floor with masking tape, identify parallel lines. Ex. Given a map, identify a road that runs somewhat perpendicular to another road. **Level II Students will:** **EEG-CO.1.** Know the attributes of lines, circles, and angles with equivalent measure. Ex. When shown the trajectory of movement of an object, predict where the object will go. Ex. Determine line, circle, and angles and describe them – circles are round. Ex. Put two objects next to each other and determine which is longer. Ex. Draw a line, circle, or angle. **Level I Students will:** **EEG-CO.1.** Identify a line and a shape (i.e. circle, square, triangle). Ex. Point to a line. Ex. Align two objects side-by-side. Ex. Move an object in a straight line. Ex. Sort shapes into groups by name. Ex. Find objects in the environment that represent/model circles, squares, or triangles.

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 1</td></tr>
<tr><td colspan="8">Standard: 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)</td></tr>
<tr><td colspan="2">Domain: Congruence</td><td colspan="6">Cluster: Experiment with transformations in the plane.</td></tr>
<tr><td colspan="2">Quarter 1:
Describe the different types of transformations including translations, reflections, rotations and dilations.

Describe transformations as functions that take points in the coordinate plane as inputs and give other points as outputs

Represent transformations in the plane using, e.g., transparencies and geometry software.

Write functions to represent transformations.

Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

From Appendix A: Build on student experience with rigid motions from earlier grades. Point out the basis of rigid motions in geometric concepts, e.g, translations move points a specific distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle.</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a variety of transformations (translations, rotations, reflections, and dilations), Represent the transformations in the plane using a variety of methods (e.g., technology, transparencies, semi-transparent mirrors (MIRAs), patty paper, compass), Describe transformations as functions that take points in the plane as inputs and give other points as outputs, explain why this satisfies the definition of a function, and adapt function notation to that of a mapping [e.g. F(x,y) → F(x+a, y+b)], Compare transformations that preserve distance and angle to those that do not.		Students know: Characteristics of transformations (translations, rotations, reflections, and dilations), Methods for representing transformations, Characteristics of functions, Conventions of functions with mapping notation.	Students understand/are able to: Accurately perform dilations, rotations, reflections, and translations on objects in the coordinate plane with and without technology, Communicate the results of performing transformations on objects and their corresponding coordinates in the coordinate plane, including when the transformation preserves distance and angle, Use the language and notation of functions as mappings to describe transformations. Mapping one point to another through a series of transformations can be recorded as a function, Some transformations (translations, rotations, and reflections) preserve distance and angle measure, and the image is then congruent to the pre-image, while dilations preserve	**EEG-CO.2.** N/A

			angle but not distance, and the pre-image is similar to the image, Distortions, such as only a horizontal stretch, preserve neither.	

<table>
<tr><td colspan="8">Grade Level/ Course (HS): Geometry Unit 1</td></tr>
<tr><td colspan="8">Standard: G.CO.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.</td></tr>
<tr><td colspan="3">Domain: Congruence</td><td colspan="5">Cluster: Experiment with transformations in the plane.</td></tr>
<tr><td colspan="3">Quarter 1:

Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and/or reflections that carry it onto itself.

From Appendix A: Build on student experience with rigid motions from earlier grades. Point out the basis of rigid motions in geometric concepts, e.g, translations move points a specific distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle.</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a collection of figures that include rectangles, parallelograms, trapezoids, or regular polygons, Identify which figures that have rotations or reflections that carry the figure onto itself, Perform and communicate rotations and reflections that map the object to itself, Distinguish these transformations from those which do not carry the object back to itself, Describe the relationship of these findings to symmetry.		Students know: Characteristics of transformations (translations, rotations, reflections, and dilations), Characteristics of rectangles, parallelograms, trapezoids, and regular polygons.	Students understand/are able to: Accurately perform dilations, rotations, reflections, and translations on objects in the coordinate plane with and without technology, Communicate the results of performing transformations on objects and their corresponding coordinates in the coordinate plane. Mapping one point to another through a series of transformations can be recorded as a function, Since rotations and reflections preserve distance and angle measure, the image is then congruent.	**EEG-CO.3.** N/A

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 1</td></tr>
<tr><td colspan="8">Standard: G.CO.4 Develop definitions of rotations, reflections and translations in terms of angles, circles, perpendicular lines, parallel lines and line segments.</td></tr>
<tr><td colspan="2">Domain: Congruence</td><td colspan="6">Cluster: Experiment with transformations in a plane.</td></tr>
<tr><td colspan="2">Quarter 1:

Recall definitions of angles, circles, perpendicular and parallel lines and line segments.

Develop definitions of rotations, reflections and translations in terms of angles, circles, perpendicular lines, parallel lines and line segments.

From Appendix A: Build on student experience with rigid motions from earlier grades. Point out the basis of rigid motions in geometric concepts, e.g., translations move points a specific distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle.</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Use geometric terminology (angles, circles, perpendicular lines, parallel lines, and line segments) to describe the series of steps necessary to produce a rotation, reflection, or translation, Use these descriptions to communicate precise definitions of rotation, reflection, and translation.		Students know: Characteristics of transformations (translations, rotations, reflections, and dilations), Properties of a mathematical definition, i.e., the smallest amount of information and properties that are enough to determine the concept. (Note: may not include all information related to concept).	Students understand/are able to: Accurately perform rotations, reflections, and translations on objects with and without technology, Communicate the results of performing transformations on objects, Use known and developed definitions and logical connections to develop new definitions. Geometric definitions are developed from a few undefined notions by a logical sequence of connections that lead to a precise definition, A precise definition should allow for the inclusion of all examples of the concept and require the exclusion of all non-examples.	Level IV Students will: EEG-CO.4-5. Demonstrate what happens when a figure is transformed. Ex. Show a rotation using an object. Ex. Using an object, show a slide (translation). Ex. Can form a picture where multiple shapes may need to be rotated to produce the given picture. Level III Students will: EEG-CO.4-5. Identify rotations, reflections, and slides. Ex. Use pattern blocks or other manipulatives to produce or copy a design in which each shape is clearly identifiable. Ex. Given two pictures, determine if an object is rotated (arrow up, arrow right). Ex. Given two pictures, pick correct reflection, slide, or rotation. Level II Students will: EE.G-CO.4-5. Recognize rotation, reflection, or slide (key terms, vocabulary, and movement). Ex. Use body to engage in activity to show rotation or slide (silhouette). Ex. Use objects, rotate, reflect, or slide. Level I Students will: EEG-CO.4-5. Attend to movement demonstrating rotations, reflections, and slides. Ex. Teacher slides an object, follow with eyes. Ex. Teacher rotates an object, follow motion.

Grade Level/ Course: Geometry Unit 1							
Standard: G.CO.5 Given a geometric figure and a rotation, reflection or translation, draw the transformed figure using, e.g. graph paper, tracing paper or geometry software. Specify a sequence of transformations that will carry a given figure onto another.							
Domain: Congruence		**Cluster: Experiment with transformations in the plane.**					
Quarter 1: Given a geometric figure and a rotation, reflection or translation, draw the transformed figure using, e.g. graph paper, tracing paper or geometry software. Draw a transformed figure and specify the sequence of transformations that were used to carry the given figure onto the other. *From Appendix A: Build on student experience with rigid motions from earlier grades. Point out the basis of rigid motions in geometric concepts, e.g., translations move points a specific distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle.*		**Quarter 2:**		**Quarter 3:**		**Quarter 4:**	
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.**

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a geometric figure, Produce the image of the figure under a rotation, reflection, or translation using graph paper, tracing paper, or geometry software, Describe and justify the sequence of transformations that will carry a given figure onto another.		Students know: Characteristics of transformations (translations, rotations, reflections, and dilations), Techniques for producing images under transformations using graph paper, tracing paper, or geometry software.	Students understand/are able to: Accurately perform rotations, reflections, and translations on objects using graph paper, tracing paper, or geometry software, Communicate the results of performing transformations on objects. The same transformation may be produced using a variety of tools, but the geometric sequence of steps that describe the transformation is consistent, Any distance preserving transformation is a combination of rotations, reflections, and translations.	Level IV Students will: EEG-CO.4-5. Demonstrate what happens when a figure is transformed. Ex. Show a rotation using an object. Ex. Using an object, show a slide (translation). Ex. Can form a picture where multiple shapes may need to be rotated to produce the given picture. Level III Students will: EEG-CO.4-5. Identify rotations, reflections, and slides. Ex. Use pattern blocks or other manipulatives to produce or copy a design in which each shape is clearly identifiable. Ex. Given two pictures, determine if an object is rotated (arrow up, arrow right). Ex. Given two pictures, pick correct reflection, slide, or rotation. Level II Students will: EE.G-CO.4-5. Recognize rotation, reflection, or slide (key terms, vocabulary, and movement). Ex. Use body to engage in activity to show rotation or slide (silhouette). Ex. Use objects, rotate, reflect, or slide. Level I Students will: EEG-CO.4-5. Attend to movement demonstrating rotations, reflections, and slides. Ex. Teacher slides an object, follow with eyes. Ex. Teacher rotates an object, follow motion.

Grade Level/ Course: Geometry Unit 1							
Standard: 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.							
Domain: Congruence		**Cluster: Understand congruence in terms of rigid motions**					
Quarter 1: Identify corresponding angles and sides of two triangles. Identify corresponding pairs of angles and sides of congruent triangles after rigid motions. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if corresponding pairs of sides and corresponding pairs of angles are congruent. Use the definition of congruence in terms of rigid motions to show that if the corresponding pairs of sides and corresponding pairs of angles of two triangles are congruent then the two triangles are congruent. Justify congruency of two triangles using transformations. From Appendix A: Rigid motions are at the foundation of the definition of congruence. Students reason from the basic properties of rigid motions (that they preserve distance and angle), which are assumed without proof. Rigid motions and their assumed properties can be used to establish the usual triangle congruence criteria, which can then be used to prove other theorems		**Quarter 2:**		**Quarter 3:**		**Quarter 4:**	
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.**

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a triangle and its image under a sequence of rigid motions (translations, reflections, and translations), Verify that corresponding sides and corresponding angles are congruent. Given two triangles that have the same side lengths and angle measures, - Find a sequence of rigid motions that will map one onto the other.	If and only if	Students know: Characteristics of translations, rotations, and reflections including the definition of congruence, Techniques for producing images under transformations, Geometric terminology which describes the series of steps necessary to produce a rotation, reflection, or translation.	Students understand/are able to: Use geometric descriptions of rigid motions to accurately perform these transformations on objects, Communicate the results of performing transformations on objects. If a series of translations, rotations, and reflections can be described that transforms one object exactly to a second object, the objects are congruent.	**Level IV Students will:** **EEG-CO.6-8.** Demonstrate why shapes are congruent. Ex. Communicate why two given congruent shapes are congruent. Ex. Given two non-congruent shapes, communicate why the shapes are not congruent. **Level III Students will:** **EEG-CO.6-8.** Identify corresponding congruent (the same) parts of shapes. Ex. Given two congruent triangles, identify the corresponding sides. Ex. Given two congruent items (stars, squares, etc.), identify the corresponding parts. Ex. Given two shapes that are not congruent but are similar, identify the similar parts. **Level II Students will:** **EEG-CO.6-8.** Recognize congruent parts (angles and sides). Ex. Identify the congruent parts of a rectangle. Ex. Identify the congruent angles of an isosceles triangle. **Level I Students will:** **EEG-CO.6-8.** Recognize shapes that are congruent. Ex. Given a shape, match a congruent shape. Ex. Given three shapes, pick the two that are congruent.

