HIGLEY UNIFIED SCHOOL DISTRICT
INSTRUCTIONAL ALIGNMENT

HS Geometry Semester 1 (1st Quarter)

Unit 1: Congruence, Proof, and Constructions

Unit 1 embodies critical changes in Geometry as outlined by the AZCCRS. The heart of the module is the study of transformations and the role transformations play in defining congruence.

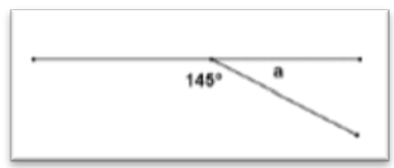
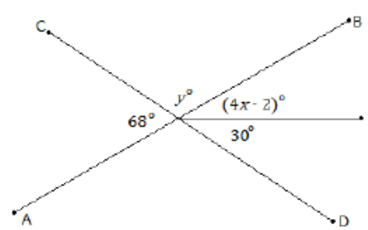
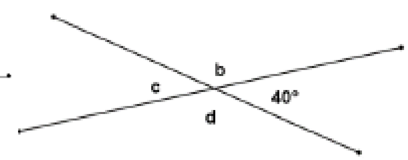
In this unit, students will work with the relatively unfamiliar concept of construction. The concept of constructions is brought to life by building upon ideas students are familiar with, such as the constant length of the radius within a circle. While the figures that are being constructed may not be novel, the process of using tools to create the figures is certainly new. Students use construction tools, such as a compass, straightedge, and patty paper, to create constructions of varying difficulty, including equilateral triangles, perpendicular bisectors, and angle bisectors. The constructions are embedded in models that require students to make sense of their space in addition to understanding how to find an appropriate solution with their tools. Students will also discover the critical need for precise language when they articulate the steps necessary for each construction. The figures covered throughout the topic provide a bridge to solving, then proving, unknown angle problems. (**G-CO.A.1, G-CO.D.12, G-CO.D.13**) Major constructions include an equilateral triangle, an angle bisector, and a perpendicular bisector. Students synthesize their knowledge of geometric terms with the use of new tools and simultaneously practice precise use of language and efficient communication when they write the steps that accompany each construction.

Students will also continue their knowledge of Transformations/Rigid Motions and Congruence, building on their intuitive understanding developed in Grade 8. With the help of manipulatives, students observed how reflections, translations, and rotations behave individually and in sequence (**8.G.A.1**, **8.G.A.2**). In high school Geometry, this experience is formalized by clear definitions (**G.CO.A.4**) and more in-depth exploration (**G.CO.A.2**, **G.CO.A.3**, **G.CO.A.5**). The concrete establishment of rigid motions also allows proofs of facts formerly accepted to be true (**G.CO.C.9**). Similarly, students' Grade 8 concept of congruence transitions from a hands-on understanding (**8.G.A.2**) to a precise, formally notated understanding of congruence (**G.CO.B.6**). With a solid understanding of how transformations form the basis of congruence, students next examine triangle congruence criteria. Part of this examination includes the use of rigid motions to prove how triangle congruence criteria such as SAS actually work (**G.CO.B.7**, **G.CO.B.8**).

Big Idea:	• The basic building blocks of geometric objects are formed from the undefined notions of point, line, distance along a line, and distance around a circular arc. • Geometry is a mathematical system built on accepted facts, basic terms, and definitions. • Special angles pairs can help you identify geometric relationships. • You can use special geometric tools to make a figure that is congruent to an original figure without measuring. • Two geometric figures are congruent if there is a sequence of rigid motions (rotations, reflections, or translations) that carries one onto the other. • A proof consists of a hypothesis and conclusion connected with a series of logical steps. • Two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles of the triangles are congruent. • It is possible to prove two triangles congruent without proving corresponding pairs of sides and corresponding pairs of angles of the triangle are congruent if certain subsets of these 6 congruence relationships are known to be true (e.g. SSS, SAS, ASA, but not SSA). • Different observed relationships between lines, between angles, between triangles, and between parallelograms are provable using basic geometric building blocks and previously proven relationships between these building blocks and between other geometric objects.
Essential Questions:	• What are the undefined building blocks of geometry and how are they used? • How will the construction of an equilateral triangle be used to solve real-life problems?

	• What is the relationship between symmetry with respect to a line and a perpendicular bisector? • How do I solve for unknown angles given angles and lines at a point? • What angle relationships exist when two parallel lines are cut by a transversal? • What relationships exist within triangles to find unknown angles? • In terms of rigid motions, when are two geometric figures congruent? • How do you prove theorems about parallel and perpendicular lines? • How do you prove basic theorems about line segments and angles? • How are transformations and functions related? • What is the relationship between a reflection and a rotation? • What differentiates between rigid motions and non-rigid motions? • What are possible conditions that are necessary to prove two triangles congruent? • What are the roles of hypothesis and conclusion in a proof? • What criteria are necessary in proving a theorem?		
Vocabulary	Geometric construction, figure, equilateral triangle, collinear, length of a segment, coordinate system on a line, point, line, plane, distance along a line, distance around a circular arc, angle, interior of an angle, angle bisector, midpoint, degree, zero and straight angle, right angle, perpendicular, equidistant, vertical angle, auxiliary line, alternate interior angles, corresponding angles, isosceles triangle, angles of a triangle, interior of a triangle, exterior angle of a triangle, rotation, reflection, line of symmetry, rotational symmetry, identity symmetry, translation, parallel, transversal, alternate interior angles, corresponding angles, congruence, rigid motion, congruence, isometry, SAS, ASA, SSS, SAA, HL, theorem		
Standard	**AZ College and Career Readiness Standards**	**Explanations & Examples**	**Resources**
G.CO.A.1	**A. Experiment with transformations in the plane** Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	As students begin to build a geometric system, precise use of language is key.	**Eureka Math:** Module 1 Lesson 1-5 Texas Instruments: Points, lines, and planes
G.CO.A.2	**A. Experiment with transformations in the plane** 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).	The expectation is to 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 specified distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle.	**Eureka Math:** Module 1 Lesson 12 - 21

G.CO.A.3	**A. Experiment with transformations in the plane** Given a rectangle, parallelogram, trapezoid, or regular polygons, describe the rotations and reflections that carry it onto itself.	Students may use geometry software and/or manipulatives to model transformations.	**Eureka Math:** Module 1 Lesson 15 - 21
G.CO.A.4	**A. Experiment with transformations in the plane** Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	Students may use geometry software and/or manipulatives to model transformations. Students may observe patterns and develop definitions of rotations, reflections, and translations. The expectation is to 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 specified distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle.	**Eureka Math:** Module 1 Lesson 12 Module 1 Lesson 13 Module 1 Lesson 15 Module 1 Lesson 16 - 21
G.CO.A.5	**A. Experiment with transformations in the plane** 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.	Students may use geometry software and/or manipulatives to model transformations and demonstrate a sequence of transformations that will carry a given figure onto another.	**Eureka Math:** Module 1 Lesson 13 Module 1 Lesson 14 Module 1 Lesson 16 **Texas Instruments:** Exploring transformations Reflections Rotations Translations
G.CO.B.6	**B. Understand congruence in terms of rigid motions** Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.	Students begin to extend their understanding of rigid transformations to define congruence (G-CO.B.6). (Dilations will be addressed in another unit.) This definition lays the foundation for work students will do throughout the course around congruence. A rigid motion is a transformation of points in space consisting of a sequence of one or more translations, reflections, and/or rotations. Rigid motions are assumed to preserve distances and angle measures. Students may use geometric software to