Grade Level/ Course: Geometry Unit 1							
Standard: G.CO.8 Explain how the criteria for triangle congruence (ASA, SAS, SSS) follow from the definition of congruence in terms of rigid motions.							
Domain: Congruence		**Cluster: Understand congruence in terms of rigid motions**					
Quarter 1: Informally use rigid motions to take angles to angles and segments to segments (from 8th grade). Formally use dynamic geometry software or straightedge and compass to take angles to angles and segments to segments. Explain how the criteria for triangle congruence (ASA, SAS, SSS) follows from the definition of congruence in terms of rigid motions (i.e. if two angles and the included side of one triangle are transformed by the same rigid motion(s) then the triangle image will be congruent to the original triangle). From Appendix A: Rigid motions are at the foundation of the definition of congruence. Students reason from the basic properties of rigid motions (that they preserve distance and angle), which are assumed without proof. Rigid motions and their assumed properties can be used to establish the usual triangle congruence criteria, which can then be used to prove other theorems.		**Quarter 2:**		**Quarter 3:**		**Quarter 4:**	
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.**

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Use rigid motions and the basic properties of rigid motions (that they preserve distance and angle), which are assumed without proof to establish that the usual triangle congruence criteria make sense and can then be used to prove other theorems.	Triangle congruence ASA SAS SSS	Students know: Basic properties of rigid motions (that they preserve distance and angle), Methods for presenting logical reasoning using assumed understandings to justify subsequent results.	Students understand/are able to: Use logical reasoning to connect geometric ideas to justify other results, Perform rigid motions of geometric figures, Determine whether two plane figures are congruent by showing whether they coincide when superimposed by means of a sequence of rigid motions (translation, reflection, or rotation), Identify two triangles as congruent if the lengths of corresponding sides are equal (SSS criterion), if the lengths of two pairs of corresponding sides and the measures of the corresponding angles between them are equal (SAS criterion), or if two pairs of corresponding angles are congruent and the lengths of the corresponding sides between them are equal	**Level IV Students will:** **EEG-CO.6-8.** Demonstrate why shapes are congruent. Ex. Communicate why two given congruent shapes are congruent. Ex. Given two non-congruent shapes, communicate why the shapes are not congruent. **Level III Students will:** **EEG-CO.6-8.** Identify corresponding congruent (the same) parts of shapes. Ex. Given two congruent triangles, identify the corresponding sides. Ex. Given two congruent items (stars, squares, etc.), identify the corresponding parts. Ex. Given two shapes that are not congruent but are similar, identify the similar parts. **Level II Students will:** **EEG-CO.6-8.** Recognize congruent parts (angles and sides). Ex. Identify the congruent parts of a rectangle. Ex. Identify the congruent angles of an isosceles triangle. **Level I Students will:** **EEG-CO.6-8.** Recognize shapes that are congruent. Ex. Given a shape, match a congruent shape. Ex. Given three shapes, pick the two that are congruent.

			(ASA criterion), Apply the SSS, SAS, and ASA criteria to verify whether or not two triangles are congruent. It is beneficial to have minimal sets of requirements to justify geometric results (e.g., use ASA, SAS, or SSS instead of all sides and all angles for congruence).	

Grade Level/ Course: Geometry Unit 1

Standard: 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.***

Domain: Congruence

Cluster: Prove Geometric Theorems

Quarter 1:

Identify and use properties of:

- Vertical angles
- Parallel lines with transversals
- All angle relationships
- Corresponding angles
- Alternate interior angles
- Perpendicular bisector
- Equidistant from endpoint

Prove vertical angles are congruent.

Prove corresponding angles are congruent when two parallel lines are cut by a transversal and converse.

Prove alternate interior angles are congruent when two parallel lines are cut by a transversal and converse.

Prove points are on a perpendicular bisector of a line segment are exactly equidistant from the segments endpoint.

From Appendix A: Encourage multiple ways of writing proofs, such as in narrative paragraphs, using flow diagrams, in two-column format, and using diagrams without words. Students should be encouraged to focus on the validity of the underlying reasoning while exploring a variety of formats for expressing that reasoning.

Quarter 2:

Quarter 3:

Quarter 4:

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.**

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Make, explain, and justify (or refute) conjectures about geometric relationships with and without technology, Explain the requirements of a mathematical proof, Present a complete mathematical proof of geometry theorems including the following: 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, Critique proposed proofs made by others.	Prove Transversal Alternate interior angles Corresponding angles	Students know: Requirements for a mathematical proof, Techniques for presenting a proof of geometric theorems.	Students understand/are able to: Communicate logical reasoning in a systematic way to present a mathematical proof of geometric theorems, Generate a conjecture about geometric relationships that calls for proof. Proof is necessary to establish that a conjecture about a relationship in mathematics is always true, and may also provide insight into the mathematics being addressed.	**EEG-CO.9-11.** N/A

Grade Level/ Course: Geometry Unit 1							
Standard: 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.							
Domain: Congruence		**Cluster: Prove Geometric Theorems**					
Quarter 1: Identify the hypothesis and conclusion of a theorem. Design an argument to prove theorems about triangles. Analyze components of the theorem. Prove theorems about triangles. *From Appendix A: Encourage multiple ways of writing proofs, such as in narrative paragraphs, using flow diagrams, in two-column format, and using diagrams without words. Students should be encouraged to focus on the validity of the underlying reasoning while exploring a variety of formats for expressing that reasoning. Implementations of G.CO.10 may be extended to include concurrence of perpendicular bisectors and angle bisectors as preparation for G.C.3 in Unit 5.*		**Quarter 2:**		**Quarter 3:**		**Quarter 4:**	
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.**

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Make, explain, and justify (or refute) conjectures about geometric relationships with and without technology, Explain the requirements of a mathematical proof, Present a complete mathematical proof of geometry theorems about triangles, including the following: 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, Critique proposed proofs made by others.		Students know: Requirements for a mathematical proof, Techniques for presenting a proof of geometric theorems.	Students understand/are able to: Communicate logical reasoning in a systematic way to present a mathematical proof of geometric theorems, Generate a conjecture about geometric relationships that calls for proof. Proof is necessary to establish that a conjecture about a relationship in mathematics is always true and may also provide insight into the mathematics being addressed.	**EEG-CO.9-11.** N/A

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 1</td></tr>
<tr><td colspan="8">Standard: G.CO.11. Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.</td></tr>
<tr><td colspan="2">Domain: Congruence</td><td colspan="6">Cluster: Prove Geometric Theorems</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:

Classify types of quadrilaterals.

Explain theorems for parallelograms and relate to figure.

Use the principle that corresponding parts of congruent triangles are congruent to solve problems.

Use properties of special quadrilaterals in a proof.

From Appendix A: Encourage multiple ways of writing proofs, such as in narrative paragraphs, using flow diagrams, in two-column format, and using diagrams without words. Students should be encouraged to focus on the validity of the underlying reasoning while exploring a variety of formats for expressing that reasoning.</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Make, explain, and justify (or refute) conjectures about geometric relationships with and without technology, Explain the requirements of a mathematical proof, Present a complete mathematical proof of geometry theorems about parallelograms, including the following: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals, Critique proposed proofs made by others.		Students know: Requirements for a mathematical proof, Techniques for presenting a proof of geometric theorems.	Students understand/are able to: Communicate logical reasoning in a systematic way to present a mathematical proof of geometric theorems, Generate a conjecture about geometric relationships that calls for proof. Proof is necessary to establish that a conjecture about a relationship in mathematics is always true and may also provide insight into the mathematics being addressed.	**EEG-CO.9-11.** N/A

Grade Level/ Course: Geometry Unit 1							
Standard: 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.*							
Domain: Congruence		**Cluster: Prove Geometric Theorems**					
Quarter 1: Explain the construction of geometric figures using a variety of tools and methods Apply the definitions, properties and theorems about line segments, rays and angles to support geometric constructions. Apply properties and theorems about parallel and perpendicular lines to support constructions. Perform geometric constructions including: 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, using a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *From Appendix A: Build on prior student experience with simple constructions. Emphasize the ability to formalize and explain how these constructions result in the desired objects. Some of these constructions are closely related to previous standards and can be introduced in conjunction with them.*		**Quarter 2:** Perform geometric constructions including: 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, using a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *From Appendix A: Build on prior student experience with simple constructions. Emphasize the ability to formalize and explain how these constructions result in the desired objects. Some of these constructions are closely related to previous standards and can be introduced in conjunction with them.*		**Quarter 3:** Perform geometric constructions including: 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, using a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *From Appendix A: Build on prior student experience with simple constructions. Emphasize the ability to formalize and explain how these constructions result in the desired objects. Some of these constructions are closely related to previous standards and can be introduced in conjunction with them.*		**Quarter 4:** Perform geometric constructions including: 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, using a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *From Appendix A: Build on prior student experience with simple constructions. Emphasize the ability to formalize and explain how these constructions result in the desired objects. Some of these constructions are closely related to previous standards and can be introduced in conjunction with them.*	
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.**

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Make and justify formal geometric constructions with a variety of tools and methods (e.g., compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.) including the following: 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, Compare and contrast different methods for doing the same construction, and identify geometric properties that justify steps in the constructions.		Students know: Methods for accurately using tools to perform geometric constructions, including compass and straightedge, string, reflective devices, paper folding, and dynamic geometric software, Methods for justifying a geometric construction using geometric properties.	Students understand/are able to: Choose and use appropriate construction tools strategically to perform geometric constructions, Use logical reasoning and properties of and relationships between geometric figures to justify geometric constructions. Limiting oneself to a specific tool or set of tools to perform a geometric construction illuminates important mathematical features of the object being constructed, Different tools for geometric constructions may offer different levels of precision in the construction and the purpose of the construction should help determine the tool of choice, Properties of geometric figures can and should be used to verify the correctness of geometric constructions regardless of the construction tool or method used.	**EEG-CO.12-13.** N/A

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 1</td></tr>
<tr><td colspan="8">Standard: G.CO.13 Construct an equilateral triangle, a square and a regular hexagon inscribed in a circle.</td></tr>
<tr><td colspan="2">Domain: Congruence</td><td colspan="6">Cluster: Make geometric constructions</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="3">Quarter 2:</td><td colspan="2">Quarter 3:</td><td>Quarter 4:
Construct an equilateral triangle, a square and a regular hexagon inscribed in a circle.

From Appendix A: Build on prior student experience with simple constructions. Emphasize the ability to formalize and explain how these constructions result in the desired objects.
Some of these constructions are closely related to previous standards and can be introduced in conjunction with them.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Use tools (e.g., compass, straight edge, geometry software) and geometric relationships to construct regular polygons inscribed in circles, Explain and justify the sequence of steps taken to complete the construction.	Construct Inscribed	Students know: Properties of regular polygons, Characteristics of inscribed figures, Methods for accurately using tools to perform geometric constructions.	Students understand/are able to: Choose and use appropriate construction tools strategically to perform geometric constructions, Communicate with logical reasoning the series of steps necessary for constructing an inscribed figure and the justification for each step. Properties of geometric figures can and should be used to verify the correctness of geometric constructions regardless of the construction tool or method used.	**EEG-CO.12-13.** N/A

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 2</td></tr>
<tr><td colspan="8">Standard: G.SRT.1a Verify experimentally the properties of dilations given by a center and a scale factor. a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.</td></tr>
<tr><td colspan="2">Domain: Similarity, Right Triangles, and Trigonometry</td><td colspan="6">Cluster: Understand similarity in terms of similarity transformations</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:

Define image, pre-image, scale factor, center, and similar figures as they relate to transformations.

Identify a dilation stating its scale factor and center.

Verify experimentally that a dilated image is similar to its pre-image by showing congruent corresponding angles and proportional sides.

Verify experimentally that a dilation takes a line not passing through the center of the dilation to a parallel line by showing the lines are parallel.

Verify experimentally that dilation leaves a line passing through the center of the dilation unchanged by showing that it is the same line.</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a center of dilation, a scale factor, and a polygonal image, Create a new image by extending a line segment from the center of dilation through each vertex of the original figure by the scale factor to find each new vertex, Present a convincing argument that line segments created by the dilation are parallel to their pre-images unless they pass through the center of dilation, in which case they remain on the same line, Find the ratio of the length of the line segment from the center of dilation to each vertex in the new image and the corresponding segment in the original image and compare that ratio to the scale factor, Conjecture a generalization of these results for all dilations.	Dilations Center Scale factor	Students know: Methods for finding the length of line segments (both in a coordinate plane and through measurement), Dilations may be performed on polygons by drawing lines through the center of dilation and each vertex of the polygon then marking off a line segment changed from the original by the scale factor.	Students understand/are able to: Accurately create a new image from a center of dilation, a scale factor, and an image, Accurately find the length of line segments and ratios of line segments, Communicate with logical reasoning a conjecture of generalization from experimental results. A dilation uses a center and line segments through vertex points to create an image which is similar to the original image but in a ratio specified by the scale factor, The ratio of the line segment formed from the center of dilation to a vertex in the new image and the corresponding vertex in the original image is equal to the scale factor.	**EEG-SRT.1-3.** N/A (See EEG-CO.6-8.)

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 2</td></tr>
<tr><td colspan="8">Standard: G.SRT.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.</td></tr>
<tr><td colspan="2">Domain: Similarity, Right Triangles, and Trigonometry</td><td colspan="6">Cluster: Understand similarity in terms of similarity transformations</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:

By using similarity transformations, explain that triangles are similar if all pairs of corresponding angles are congruent and all corresponding pairs of sides are proportional.

Given two figures, decide if they are similar by using the definition of similarity in terms of similarity transformations.</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given two figures, Determine if they are similar by demonstrating whether one figure can be obtained from the other through a dilation and a combination of translations, reflections, and rotations. Given a triangle, Produce a similar triangle through a dilation and a combination of translations, rotations, and reflections, Demonstrate that a dilation and a combination of translations, reflections, and rotations maintain the measure of each angle in the triangles and all corresponding pairs of sides of the triangles are proportional.	Similarity transformation	Students know: Properties of rigid motions and dilations, Definition of similarity in terms of similarity transformations, Techniques for producing images under a dilation and rigid motions.	Students understand/are able to: Apply rigid motion and dilation to a figure, Explain and justify whether or not one figure can be obtained from another through a combination of rigid motion and dilation. A figure that may be obtained from another through a dilation and a combination of translations, reflections, and rotations is similar to the original, When a figure is similar to another the measures of all corresponding angles are equal, and all of the corresponding sides are in the same proportion.	**EEG-SRT.1-3.** N/A (See EEG-CO.6-8.)

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 2</td></tr>
<tr><td colspan="8">Standard: G.SRT.1b Verify experimentally the properties of dilations given by a center and a scale factor. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.</td></tr>
<tr><td colspan="2">Domain: Similarity, Right Triangles, and Trigonometry</td><td colspan="6">Cluster: Understand similarity in terms of similarity transformations</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:

Define image, pre-image, scale factor, center, and similar figures as they relate to transformations.

Identify a dilation stating its scale factor and center.

Explain that the scale factor represents how many times longer or shorter a dilated line segment is than its pre-image.

Verify experimentally that the dilation of a line segment is longer or shorter in the ratio given by the scale factor.</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a center of dilation, a scale factor, and a polygonal image, Create a new image by extending a line segment from the center of dilation through each vertex of the original figure by the scale factor to find each new vertex, Present a convincing argument that line segments created by the dilation are parallel to their pre-images unless they pass through the center of dilation, in which case they remain on the same line, Find the ratio of the length of the line segment from the center of dilation to each vertex in the new image and the corresponding segment in the original image and compare that ratio to the scale factor, Conjecture a generalization of these results for all dilations.	Dilations Center Scale factor	Students know: Methods for finding the length of line segments (both in a coordinate plane and through measurement), Dilations may be performed on polygons by drawing lines through the center of dilation and each vertex of the polygon then marking off a line segment changed from the original by the scale factor.	Students understand/are able to: Accurately create a new image from a center of dilation, a scale factor, and an image, Accurately find the length of line segments and ratios of line segments, Communicate with logical reasoning a conjecture of generalization from experimental results. A dilation uses a center and line segments through vertex points to create an image which is similar to the original image but in a ratio specified by the scale factor, The ratio of the line segment formed from the center of dilation to a vertex in the new image and the corresponding vertex in the original image is equal to the scale factor.	**EEG-SRT.1-3.** N/A (See EEG-CO.6-8.)

Grade Level/ Course: Geometry Unit 2							
Standard: G.SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.							
Domain: Similarity, Right Triangles, and Trigonometry		**Cluster: Understand similarity in terms of similarity transformations**					
Quarter 1:		**Quarter 2:** Recall the properties of similarity transformations. Establish the AA criterion for similarity of triangles by extending the properties of similarity transformations to the general case of any two similar triangles.		**Quarter 3:**		**Quarter 4:**	
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.**

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given two triangles, Explain why if the measures of two angles from one triangle are equal to the measures of two angles from another triangle, then measures of the third angles must be equal to each other, Use this established fact and the properties of a similarity transformation to demonstrate that the Angle-Angle () criterion for similar triangles is sufficient.	criterion	Students know: The sum of the measures of the angles of a triangle is 180 degrees, Properties of rigid motions and dilations.	Students understand/are able to: Explain and justify why the third pair of corresponding angles of two triangles must be equal if each of the other two corresponding pairs are equal, Justify through the use of rigid motion and dilation why corresponding sides of triangles are in the same proportion if the measures of two pairs of corresponding angles are equal. It is beneficial to have minimal sets of requirements to justify geometric results (i.e., use instead of all sides proportional and all angles congruent for similarity), If the measures of two angles of one triangle are equal to the measures of two angles of another triangle, then the triangles are similar and the similarity of the triangles can be justified through similarity transformations.	**EEG-SRT.1-3.** N/A (See EEG-CO.6-8.)

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 2</td></tr>
<tr><td colspan="8">Standard: G.SRT.4 Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.</td></tr>
<tr><td colspan="2">Domain: Similarity, Right Triangles, and Trigonometry</td><td colspan="6">Cluster: Prove theorems involving similarity.</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:

Recall postulates, theorems, and definitions to prove theorems about triangles.

Prove theorems involving similarity about triangles.
(Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.)</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a triangle and a line parallel to one of the sides, Prove the other two sides are divided proportionally by using , similarity properties, previously proven theorems and properties of equality (Table 4). Given a triangle with two of the sides divided proportionally, Prove the line dividing the sides is parallel to the third side of the triangle. Given a right triangle, Use similar triangles and properties of equality (Table 4) to prove the Pythagorean Theorem.	Theorem	Students know: Properties of similar triangles and methods of showing that triangles are similar, Properties of equality (Table 4), Previously proven theorems including those concerning parallel lines.	Students understand/are able to: Apply properties of similar triangles to justify relationships of the sides of a triangle, Explain and justify that a line passing through the triangle divides the sides proportionally, if and only if, the line is parallel to a side of the triangle, Justify the Pythagorean Theorem through the use of similar triangles. Triangle similarity may be used to justify theorems involving the connection between the proportion of sides and whether or not the line dividing the sides is parallel to the other side of the triangle, Through the use of similar triangles, a right triangle may be divided into two right triangles which are similar to the original right triangle; therefore the corresponding sides must be proportional and may be used to prove the Pythagorean Theorem, The same theorem may be proven in many different ways (i.e., the Pythagorean Theorem).	**EEG-SRT.4-5.** N/A

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 2</td></tr>
<tr><td colspan="8">Standard: G.SRT.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.</td></tr>
<tr><td colspan="2">Domain: Similarity, Right Triangles, and Trigonometry</td><td colspan="6">Cluster: Prove theorems involving similarity</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="3">Quarter 2:

Recall congruence and similarity criteria for triangles.

Use congruency and similarity theorems for triangles to solve problems.

Use congruency and similarity theorems for triangles to prove relationships in geometric figures.</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a contextual situation involving triangles, Determine solutions to problems by applying congruence and similarity criteria for triangles to assist in solving the problem, Justify solutions and critique the solutions of others. Given a geometric figure, Establish and justify relationships in the figure through the use of congruence and similarity criteria for triangles.	Congruence and similarity criteria for triangles	Students know: Criteria for congruent (SAS, ASA, S, SSS) and similar () triangles and transformation criteria, Techniques to apply criteria of congruent and similar triangles for solving a contextual problem.	Students understand/are able to: Accurately solve a contextual problem by applying the criteria of congruent and similar triangles, Provide justification for the solution process, Analyze the solutions of others and explain why their solutions are valid or invalid, Justify relationships in geometric figures through the use of congruent and similar triangles. Congruence and similarity criteria for triangles may be used to find solutions of contextual problems, Relationships in geometric figures may be proven through the use of congruent and similar triangles.	**EEG-SRT.4-5.** N/A

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 2</td></tr>
<tr><td colspan="8">Standard: 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.</td></tr>
<tr><td colspan="2">Domain: Similarity, Right Triangles, and Trigonometry</td><td colspan="6">Cluster: Define trigonometric ratios and solve problems involving right triangles</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:

Names the sides of right triangles as related to an acute angle.

Recognize that if two right triangles have a pair of acute, congruent angles that the triangles are similar.

Compare common ratios for similar right triangles and develop a relationship between the ratio and the acute angle leading to the trigonometry ratios.</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a collection of right triangles, Construct similar right triangles of various sizes for each right triangle given, Compare the ratios of the sides of the original triangles to the ratios of the sides of the similar triangles, Communicate observations made about changes (or no change) to such ratios as the length of the side opposite an angle to the hypotenuse, or the side opposite the angle to the side adjacent, as the size of the angle changes or in the case of similar triangles, remains the same, Summarize these observations by defining the six trigonometric ratios.	Side ratios Trigonometric ratios	Students know: Techniques to construct similar triangles, Properties of similar triangles.	Students understand/are able to: Accurately find the side ratios of triangles, Explain and justify relationships between the side ratios of a right triangle and the angles of a right triangle. The ratios of the sides of right triangles are dependent on the size of the angles of the triangle.	**EEG-SRT.6-8.** N/A

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 2</td></tr>
<tr><td colspan="8">Standard: G.SRT.7 Explain and use the relationship between the sine and cosine of complementary angles.</td></tr>
<tr><td colspan="3">Domain: Similarity, Right Triangles, and Trigonometry</td><td colspan="5">Cluster: Define trigonometric ratios and solve problems involving right triangles</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="3">Quarter 2:

Use the relationship between the sine and cosine of complementary angles.

Explain how the sine and cosine of complementary angles are related to each other.</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a right triangle, Explain why the two smallest angles must be complements, Compare the side ratios of opposite/hypotenuse and adjacent/hypotenuse for each of these angles and discuss conclusions. Given a contextual situation involving right triangles, Compare solutions to the situation using the sine of the given angle and the cosine of its complement.	Sine Cosine Complementary angles	Students know: Methods for finding sine and cosine ratios in a right triangle (e.g., use of triangle properties: similarity; Pythagorean Theorem; isosceles and equilateral characteristics for 45-45-90 and 30-60-90 triangles and technology for others).	Students understand/are able to: Accurately solve a contextual problem by using the sine and cosine ratios, Justify solutions and discuss other possible solutions through the use of complementary angles and the sine or cosine ratios. The sine of an angle is equal to the cosine of the complement of the angle, Switching between using a given angle or its complement and between sine or cosine ratios may be used when solving contextual problems.	**EEG-SRT.6-8.** N/A

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 2</td></tr>
<tr><td colspan="8">Standard: G.SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.</td></tr>
<tr><td colspan="2">Domain: Similarity, Right Triangles, and Trigonometry</td><td colspan="6">Cluster: Define trigonometric ratios and solve problems involving right triangles</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="3">Quarter 2:

Recognize which methods could be used to solve right triangles in applied problems.

Solve for an unknown angle or side of a right triangle using sine, cosine, and tangent.

Apply right triangle trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a contextual situation involving right triangles, Create a drawing to model the situation, Find the missing sides and angles using trigonometric ratios and the Pythagorean Theorem, Use the above information to interpret results in the context of the situation.		Students know: Methods of using the trigonometric ratios to solve for sides or angles in a right triangle, The Pythagorean Theorem and its use in solving for unknown parts of a right triangle.	Students understand/are able to: Create an accurate diagram to model a contextual situation involving right triangles and use it to solve the right triangles, Identify the trigonometric ratio useful to solve for a particular unknown part of a right triangle and use that ratio to accurately solve for the unknown part. use the Pythagorean Theorem to find unknown sides of a right triangle explain the solution in terms of the given contextual situation Unknown parts of right triangles may be found through the use of trigonometric ratios, Pythagorean Theorem, or a combination of both, Right triangles may be used to model and solve contextual situations.	**EEG-SRT.6-8.** N/A

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 2</td></tr>
<tr><td colspan="8">Standard: 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).* (*Modeling Standard)</td></tr>
<tr><td colspan="2">Domain: Modeling with Geometry</td><td colspan="6">Cluster: Apply geometric concepts in modeling situations</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:

Use measures and properties of geometric shapes to describe real world objects.

Given a real world object, classify the object as a known geometric shape – use this to solve problems in context.

From Appendix A: Focus on situations well modeled by trigonometric ratios for acute angles.</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a real-world object, Select an appropriate geometric shape to model the object, Provide a description of the object through the measures and properties of the geometric shape which is modeling the object, Explain and justify the model which was selected.		Students know: Techniques to find measures of geometric shapes, Properties of geometric shapes.	Students understand/are able to: Model a real-world object through the use of a geometric shape, Justify the model by connecting its measures and properties to the object. Geometric shapes may be used to model real-world objects, Attributes of geometric figures help us identify the figures and find their measures, therefore matching these figures to real world objects allows the application of geometric techniques to real world problems.	**Level IV Students will:** **EEG-MG.1-3.** Apply geometric methods to solve design problems. Ex. Identify the two-dimensional shapes that create the three-dimensional figure (e.g., I can see four triangles in a pyramid; I can see six squares on the outside of a cube). Ex. Determine the least number of tiles needed to cover the outside of a cubed figure- glue tiles onto a box. Ex. How many cups of water will this cylinder hold? Ex. Determine the amount of materials needed to wrap a present. **Level III Students will:** **EEG-MG.1-3.** Use properties of geometric shapes to describe real-life objects. Ex. Name everyday objects in terms of geometric shapes (can of soda is a cylinder, box of cereal is a rectangular prism). Ex. Describe the sides of a box of tissues (ends are squares, sides are rectangles). Ex. How many small square boxes (cubes)can I fit into a large cube? Ex. How many boxes (cubes) will fit on this shelf? Ex. Determine the dimensions of a classroom (length, width, and height.) **Level II Students will:** **EEG-MG.1-3.** Identify geometric shapes. Ex. Find real-life objects that have similar characteristics to a sphere. Ex. Given a cube, determine what real-life object has similar characteristics to a cube. **Level I Students will:** **EEG-MG.1-3.** Compare the capacity of three-dimensional objects. Ex. Which has the greatest capacity, a house or a school? Ex. Determine, which holds more, a cup or a barrel?

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 2</td></tr>
<tr><td colspan="8">Standard: 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).* (*Modeling Standard)</td></tr>
<tr><td colspan="2">Domain: Modeling with Geometry</td><td colspan="6">Cluster: Apply geometric concepts in modeling situations</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Define density.

Apply concepts of density based on area and volume to model real-life situations (e.g., persons per square mile, BTUs per cubic foot).</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a contextual situation involving density, Model the situation by creating an average per unit of area or unit of volume, Generate questions raised by the model and defend answers they produce to the generated questions (e.g., should population density be given per square mile or per acre? What insights might one yield over the other?), Explain and justify the model in terms of the original context.	Density	Students know: Geometric concepts of area and volume, Properties of rates, Modeling techniques.	Students understand/are able to: Accurately model a situation involving density, Justify how the model is an accurate representation of the given situation. Situations involving density may be modeled through a representation of a concentration per unit of area or unit of volume.	**Level IV Students will:** **EEG-MG.1-3.** Apply geometric methods to solve design problems. Ex. Identify the two-dimensional shapes that create the three-dimensional figure (e.g., I can see four triangles in a pyramid; I can see six squares on the outside of a cube). Ex. Determine the least number of tiles needed to cover the outside of a cubed figure- glue tiles onto a box. Ex. How many cups of water will this cylinder hold? Ex. Determine the amount of materials needed to wrap a present. **Level III Students will:** **EEG-MG.1-3.** Use properties of geometric shapes to describe real-life objects. Ex. Name everyday objects in terms of geometric shapes (can of soda is a cylinder, box of cereal is a rectangular prism). Ex. Describe the sides of a box of tissues (ends are squares, sides are rectangles). Ex. How many small square boxes (cubes)can I fit into a large cube? Ex. How many boxes (cubes) will fit on this shelf? Ex. Determine the dimensions of a classroom (length, width, and height.) **Level II Students will:** **EEG-MG.1-3.** Identify geometric shapes. Ex. Find real-life objects that have similar characteristics to a sphere. Ex. Given a cube, determine what real-life object has similar characteristics to a cube. **Level I Students will:** **EEG-MG.1-3.** Compare the capacity of three-dimensional objects. Ex. Which has the greatest capacity, a house or a school? Ex. Determine, which holds more, a cup or a barrel?

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 2</td></tr>
<tr><td colspan="8">Standard: G.MG.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).*(*Modeling Standard)</td></tr>
<tr><td colspan="2">Domain: Modeling with Geometry</td><td colspan="6">Cluster: Apply geometric concepts in modeling situations</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:

Describe a typographical grid system.

Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

From Appendix A: Focus on situations well modeled by trigonometric ratios for acute angles.</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a contextual situation involving design problems, Create a geometric method to model the situation and solve the problem, Explain and justify the model which was created to solve the problem.	Geometric methods Design problems	Students know: Properties of geometric shapes, Characteristics of a mathematical model.	Students understand/are able to: Accurately model and solve a design problem, Justify how their model is an accurate representation of the given situation. Design problems may be modeled with geometric methods, Geometric models may have physical constraints, Models represent the mathematical core of a situation without extraneous information, for the benefit in a problem solving situation.	**Level IV Students will:** **EEG-MG.1-3.** Apply geometric methods to solve design problems. Ex. Identify the two-dimensional shapes that create the three-dimensional figure (e.g., I can see four triangles in a pyramid; I can see six squares on the outside of a cube). Ex. Determine the least number of tiles needed to cover the outside of a cubed figure- glue tiles onto a box. Ex. How many cups of water will this cylinder hold? Ex. Determine the amount of materials needed to wrap a present. **Level III Students will:** **EEG-MG.1-3.** Use properties of geometric shapes to describe real-life objects. Ex. Name everyday objects in terms of geometric shapes (can of soda is a cylinder, box of cereal is a rectangular prism). Ex. Describe the sides of a box of tissues (ends are squares, sides are rectangles). Ex. How many small square boxes (cubes)can I fit into a large cube? Ex. How many boxes (cubes) will fit on this shelf? Ex. Determine the dimensions of a classroom (length, width, and height.) **Level II Students will:** **EEG-MG.1-3.** Identify geometric shapes. Ex. Find real-life objects that have similar characteristics to a sphere. Ex. Given a cube, determine what real-life object has similar characteristics to a cube. **Level I Students will:** **EEG-MG.1-3.** Compare the capacity of three-dimensional objects. Ex. Which has the greatest capacity, a house or a school? Ex. Determine, which holds more, a cup or a barrel?

Grade Level/ Course: Geometry Unit 2							
Standard: G.SRT.9 (+) Derive the formula A = 1/2 ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.							
Domain: Similarity, right triangles, and trigonometry		**Cluster: Apply trigonometry to general triangles**					
Quarter 1:		**Quarter 2:** Recall right triangle trigonometry to solve mathematical problems. Derive the formula $A = 1/2\ ab$ sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.		**Quarter 3:**		**Quarter 4:**	
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.**

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given any triangle, Derive the given formula for the area using the lengths of two sides of the triangle and the included angle.	Auxiliary line Vertex	Students know: The auxiliary line drawn from the vertex perpendicular to the opposite side forms an altitude of the triangle. The formula for the area of a triangle (A = 1/2 bh). Properties of the sine ratio.	Students understand/are able to: Properly label a triangle according to convention. Perform algebraic manipulations. Given the lengths of the sides and included angle of any triangle the area can be determined. There is more than one formula to find the area of a triangle.	**EEG-SRT.9-11.** N/A (+)

Grade Level/ Course: Geometry Unit 2							
Standard: G.SRT.10 (+) Prove the Laws of Sines and Cosines and use them to solve problems.							
Domain: Similarity, Right Triangles, and Trigonometry		**Cluster: Apply trigonometry to general triangles**					
Quarter 1:		**Quarter 2:** Use the Laws of Sines and Cosines this to find missing angles or side length measurements. Prove the Law of Sines Prove the Law of Cosines Recognize when the Law of Sines or Law of Cosines can be applied to a problem and solve problems in context using them. *From Appendix A: With respect to the general case of Laws of Sines and Cosines, the definition of sine and cosine must be extended to obtuse angles.*		**Quarter 3:**		**Quarter 4:**	
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.**

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given any triangle, Derive the Law of Sines and the Law of Cosines. Given any triangle, Use the Law of Sines or the Law of Cosines to find unknown lengths of sides and measures of angles.	Law of Sines Law of Cosines	Students know: The auxiliary line drawn from the vertex perpendicular to the opposite side forms an altitude of the triangle. Properties of the Sine and Cosine ratios. Pythagorean Theorem. Pythagorean Identity.	Students understand/are able to: Properly label a triangle according to convention. Perform algebraic manipulations. The given information will determine whether it is appropriate to use the Law of Sines or the Law of Cosines. Proof is necessary to establish that a conjecture about a relationship in mathematics is always true and may provide insight into the mathematics being addressed.	**EEG-SRT.9-11.** N/A (+)

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 2</td></tr>
<tr><td colspan="8">Standard: G.SRT.11 (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).</td></tr>
<tr><td colspan="2">Domain: Similarity, Right Triangles, and Trigonometry</td><td colspan="6">Cluster: Apply trigonometry to general triangles</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:

Determine from given measurements in right and non-right triangles whether it is appropriate to use the Law of Sines or Cosines.

Apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

From Appendix A: With respect to the general case of the Laws of Sines and Cosines, the definition of sine and cosine must be extended to obtuse angles.</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	**Vocabulary**	**Knowledge**	**Skills**	**Instructional Achievement Level Descriptors**
Students: Given a contextual situation, Choose the appropriate law and apply it to determine the measures of unknown quantities.	Law of Sines Law of Cosines	Students know: The Laws of Sines and Cosines can apply to any triangle, right or non-right. Laws of Sines and Cosines. Vector quantities can represent lengths of sides and angles in a triangle. Values of the $\sin(90^{\circ})$ and $\cos(90^{\circ})$.	Students understand/are able to: Label triangles in context and by convention. Perform algebraic manipulations. Find inverse sine and cosine values. Proven laws allow us to solve problems in contextual situations.	**EEG-SRT.9-11.** N/A (+)

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 3</td></tr>
<tr><td colspan="8">Standard: G.GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.*(*Modeling Standard)</td></tr>
<tr><td colspan="2">Domain: Geometric Measurement and Dimension</td><td colspan="6">Cluster: Explain volume formulas and use them to solve problems.</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:

Utilize the appropriate formula for volume depending on the figure.

Use volume formulas for cylinders, pyramids, cones, and spheres to solve contextual problems.

From Appendix A: Informal arguments for area and volume formulas can make use of the way in which area and volume scale under similarity transformations: when one figure in the plane results from another by applying a similarity transformation with scale factor K, its area is K2 times the area of the first. Similarly, volumes of solid figures scale by K3 under a similarity transformations with scale factor K.</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a contextual situation that requires finding the volume of a cylinder, pyramid, cone, or sphere as part of its solution, Use an appropriate shape or 2-D drawing to model the situation, Solve using the appropriate formula, Justify and explain the solution and solution path in the context of the given situation.		Students know: Volume formulas for cylinders, pyramids, cones, and spheres, Techniques for modeling 3-D objects with shapes or 2-D drawings, and for using these models to identify specific values for use in volume formulas.	Students understand/are able to: Accurately model a contextual situation with a cylinder, pyramid, cone, sphere, or a 2-D drawing, Use the model or drawing to find values needed for use in the volume formula, Accurately find a solution to the given situation, and explain the solution in the context of the situation. A contextual situation involving cylinders, pyramids, cones, and spheres may be modeled by shapes or 2-D drawings, and the model may provide insight into the solution of the problem, Formulas are useful for efficiency when many problems of the same type need to be solved.	**Level IV Students will:** **EEG-GMD.1-3.** Apply knowledge of volume to make appropriate volumetric estimates. Ex. Select appropriate tool to fill a pitcher and estimate the number of proportions needed to fill a five-gallon bucket (teaspoon, cup, bucket). Ex. Select appropriate tool to measure flour for a cake – cup or bucket. Ex. Convert – how many cups in a pint – given cups and a pint container filled with water. **Level III Students will:** **EEG-GMD.1-3.** Make a prediction based on knowledge of volume to identify volume of common containers (cups, pints, gallons, etc.). Ex. Which will hold more than three cups, a gallon or a pint? (Objects: cup, teaspoon, gallon) Ex. Which is a gallon? (Objects: teaspoon, cup, gallon) Ex. If I wanted to carry a gallon of water, would I use a bucket or a cup? **Level II Students will:** **EEG-GMD.1-3.** Which is more or less? Ex. Which shaped peg can fit inside each sculpted hole? Ex. Which container has more marbles in it? Ex. Which container has less marbles in it? **Level I Students will:** **EEG-GMD.1-3.** Experience volume. Ex. Point to the empty cup. Ex. Point to the full container. Ex. Indicate which container will hold more water (e.g., bucket or cup).

<table>
<tr><td colspan="8">Grade Level/ Course (high school): Geometry Unit 3</td></tr>
<tr><td colspan="8">Standard: 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.</td></tr>
<tr><td colspan="2">Domain: Geometric Measurement & Dimension</td><td colspan="6">Cluster: Visualize relationships between two-dimensional and three-dimensional objects</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:

Use strategies to help visualize relationships between two-dimensional and three dimensional objects

Relate the shapes of two-dimensional cross-sections to their three-dimensional objects

Discover three-dimensional objects generated by rotations of two-dimensional objects.</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given 3-D objects, Conjecture about the characteristics of geometric shapes formed if a cross-section of a 3-D shape is taken, Take 2-D cross-sections at different angles of cut, Explain the shape formed by taking 2-D cross-sections, Compare and contrast the figures formed when the angle of the cut changes. Given 2-D objects, Conjecture about the characteristics of geometric shapes formed from rotating a 2-D shape about a line, Rotate the object about given lines, Explain the 3-D objects formed if the 2-D object is rotated about a line.	Two-dimensional cross-sections Two-dimensional objects Three-dimensional objects Rotations	Students know: Characteristics of 2-D and 3-D geometric objects, Techniques for finding a cross-section of a 3-D object, Techniques for rotating a 2-D object about a line.	Students understand/are able to: Conjecture about the characteristics of geometric shapes formed from taking a cross-section of a 3-D shape, or rotating a 2-D shape about a line, Accurately determine the geometric shapes formed from taking a cross-section of a 3-D shape, or rotating a 2-D shape about a line. 3-D objects can be created from 2-D plane figures through transformations such as rotations, Cross-sections of 3-D objects can be formed in a variety of ways, depending on the angle of the cut with the base of the object.	**Level IV Students will:** **EEG-GMD.4.** Use the properties of two-dimensional and three-dimensional objects to solve real-world problems. Ex. Determine how much cereal a container can hold using standard measurement. Ex. Using the dimensions of a shelf to determine how many boxes would fit. **Level III Students will:** **EEG-GMD.4.** Distinguish between two-dimensional and three-dimensional objects to solve real-world problems. Ex. Build a floor and walls of a building using technology or blocks. Ex. Describe the differences between a map of the school and the model of the school. Ex. Identify height as a dimension of three-dimensional objects. Ex. Show use of spatial relationships by stacking boxes to specified dimensions (length, width, height). **Level II Students will:** **EEG-GMD.4.** Distinguish between two-dimensional and three-dimensional Ex. Classify two-dimensional and three-dimensional objects by their use (e.g., Which of these can you use as a container, a box, or a square?). Ex. Given two examples, which is a cube and which is square? Ex. Given a picture of a silo, a square building, and a box, determine which three-dimensional object corresponds to a circle. Ex. Which can hold cereal: a square or a box? **Level I Students will:** **EEG-GMD.4.** Identify two-dimensional shapes. Ex. Identify squares from non-squares. Ex. Choose polygons from line segments and angles.

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 3</td></tr>
<tr><td colspan="8">Standard: 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).*(*Modeling Standard)</td></tr>
<tr><td colspan="2">Domain: Modeling with Geometry</td><td colspan="6">Cluster: Apply geometric concepts in modeling situations</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:

Use measures and properties of geometric shapes to describe real world objects

Given a real world object, classify the object as a known geometric shape; use this to solve problems in context.

From Appendix A: Focus on situations that require relating two- and three-dimensional objects, determining and using volume, and the trigonometry of general triangles.</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
</table>

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a real-world object, Select an appropriate geometric shape to model the object, Provide a description of the object through the measures and properties of the geometric shape which is modeling the object, Explain and justify the model which was selected.		Students know: Techniques to find measures of geometric shapes, Properties of geometric shapes.	Students understand/are able to: Model a real-world object through the use of a geometric shape, Justify the model by connecting its measures and properties to the object. Geometric shapes may be used to model real-world objects, Attributes of geometric figures help us identify the figures and find their measures, therefore matching these figures to real world objects allows the application of geometric techniques to real world problems.	**Level IV Students will:** **EEG-MG.1-3.** Apply geometric methods to solve design problems. Ex. Identify the two-dimensional shapes that create the three-dimensional figure (e.g., I can see four triangles in a pyramid; I can see six squares on the outside of a cube). Ex. Determine the least number of tiles needed to cover the outside of a cubed figure- glue tiles onto a box. Ex. How many cups of water will this cylinder hold? Ex. Determine the amount of materials needed to wrap a present. **Level III Students will:** **EEG-MG.1-3.** Use properties of geometric shapes to describe real-life objects. Ex. Name everyday objects in terms of geometric shapes (can of soda is a cylinder, box of cereal is a rectangular prism). Ex. Describe the sides of a box of tissues (ends are squares, sides are rectangles). Ex. How many small square boxes (cubes)can I fit into a large cube? Ex. How many boxes (cubes) will fit on this shelf? Ex. Determine the dimensions of a classroom (length, width, and height.) **Level II Students will:** **EEG-MG.1-3.** Identify geometric shapes. Ex. Find real-life objects that have similar characteristics to a sphere. Ex. Given a cube, determine what real-life object has similar characteristics to a cube. **Level I Students will:** **EEG-MG.1-3.** Compare the capacity of three-dimensional objects. Ex. Which has the greatest capacity, a house or a school? Ex. Determine, which holds more, a cup or a barrel?

<table>
<tr><td colspan="8">Grade Level/ Course (high School): Geometry Unit 4</td></tr>
<tr><td colspan="8">Standard: G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).</td></tr>
<tr><td colspan="2">Domain: Expressing Geometric Properties With Equations</td><td colspan="6">Cluster: Use coordinates to prove simple geometric theorems algebraically.</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:
Recall previous understandings of coordinate geometry (including, but not limited to: distance, midpoint and slope formula, equation of a line, definitions of parallel and perpendicular lines, etc.)

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).
e.g., derive the equation of a line through 2 points using similar right triangles.

From Appendix A: This unit has a close connection with the next unit. For example, a curriculum might merge G.GPE.1 and the unit 5 treatment of G.GPE.4 with the standards in this unit. Reasoning with triangles in this unit is limited to right triangles.</td><td colspan="2">Quarter 4:
(</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given coordinates and geometric theorems and statements defined on a coordinate system, Use the coordinate system and logical reasoning to justify (or deny) the statement or theorem, and to critique arguments presented by others.	Simple geometric theorems	Students know: Relationships (e.g. distance, slope of line) between sets of points, Properties of geometric shapes, Coordinate graphing rules and techniques, Techniques for presenting a proof of geometric theorems.	Students understand/are able to: Accurately determine what information is needed to prove or disprove a statement or theorem, Accurately find the needed information and explain and justify conclusions, Communicate logical reasoning in a systematic way to present a mathematical proof of geometric theorems.	**EEG-GPE.4.** N/A (See EEG-GPE)

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 4</td></tr>
<tr><td colspan="8">Standard: G.GPE.7 Use coordinates to compute perimeters of polygons and area of triangles and rectangles, e.g., using the distance formula.*(*Modeling Standard)</td></tr>
<tr><td colspan="2">Domain: Expressing Geometric Properties with Equations</td><td colspan="6">Cluster: Use coordinates to prove simple geometric theorems algebraically</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="3">Quarter 3:

Use the coordinates of the vertices of a polygon to find the necessary dimensions for finding the perimeter (i.e., the distance between vertices).

Use the coordinates of the vertices of a triangle to find the necessary dimensions (base, height) for finding the area (i.e., the distance between vertices by counting, distance formula, Pythagorean Theorem, etc.).

Use the coordinates of the vertices of a rectangle to find the necessary dimensions (base, height) for finding the area (i.e., the distance between vertices by counting, distance formula).

Formulate a model of figures in contextual problems to compute area and/or perimeter.

From Appendix A: G.GPE.7 provides practice with the distance formula and its connection with the Pythagorean theorem.</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a contextual situation that requires the perimeter and/or area of a polygon as part of its solution, Find the solution to the situation through the use of coordinates and the distance formula as appropriate, through modeling the situation in a Cartesian coordinate system and explain and justify the solution.		Students know: The distance formula and its applications, Techniques for coordinate graphing.	Students understand/are able to: Create geometric figures on a coordinate system from a contextual situation, Accurately find the perimeter of polygons and the area of triangles and rectangles from the coordinates of the shapes, Explain and justify solutions in the original context of the situation. Contextual situations may be modeled in a Cartesian coordinate system, Coordinate modeling is frequently useful to visualize a situation and to aid in solving contextual problems.	**Level IV Students will:** **EEG-GPE.7.** Use formulas to find perimeter and area of squares and rectangles to solve real-world problems. Ex. Find the perimeter using p = side + side + side + side. Ex. Find the area of the classroom floor using A = length x width. **Level III Students will:** **EEG-GPE.7.** Find perimeter and area of squares and rectangles to solve real-world problems. Ex. Find the perimeter by adding the length of the sides to determine how much fence you will need to go around your garden. Ex. Find the area of a room on a grid to decide how many tiles (one grid each) you will need to cover the area of your room. Ex. Determine the number of one foot squared sections needed to make a tabletop garden that is four feet by four feet square. **Level II Students will:** **EEG-GPE.7.** Find perimeter or area by counting on a grid. Ex. Find the perimeter of a small room on a grid. Ex. Draw a shape on a grid and find the perimeter. **Level I Students will:** **EEG-CPE.7.** Identify inside, around, and outside of a closed figure. Ex. Identify position of a dog as inside or outside the fenced yard. Ex. Choose the term (inside, around, or outside) to describe position.

<table>
<tr><td colspan="8">Grade Level/ Course (high school): Geometry Unit 4</td></tr>
<tr><td colspan="8">Standard: G.GPE.2 Derive the equation of a parabola given a focus and directrix.</td></tr>
<tr><td colspan="2">Domain: Expressing Geometric Properties with Equations</td><td colspan="6">Cluster: Translate between the geometric description and the equation for a conic section.</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Define a parabola including the relationship of the focus and the equation of the directrix to the parabolic shape.

Derive the equation of parabola given the focus and directrix.

From Appendix A: The directrix should be parallel to a coordinate axis.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given the focus and directrix of a parabola, Use the distance formula to write an equation for all points which are equidistant from a given focus and directory, Use logical repeated reasoning to generalize to a general point and general directrix, developing the formula for the equation of a parabola, Compare and contrast parabola equations for horizontal and vertical directrices.	Parabola Focus Directrix	Students know: The distance formula for points in the coordinate plane and methods of finding the distance between a point and a line, Properties of equality (Table 4).	Students understand/are able to: Create and justify a formula through algebraic manipulation after setting the distances between two points and between a point and a line equal to each other. The points that satisfy the equation of a parabola represent all of the points that are equidistant from a given point and a given line.	**EEG-GPE.2-3.** N/A

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 4</td></tr>
<tr><td colspan="8">Standard: G.GPE.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).</td></tr>
<tr><td colspan="2">Domain: Expressing Geometric Properties with Equations</td><td colspan="6">Cluster: Use coordinates to prove simple geometric theorems algebraically</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:
Recognize that slopes of parallel lines are equal.

Recognize that slopes of perpendicular lines are opposite reciprocals (i.e, the slopes of perpendicular lines have a product of -1)

Find the equation of a line parallel to a given line that passes through a given point.

Find the equation of a line perpendicular to a given line that passes through a given point.

Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems.

From Appendix A: Relate work on parallel lines in G.GPE.5 to work on A.REI.5 in High School Algebra 1 involving systems of equations having no solution or infinitely many solutions.</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a line, Create lines parallel to the given line and compare the slopes of parallel lines by examining the rise/run ratio of each line, Create lines perpendicular to the given line by rotating the line 90 degrees and compare the slopes by examining the rise/run ratio of each line, Use understandings of similar triangles and logical reasoning to prove that parallel lines have equal slopes and the slopes of perpendicular lines are negative reciprocals. Given a geometric problem involving parallel or perpendicular lines, Apply the appropriate slope criteria to solve the problem and justify the solution including finding equations of lines parallel or perpendicular to a given line.	Slope criteria for parallel and perpendicular lines	Students know: Techniques to find the slope of a line, Key features needed to solve geometric problems, Techniques for presenting a proof of geometric theorems.	Students understand/are able to: Explain and justify conclusions reached regarding the slopes of parallel and perpendicular lines, Apply slope criteria for parallel and perpendicular lines to accurately find the solutions of geometric problems and justify the solutions, Communicate logical reasoning in a systematic way to present a mathematical proof of geometric theorems. Modeling geometric figures or relationships on a coordinate graph assists in determining truth of a statement or theorem, Geometric theorems may be proven or disproven by examining the properties of the geometric shapes in the theorem through the use of appropriate algebraic techniques.	**EEG-GPE.5-6.** N/A (See EEG.CO.1)

<table>
<tr><td colspan="8">Grade Level/ Course (HS): Geometry Unit 5</td></tr>
<tr><td colspan="8">Standard: G.C.1 Prove that all circles are similar.</td></tr>
<tr><td colspan="2">Domain: Circles</td><td colspan="6">Cluster: Understand and apply theorems about circles</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Recognize when figures are similar. (Two figures are similar if one is the image of the other under a transformation from the plane into itself that multiplies all distances by the same positive scale factor, k. That is to say, one figure is a dilation of the other.)

Compare the ratio of the circumference of a circle to the diameter of the circle.

Discuss, develop and justify this ratio for several circles.

Determine that this ratio is constant for all circles.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a collection of circles, Show that in each case there exists a transformation that consists of a dilation and a combination of rigid motions that will take one of the circles to any of the others, Verify that the ratio of the circumference of the circles created through dilations is equal to the ratio of the radii of the circles, wh ich is the same as the scale factor of the dilation, Explain with logical reasoning how a circle is fully defined by a single parameter "r" so the only non-translational changes that can be made is alteration of "r", which changes the size and not the shape and therefore the circles are similar.		Students know: Techniques to create dilations, Similar figures have the same shape, A figure transformed by a dilation and any combination of rigid motions will be similar to the image.	Students understand/are able to: Accurately create circles by making dilations of a given circle, Communicate logical reasoning in a systematic way to present a mathematical proof of geometric theorems. Any circle can be created through a dilation of another circle and a combination of rigid motions, Any geometric figure that is fully defined by a single parameter will be similar to all other figures in that class (squares, equilateral triangles, circles, parabola, etc.)	**EEG-C.1-3.** N/A

<table>
<tr><td colspan="8">Grade Level/ Course (high school): Geometry Unit 4</td></tr>
<tr><td colspan="8">Standard: G.GPE.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.</td></tr>
<tr><td colspan="2">Domain: Expressing Geometric Properties with Equations</td><td colspan="6">Cluster: Use coordinates to prove simple geometric theorems algebraically</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:

Recall the definition of ratio.

Recall previous understandings of coordinate geometry.

Given a line segment (including those with positive and negative slopes) and a ratio, find the point on the segment that partitions the segment into the given ratio.</td><td colspan="2">Quarter 4:</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given two points and a ratio that partitions the segment between the points, Construct a circle using one of the given points as the center and the distance between the points as the radius, Construct a dilation of the circle using the given ratio as the scale factor and find the intersection between the dilation and the equation of the line passing through the given points, Justify and explain the reasons for each step in the process of finding a point that partitions a segment in a given ratio.	Directed line segment Partitions	Students know: Techniques for finding the distance between two points and the equation of a line passing through two points, Forms for writing the equation of a circle dependent on the information given to find the equation of the dilation of a circle, Techniques to find the intersection between a line and a circle.	Students understand/are able to: Accurately find the distance between two points and the equation of a line passing through two points, Accurately find the equation of a dilation of a circle, Find the intersection point(s) of a line and a circle. A radius of a circle may be used to show the distance between two points, A dilation of a circle may be used to partition a line segment by making it the radius, in a given ratio.	**EEG-GPE.5-6.** N/A (See EEG.CO.1)

<table>
<tr><td colspan="8">Grade Level/ Course (HS): Geometry Unit 5</td></tr>
<tr><td colspan="8">Standard: 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.</td></tr>
<tr><td colspan="2">Domain: Circles</td><td colspan="6">Cluster: Understand and apply theorems about circles</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Identify inscribed angles, radii, chords, central angles, circumscribed angles, diameter, tangent.

Recognize that inscribed angles on a diameter are right angles.

Recognize that radius of a circle is perpendicular to the radius at the point of tangency.

Examine the relationship between central, inscribed and circumscribed angles by applying theorems about their measures.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given circles with two points on the circle, Compare the measures of the angles (with and without technology) formed by creating radii to the given points, creating chords from a third point on the circle to the given points, and creating tangents from a third point outside the circle to the given points, and conjecture about possible relationships among the angles, Use logical reasoning to justify (or deny) the conjectures (in particular justify that an inscribed angle is one half the central angle cutting off the same arc, and the circumscribed angle cutting off that arc is supplementary to the central angle relating all three). Given circles with chords from a point on the circle to the endpoints of a diameter, Find the measure of the	Central angles Inscribed angles Circumscribed angles	Students know: Definitions and characteristics of central, inscribed, and circumscribed angles in a circle, Techniques to find measures of angles including using technology (dynamic geometry software).	Students understand/are able to: Explain and justify possible relationships among central, inscribed, and circumscribed angles sharing intersection points on the circle, Accurately find measures of angles (including using technology (dynamic geometry software)) formed from inscribed angles, radii, chords, central angles, circumscribed angles, and tangents Relationships that exist among inscribed angles, radii, and chords may be used to find the measures of other angles when appropriate conditions are given, Identifying and justifying relationships exist in geometric figures.	**EEG-C.1-3.** N/A

angles (with and without technology), conjecture about and explain possible relationships, Use logical reasoning to justify (or deny) the conjectures (in particular justify that an inscribed angle on a diameter is a right angle). Given a circle with a tangent and radius intersecting at a point on the circle, Find the measure of the angle at the intersection point (with and without technology), conjecture about and explain possible relationships, Use logical reasoning to justify (or deny) the conjectures (in particular justify that the radius of a circle is perpendicular to the tangent where the radius intersects the circle.				

<table>
<tr><td colspan="8">Grade Level/ Course (HS): Geometry Unit 5</td></tr>
<tr><td colspan="8">Standard: G.C.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.</td></tr>
<tr><td colspan="2">Domain: Circles</td><td colspan="6">Cluster: Understand and apply theorems about circles.</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Define inscribed and circumscribed circles of a triangle.

Recall midpoint and bisector definitions.

Define a point of concurrency.

Prove properties of angles for a quadrilateral inscribed in a circle.

Construct inscribed circles of a triangle

Construct circumscribed circles of a triangle.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a triangle, Use tools (e.g., compass, straight edge, geometry software) to construct inscribed and circumscribed circles, Explain and justify the sequence of steps taken to complete the construction. Given a quadrilateral inscribed in a circle, Conjecture possible relationships among the angles through the use of inscribed angles use logical reasoning to justify (or deny) the conjectures (in particular, justify that diagonally opposite angles of a quadrilateral are supplementary).	Construct Inscribed and circumscribed circles of a triangle Quadrilateral inscribed in a circle	Students know: Techniques to find circumcenter and in center of a triangle, and to use this in inscribing or circumscribing the triangle, Properties of inscribed angles.	Students understand/are able to: Use appropriate tools to accurately construct inscribed and circumscribed circles of a triangle, Explain and justify the steps that are used when creating the construction, Apply the properties of inscribed angles to reach a conclusion. Every triangle has a point which is equidistant from each vertex of the triangle and a point which is equidistant from each side of the triangle, Opposite angles of a quadrilateral inscribed in a circle are supplementary.	**EEG-C.1-3.** N/A

<table>
<tr><td colspan="8">Grade Level/ Course (HS): Geometry Unit 5</td></tr>
<tr><td colspan="8">Standard: G.C. 4 (+) Construct a tangent line from a point outside a given circle to the circle.</td></tr>
<tr><td colspan="2">Domain: Circles</td><td colspan="6">Cluster: Understand and Apply Theorems about circles</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="3">Quarter 2:</td><td colspan="2">Quarter 3:</td><td>Quarter 4:

Recall vocabulary:
• Tangent
• Radius
• Perpendicular bisector
• Midpoint
•
Identify the center of the circle.

Synthesize theorems that apply to circles and tangents, such as:
• Tangents drawn from a common external point are congruent.
• A radius is perpendicular to a tangent at the point of tangency.

Construct the perpendicular bisector of the line segment between the center C to the outside point P.

Construct arcs on circle C from the midpoint Q, having length of CQ.

Construct the tangent line.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a circle and an external point, Use tools to construct a tangent line to the circle from the point.	Tangent line	Students know: Definition of a tangent line. Tangent lines are perpendicular to the radius of the circle at the point of tangency. An angle inscribed in a semi-circle is a right angle.	Students understand/are able to: Perform basic geometric constructions using tools. Any external point has two tangent lines to the circle.	**EEG-C.4.** N/A (+)

<table>
<tr><td colspan="8">Grade Level/ Course (HS): Geometry Unit 5</td></tr>
<tr><td colspan="8">Standard: G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0,2).</td></tr>
<tr><td colspan="2">Domain: Expressing Geometric Properties with Equations</td><td colspan="6">Cluster: Use coordinates to prove simple geometric theorems algebraically</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Recall previous understandings of coordinate geometry (including, but not limited to: distance, midpoint and slope formula, equation of a line, definitions of parallel and perpendicular lines, etc.)

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).

From Appendix A: Include simple proofs involving circles.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given coordinates and geometric theorems and statements defined on a coordinate system, Use the coordinate system and logical reasoning to justify (or deny) the statement or theorem, and to critique arguments presented by others.	Simple geometric theorems	Students know: Relationships (e.g. distance, slope of line) between sets of points, Properties of geometric shapes, Coordinate graphing rules and techniques, Techniques for presenting a proof of geometric theorems.	Students understand/are able to: Accurately determine what information is needed to prove or disprove a statement or theorem, Accurately find the needed information and explain and justify conclusions, Communicate logical reasoning in a systematic way to present a mathematical proof of geometric theorems.	**EEG-GPE.4.** N/A (See EEG-GPE)

Grade Level/ Course (HS): Geometry Unit 5							
Standard: 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.							
Domain: Circles		**Cluster: Find arc lengths and areas of sectors of circles.**					
Quarter 1:		**Quarter 2:**		**Quarter 3:**		**Quarter 4:** Recall how to find the area and circumference of a circle. Explain that 1° = Π/180 radians Recall from G.C.1, that all circles are similar. Determine the constant of proportionality (scale factor). Justify the radii of any two circles (r1 and r2) and the arc lengths (s1 and s2) determined by congruent central angles are proportional, such that r1 /s1 = r2/s2 Verify that the constant of a proportion is the same as the radian measure, Θ, of the given central angle. Conclude s = r Θ *From Appendix A: Emphasize the similarity of all circles. Note that by similarity of sectors with the same central angle, arc lengths are proportional to the radius. Use this as a basis for introducing radian as a unit of measure. It is not intended that it be applied to the development of circular trigonometry in this course.*	
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.**

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given an arc intercepted by an angle, Use dilations to create arcs intercepted by the same central angle with radii of various sizes (including using dynamic geometry software), and use the ratios of the arc lengths and radii to make conjectures regarding possible relationship between the arc length and the radius, Justify the conjecture for the formula for any arc length (i.e., since $2\pi r$ is the circumference of the whole circle, a piece of the circle is reduced by the ratio of the arc angle to a full angle (360)), Find the ratio of the arc length to the radius of each intercepted arc and use the ratio to name the angle calling this the radian measure of the angle by extending the definition of one radian as the angle which intercepts an arc of the same length as the radius, Develop the formula for the area of a sector by interpreting a circle as a complete revolution and a sector as a fractional part of a revolution.	Similarity Constant of proportionality Sector	Students know: Techniques to use dilations (including using dynamic geometry software) to create circles with arcs intercepted by same central angles, Techniques to find arc length, Formulas for area and circumference of a circle.	Students understand/are able to: Reason from progressive examples using dynamic geometry software to form conjectures about relationships among arc length, central angles, and the radius, Use logical reasoning to justify (or deny) these conjectures and critique the reasoning presented by others, Interpret a sector as a portion of a circle, and use the ratio of the portion to the whole circle to create a formula for the area of a sector. Radians measure the ratio of the arc length to the radius for an intercepted arc, The ratio of the area of a sector to the area of a circle is proportional to the ratio of the central angle to a complete revolution.	**EEG-C.5.** N/A

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<tr><td colspan="8">Grade Level/ Course: Geometry Unit 6</td></tr>
<tr><td colspan="8">Standard: 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”). Statistics and Probability is a Modeling Conceptual Category.</td></tr>
<tr><td colspan="2">Domain: Conditional Probability and the Rules of Probability</td><td colspan="6">Cluster: Understand independence and conditional probability and use them to interpret data.</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Define unions, intersections and complements of events.

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”).</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	CCSS Standard
Students: Given scenarios involving chance, Determine the sample space and a variety of simple and compound events that may be defined from the sample space, Use the language of union, intersection, and complement appropriately to define events.	Subsets Sample space Unions Intersections Complements	Students know: Methods for describing events from a sample space using set language (subset, union, intersection, complement).	Students understand/are able to: Interpret the given information in the problem, Accurately determine the probability of the scenario. Set language can be useful to define events in a probability situation and to symbolize relationships of events.	**Level IV Students will:** **EES-CP.1-5.** Find the probability of an event after another event has occurred. Ex. Find the probability of the next coin flip after a succession of coin flips (e.g., If Joe flipped a coin four times in row and got heads each time, what is the probability of getting heads on the next flip?). Ex. Find the probability of drawing a particular color after a succession of draws (e.g., If Sam had three die in a bag - one red, one blue, and one green, what is the probability of drawing and rolling a blue?). Ex. Find the probability of drawing a particular color after the color has been withdrawn (e.g., A bag contains four blue, three red, two yellow, and one black balls. Wes randomly selected the black ball. What is the probability he will select a yellow ball next if the black ball is not replaced in the bag?). **Level III Students will:** **EES-CP.1-5.** Identify when events are independent or dependent. Ex. When asked if winning the lottery depends on the weather, reply no. Ex. When asked if the basketball game is likely to be canceled if it rains, reply no. Ex. When asked if the baseball game is likely to will be canceled if it rains, indicate likely. Ex. When asked whether catching the bus depends upon whether you get up on time, reply yes. **Level II Students will:** **EES-CP.1-5.** Identify the outcomes of an event. Ex. What happens when an egg falls off the table? Ex. Two red and two blue balls are in a bag, two balls are taken out, what colors (two red, two blue, or red and blue) could the balls be? **Level I Students will:** **EES-CP.1-5.** Determine which event occurs first in a sequence. Ex. Which is put on first - socks or shoes? Ex. Using a daily schedule, what activity would come next?

Grade Level/ Course (HS): Geometry Unit 5							
Standard: G.GPE.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.							
Domain: Expressing Geometric Properties with Equations		**Cluster: Translate between the geometric description and the equation for a conic section**					
Quarter 1:		**Quarter 2:**		**Quarter 3:**		**Quarter 4:** Define a circle. Use Pythagorean Theorem. Complete the square of a quadratic equation. Derive equation of a circle using the Pythagorean Theorem – given coordinates of the center and length of the radius. Determine the center and radius by completing the square. From Appendix A: Emphasize the similarity of all circles. Note that by similarity of sectors with the same central angle, arc lengths are proportional to the radius. Use this as a basis for introducing radian as a unit of measure. It is not intended that it be applied to the development of circular trigonometry in this course.	
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.**

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given the center (h, k) and radius (r) of a circle, Explain and justify that every point on the circle is a combination of a horizontal and vertical shift from the center with a length equal to the radius, Create a right triangle from the center of a circle to a general point on the circle, and show that the legs of the right triangle are the absolute values of x-h and y-k, and the hypotenuse is r, then apply Pythagorean theorem to show that $r^2 = (x - h)^2 + (y - k)^2$. Given an equation of a circle in general form, Complete the square to rewrite the equation in the form $r^2 = (x - h)^2 + (y - k)^2$ and determine the center and radius.		Students know: Key features of a circle, The Pythagorean Theorem, The technique of completing the square.	Students understand/are able to: Create a right triangle in a circle using the horizontal and vertical shifts from the center as the legs and the radius of the circle as the hypotenuse, Convert an equation of a circle from general form to standard form using the method of completing the square. Circles represent a fixed distance in all directions in a plane from a given point, and a right triangle may be created to show the relationship of the horizontal and vertical shift to the distance, Rewriting algebraic expressions or equations in equivalent forms often reveals significant features of the expression, (i.e., circles written in standard form are useful for recognizing the center and radius of a circle).	**EEG-GPE.1.** N/A

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<tr><td colspan="8">Grade Level/ Course: Geometry Unit 5</td></tr>
<tr><td colspan="8">Standard: 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).*(*Modeling Standard)</td></tr>
<tr><td colspan="2">Domain: Modeling with Geometry</td><td colspan="6">Cluster: Apply geometric concepts in modeling situations</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="3">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Use measures and properties of geometric shapes to describe real world objects.

Given a real world object, classify the object as a known geometric shape - use this to solve problems in context.

From Appendix A: Focus on situations in which the analysis of circles is required.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a real-world object, Select an appropriate geometric shape to model the object, Provide a description of the object through the measures and properties of the geometric shape which is modeling the object, Explain and justify the model which was selected.		Students know: Techniques to find measures of geometric shapes, Properties of geometric shapes.	Students understand/are able to: Model a real-world object through the use of a geometric shape, Justify the model by connecting its measures and properties to the object. Geometric shapes may be used to model real-world objects, Attributes of geometric figures help us identify the figures and find their measures, therefore matching these figures to real world objects allows the application of geometric techniques to real world problems.	**Level IV Students will:** **EEG-MG.1-3.** Apply geometric methods to solve design problems. Ex. Identify the two-dimensional shapes that create the three-dimensional figure (e.g., I can see four triangles in a pyramid; I can see six squares on the outside of a cube). Ex. Determine the least number of tiles needed to cover the outside of a cubed figure- glue tiles onto a box. Ex. How many cups of water will this cylinder hold? Ex. Determine the amount of materials needed to wrap a present. **Level III Students will:** **EEG-MG.1-3.** Use properties of geometric shapes to describe real-life objects. Ex. Name everyday objects in terms of geometric shapes (can of soda is a cylinder, box of cereal is a rectangular prism). Ex. Describe the sides of a box of tissues (ends are squares, sides are rectangles). Ex. How many small square boxes (cubes)can I fit into a large cube? Ex. How many boxes (cubes) will fit on this shelf? Ex. Determine the dimensions of a classroom (length, width, and height.) **Level II Students will:** **EEG-MG.1-3.** Identify geometric shapes. Ex. Find real-life objects that have similar characteristics to a sphere. Ex. Given a cube, determine what real-life object has similar characteristics to a cube. **Level I Students will:** **EEG-MG.1-3.** Compare the capacity of three-dimensional objects. Ex. Which has the greatest capacity, a house or a school? Ex. Determine, which holds more, a cup or a barrel?

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 6</td></tr>
<tr><td colspan="8">Standard: 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. Statistics and Probability is a Modeling Conceptual Category.</td></tr>
<tr><td colspan="2">Domain: Conditional Probability and the Rules of Probability</td><td colspan="6">Cluster: Understand independence and conditional probability and use them to interpret data.</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Categorize events as independent or not using the characterization that two events A and B are independent when the probability of A and B occurring together is the product of their probabilities.

From Appendix A: Build on work from 2-way tables from Algebra 1 Unit 3 (S.ID.5) to develop understanding of conditional probability and independence.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given scenarios involving two events, Explain the meaning of independence from a formula perspective $P(A \cap B) = P(A) \times P(B)$ and from the intuitive notion that *A* occurring has no impact on whether *B* occurs or not, Compare these two interpretations within the context of the scenario.	Independent	Students know: Methods to find probability of simple and compound events.	Students understand/are able to: Interpret the given information in the problem, Accurately determine the probability of simple and compound events, Accurately calculate the product of the probabilities of two events. Events are independent if one occurring does not affect the probability of the other occurring, and that this may be demonstrated mathematically by showing the truth of $P(A \cap B) = P(A) \times P(B)$.	**Level IV Students will:** **EES-CP.1-5.** Find the probability of an event after another event has occurred. Ex. Find the probability of the next coin flip after a succession of coin flips (e.g., If Joe flipped a coin four times in row and got heads each time, what is the probability of getting heads on the next flip?). Ex. Find the probability of drawing a particular color after a succession of draws (e.g., If Sam had three die in a bag - one red, one blue, and one green, what is the probability of drawing and rolling a blue?). Ex. Find the probability of drawing a particular color after the color has been withdrawn (e.g., A bag contains four blue, three red, two yellow, and one black balls. Wes randomly selected the black ball. What is the probability he will select a yellow ball next if the black ball is not replaced in the bag?). **Level III Students will:** **EES-CP.1-5.** Identify when events are independent or dependent. Ex. When asked if winning the lottery depends on the weather, reply no. Ex. When asked if the basketball game is likely to be canceled if it rains, reply no. Ex. When asked if the baseball game is likely to will be canceled if it rains, indicate likely. Ex. When asked whether catching the bus depends upon whether you get up on time, reply yes. **Level II Students will:** **EES-CP.1-5.** Identify the outcomes of an event. Ex. What happens when an egg falls off the table? Ex. Two red and two blue balls are in a bag, two balls are taken out, what colors (two red, two blue, or red and blue) could the balls be? **Level I Students will:** **EES-CP.1-5.** Determine which event occurs first in a sequence. Ex. Which is put on first - socks or shoes? Ex. Using a daily schedule, what activity would come next?

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<tr><td colspan="8">Grade Level/ Course: Geometry Unit 6</td></tr>
<tr><td colspan="8">Standard: 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. Statistics and Probability is a Modeling Conceptual Category.</td></tr>
<tr><td colspan="2">Domain: Conditional Probability and the Rules of Probability</td><td colspan="6">Cluster: Understand independence and conditional probability and use them to interpret data</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Know the conditional probability of A given B as P(A and B)/P(B)

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.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given scenarios involving two events *A* and *B* both when *A* and *B* are independent and when *A* and *B* are dependent, Determine the probability of each individual event, then limit the sample space to those outcomes where *B* has occurred and calculate the probability of *A*, compare the *P(A)* and the *P(A given B)*, and explain the equality or difference in the original context of the problem, Justify that *P(A given B) = P(A∩B)/P(B)*.	Conditional probability Independence	Students know: Methods to find probability of simple and compound events, Techniques to find conditional probability.	Students understand/are able to: Accurately determine the probability of simple and compound events, Accurately determine the conditional probability P(A given B)from a sample space or from the knowledge of P(A∩B) and the P(B). The independence of two events is determined by the effect that one event has on the outcome of another event, The occurrence of one event may or may not influence the likelihood that another event occurs (e.g., successive flips of a coin - the first toss exerts no influence on whether a head occurs on the second, drawing an ace from a deck changes the probability that the next card drawn is an ace).	**Level IV Students will:** **EES-CP.1-5.** Find the probability of an event after another event has occurred. Ex. Find the probability of the next coin flip after a succession of coin flips (e.g., If Joe flipped a coin four times in row and got heads each time, what is the probability of getting heads on the next flip?). Ex. Find the probability of drawing a particular color after a succession of draws (e.g., If Sam had three die in a bag - one red, one blue, and one green, what is the probability of drawing and rolling a blue?). Ex. Find the probability of drawing a particular color after the color has been withdrawn (e.g., A bag contains four blue, three red, two yellow, and one black balls. Wes randomly selected the black ball. What is the probability he will select a yellow ball next if the black ball is not replaced in the bag?). **Level III Students will:** **EES-CP.1-5.** Identify when events are independent or dependent. Ex. When asked if winning the lottery depends on the weather, reply no. Ex. When asked if the basketball game is likely to be canceled if it rains, reply no. Ex. When asked if the baseball game is likely to will be canceled if it rains, indicate likely. Ex. When asked whether catching the bus depends upon whether you get up on time, reply yes. **Level II Students will:** **EES-CP.1-5.** Identify the outcomes of an event. Ex. What happens when an egg falls off the table? Ex. Two red and two blue balls are in a bag, two balls are taken out, what colors (two red, two blue, or red and blue) could the balls be? **Level I Students will:** **EES-CP.1-5.** Determine which event occurs first in a sequence. Ex. Which is put on first - socks or shoes? Ex. Using a daily schedule, what activity would come next?

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<tr><td colspan="8">Grade Level/ Course: Geometry Unit 6</td></tr>
<tr><td colspan="8">Standard: S.CP. 4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. 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 10th grade. Do the same for other subjects and compare the results. Statistics and Probability is a Modeling Conceptual Category.</td></tr>
<tr><td colspan="2">Domain: Conditional Probability and the Rules of Probability</td><td colspan="6">Cluster: Understand independence and conditional probability and use them to interpret data</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.

Interpret two-way frequency tables of data when two categories are associated with each object being classified. (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 10th grade. Do the same for other subjects and compare the results.)

From Appendix A: Build on work with two-way tables from Algebra 1 Unit 3 (S.ID.5) to develop understanding of conditional probability and independence.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a situation in which it is meaningful to collect categorical data for two categories Collect data and create two-way frequency tables, Determine probabilities of simple events and conditional events from the table, explain whether the events are independent based on the context and the probability calculations.	Two way frequency tables Sample space Independent Conditional probabilities	Students know: Techniques to construct two-way frequency tables, Techniques to find simple and conditional probability in two-way frequency tables.	Students understand/are able to: Accurately construct a two-way frequency table, Accurately find simple and conditional probability from a two-way frequency table. Two-way frequency tables show conditional probability and can be used to test for independence.	**Level IV Students will:** **EES-CP.1-5.** Find the probability of an event after another event has occurred. Ex. Find the probability of the next coin flip after a succession of coin flips (e.g., If Joe flipped a coin four times in row and got heads each time, what is the probability of getting heads on the next flip?). Ex. Find the probability of drawing a particular color after a succession of draws (e.g., If Sam had three die in a bag - one red, one blue, and one green, what is the probability of drawing and rolling a blue?). Ex. Find the probability of drawing a particular color after the color has been withdrawn (e.g., A bag contains four blue, three red, two yellow, and one black balls. Wes randomly selected the black ball. What is the probability he will select a yellow ball next if the black ball is not replaced in the bag?). **Level III Students will:** **EES-CP.1-5.** Identify when events are independent or dependent. Ex. When asked if winning the lottery depends on the weather, reply no. Ex. When asked if the basketball game is likely to be canceled if it rains, reply no. Ex. When asked if the baseball game is likely to will be canceled if it rains, indicate likely. Ex. When asked whether catching the bus depends upon whether you get up on time, reply yes. **Level II Students will:** **EES-CP.1-5.** Identify the outcomes of an event. Ex. What happens when an egg falls off the table? Ex. Two red and two blue balls are in a bag, two balls are taken out, what colors (two red, two blue, or red and blue) could the balls be? **Level I Students will:** **EES-CP.1-5.** Determine which event occurs first in a sequence. Ex. Which is put on first - socks or shoes? Ex. Using a daily schedule, what activity would come next?

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<tr><td colspan="8">Grade Level/ Course: Geometry Unit 6</td></tr>
<tr><td colspan="8">Standard: S.CP.5 Recognizeandexplaintheconceptsofconditionalprobabilityandindependenceineverydaylanguageand 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. Statistics and Probability is a Modeling Conceptual Category.</td></tr>
<tr><td colspan="2">Domain: Conditional Probability and Rules of Probability</td><td colspan="6">Cluster: Understand independence and conditional probability and use them to interpret data</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Recognize the concepts of conditional probability and independence in everyday language and everyday situations.

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.)</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a contextual situation and scenarios involving two events, Explain the meaning of independence from a formula perspective $P(A \cap B) = P(A) \times P(B)$ and from the intuitive notion that A occurring has no impact on whether B occurs or not, Compare these two interpretations within the context of the scenario.	Conditional probability Independence	Students know: Possible relationships and differences between the simple probability of an event and the probability of an event under a condition.	Students understand/are able to: Communicate the concepts of conditional probability and independence using everyday language by discussing the impact of the occurrence of one event on the likelihood of the other occurring. The occurrence of one event may or may not influence the likelihood that another event occurs (e.g., successive flips of a coin - first toss exerts no influence on whether a head occurs on the second, drawing an ace from a deck changes the probability that the next card drawn is an ace), Events are independent if the occurrence of one does not affect the probability of the other occurring.	**Level IV Students will:** **EES-CP.1-5.** Find the probability of an event after another event has occurred. Ex. Find the probability of the next coin flip after a succession of coin flips (e.g., If Joe flipped a coin four times in row and got heads each time, what is the probability of getting heads on the next flip?). Ex. Find the probability of drawing a particular color after a succession of draws (e.g., If Sam had three die in a bag - one red, one blue, and one green, what is the probability of drawing and rolling a blue?). Ex. Find the probability of drawing a particular color after the color has been withdrawn (e.g., A bag contains four blue, three red, two yellow, and one black balls. Wes randomly selected the black ball. What is the probability he will select a yellow ball next if the black ball is not replaced in the bag?). **Level III Students will:** **EES-CP.1-5.** Identify when events are independent or dependent. Ex. When asked if winning the lottery depends on the weather, reply no. Ex. When asked if the basketball game is likely to be canceled if it rains, reply no. Ex. When asked if the baseball game is likely to will be canceled if it rains, indicate likely. Ex. When asked whether catching the bus depends upon whether you get up on time, reply yes. **Level II Students will:** **EES-CP.1-5.** Identify the outcomes of an event. Ex. What happens when an egg falls off the table? Ex. Two red and two blue balls are in a bag, two balls are taken out, what colors (two red, two blue, or red and blue) could the balls be? **Level I Students will:** **EES-CP.1-5.** Determine which event occurs first in a sequence. Ex. Which is put on first - socks or shoes? Ex. Using a daily schedule, what activity would come next?

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 6</td></tr>
<tr><td colspan="8">Standard: S.CP.6 Find the conditional probability of A given B as the fraction of B’s outcomes that also belong to A and interpret the answer in terms of the model. Statistics and Probability is a Modeling Conceptual Category.</td></tr>
<tr><td colspan="2">Domain: Conditional Probability and Rules of Probability</td><td colspan="6">Cluster: Use rules of probability to compute probabilities of compound events in a uniform probability model.</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Find the conditional probability of A given B as the fraction of B’s outcomes that also belong to A.

Interpret the answer in terms of the model.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a contextual situation consisting of two events, Determine the probability of each individual event, then limit the sample space to those outcomes where *B* has occurred and calculate the probability of *A*, compare the *P(A)* and the *P(A given B)*, and explain the equality or difference in the original context of the problem, Determine the probability of each individual event, then limit the sample space to those outcomes where *B* has occurred and calculate the *P(A and B)*, compare the ratio of *P(A and B)* and *P(B) to P(A given B)*, and explain the equality or difference in the original context of the problem.	Conditional probability	Students know: Possible relationships and differences between the simple probability of an event and the probability of an event under a condition.	Students understand/are able to: Accurately determine the probability of simple and compound events, Accurately determine the conditional probability P(A given B) from a sample space or from the knowledge of P(A∩B) and the P(B). Conditional probability is the probability of an event occurring given that another event has occurred.	**EES-CP.6-7.** N/A (See EES-IC.1-2)

Grade Level/ Course: Geometry Unit 6							
Standard: S.CP.7 Apply the Additional Rule, P(A or B) = P(A) + P(B) – P(A and B) and interpret the answer in terms of the model. Statistics and Probability is a Modeling Conceptual Category.							
Domain: Conditional Probability and Rules of Probability		**Cluster: Use rules of probability to compute probabilities of compound events in a uniform probability model.**					
Quarter 1:		**Quarter 2:**		**Quarter 3:**		**Quarter 4:** Use the Additional Rule, P(A or B) = P(A) + P(B) – P(A and B) Interpret the answer in terms of the model.	
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.**

Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a contextual situation consisting of two events, Determine the simple probability of each event, Determine the P(A or B) and P(A and B), Interpret the Addition Rule by counting outcomes in the four events A, B, A and B, A or B and showing the relationship to P(A or B) = P(A) + P(B) - P(A and B), Interpret the Addition Rule in the case that the P(A and B) = 0.	Addition Rule	Students know: Techniques for finding probabilities of simple and compound events.	Students understand/are able to: Accurately determine the probability of simple and compound events. Formulas are useful to generalize regularities, but must be justified, The Addition Rule may be used for finding compound probability.	**EES-CP.6-7.** N/A (See EES-IC.1-2)

<table>
<tr><td colspan="8">Grade Level/ Course: Geometry Unit 6</td></tr>
<tr><td colspan="8">Standard: S.CP.8 (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model. Statistics and Probability is a Modeling Conceptual Category.</td></tr>
<tr><td colspan="2">Domain: Conditional Probability and Rules of Probability</td><td colspan="6">Cluster: Use the rules of probability to compute probabilities of compound events in a uniform probability model.</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Use the multiplication rule with correct notation.

Apply the general Multiplication Rule in a uniform probability model P(A and B) = P(A)P(B|A) = P(B)P(A|B).

Interpret the answer in terms of the model.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a contextual situation consisting of two events A and B, Use the definition of conditional probability P(B|A) = P(A and B)/P(A) to determine the probability of the compound event (A and B) when the P(A|B) and the P(A) are known or may be determined. Interpret the probability as it relates to the context.	Uniform probability model General Multiplication Rule	Students know: Techniques for finding probabilities of simple and conditional events.	Students understand/are able to: Determine the probability of a single event. Determine the probability of a conditional event. The general Multiplication Rule for probability is a manipulation of the formula for conditional probability. The formula P(A and B) = P(A)P(B|A) will always apply regardless of whether the events are independent or dependent.	**EES-CP.8-9.** N/A (+)

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<tr><td colspan="8">Grade Level/ Course: Geometry Unit 6</td></tr>
<tr><td colspan="8">Standard: S.CP.9 (+) Use permutations and combinations to compute probabilities of compound events and solve problems. Statistics and Probability is a Modeling Conceptual Category.</td></tr>
<tr><td colspan="2">Domain: Conditional Probability and Rules of Probability</td><td colspan="6">Cluster: Use rules of probability to compute probabilities of compound events in a uniform probability model.</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="3">Quarter 2:</td><td colspan="2">Quarter 3:</td><td>Quarter 4:

Identify situations that are permutations and those that are combinations.

Use permutations and combinations to compute probabilities of compound events and solve problems.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td colspan="2">Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a contextual situation, Choose the appropriate counting technique (permutation or combination), find the number of ways an event(s) can occur, and use these counts to determine probabilities of the event, including compound events.	Permutations Combinations Compound events	Students know: Order is the determining factor in whether an event requires a permutation or a combination to count the number of possible outcomes of the event. Techniques for finding probabilities of simple and compound events. Techniques for finding the number of permutations or combinations of an event.	Students understand/are able to: Evaluate factorial expressions. Apply the multiplication and addition rules to determine probabilities. Interpret and apply the different notations for combinations and permutations. Perform procedures to evaluate expressions involving the number of combinations and permutations of n things taken r at a time. There are contextual situations that can be interpreted through the use of combinations and permutations. The contextual situation determines whether combinations or permutations must be utilized. Mathematics is a coherent	**EES-CP.8-9.** N/A (+)

			whole. Structure within mathematics allows for procedures or models from one concept to be applied elsewhere (e.g., Pascal's triangle as it applies to the number of combinations).	

<table>
<tr><td colspan="8">Grade Level/ Course (HS): Geometry Unit 6</td></tr>
<tr><td colspan="8">Standard: S.MD.6 (+) Use probabilities to make fair decisions (e.g. drawing by lots, using a random number generator.)

This unit sets the stage for work in Algebra II, where the ideas of statistical inference are introduced. Evaluating the risks associated with conclusions drawn from sample data (i.e. incomplete information) requires an understanding of probability concepts. Statistics and Probability is a Modeling Conceptual Category.</td></tr>
<tr><td colspan="2">Domain: Using Probability to Make Decisions</td><td colspan="6">Cluster: Use probability to evaluate outcomes of decisions</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Compute Theoretical and Experimental Probabilities.

Use probabilities to make fair decisions (e.g. drawing by lots, using a random number generator.)

From Appendix A: This unit sets the stage for work in Algebra II, where the ideas of statistical inference are introduced. Evaluating the risks associated with conclusions drawn from sample data (i.e. incomplete information) requires an understanding of probability concepts.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a contextual situation in which a decision needs to be made, Use a random probability selection model to produce unbiased decisions.	Fair decisions	Students know: The characteristics of a random sample.	Students understand/are able to: Randomly select a sample from a population (using technology when appropriate). Multiple factors may ultimately determine the decision one makes other than the probability of events, such as ethical constraints, social policy, or feelings of others. Probabilities can be used to explain why a decision was considered to be fair or objective.	**EES-MD.1-7** N/A (+)

<table>
<tr><td colspan="8">Grade Level/ Course (HS): Geometry Unit 6</td></tr>
<tr><td colspan="8">Standard: S.MD.7 (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game.) Statistics and Probability is a Modeling Conceptual Category.</td></tr>
<tr><td colspan="2">Domain: Using Probability to Make Decisions</td><td colspan="6">Cluster: Use probability to evaluate outcomes of decisions</td></tr>
<tr><td colspan="2">Quarter 1:</td><td colspan="2">Quarter 2:</td><td colspan="2">Quarter 3:</td><td colspan="2">Quarter 4:

Recall prior understandings of probability.

Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game.)

From Appendix A: This unit sets the stage for work in Algebra II, where the ideas of statistical inference are introduced. Evaluating the risks associated with conclusions drawn from sample data (i.e. incomplete information) requires an understanding of probability concepts.</td></tr>
<tr><td>Make sense of problems and persevere in solving them.</td><td>Reason abstractly and quantitatively.</td><td>Construct viable arguments and critique the reasoning of others.</td><td>Model with mathematics.</td><td>Use appropriate tools strategically.</td><td>Attend to precision.</td><td>Look for and make use of structure.</td><td>Look for and express regularity in repeated reasoning.</td></tr>
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Evidence of Student Attainment/Assessment	Vocabulary	Knowledge	Skills	Instructional Achievement Level Descriptors
Students: Given a contextual situation in which a decision needs to be made, Use probability concepts to analyze, justify, and make objective decisions.		Students know: Techniques for finding probabilities of simple, compound, and conditional events and from probability distributions.	Students understand/are able to: Choose the appropriate probability concept for the given situation. Use and apply the selected probability rule. Communicate the reasoning behind decisions. Objective decision making can be mathematically based, often using analysis involving probability concepts. Multiple factors may ultimately determine the decision one makes other than the probability of events, such as ethical constraints, social policy, or feelings of others.	**EES-MD.1-7** N/A (+)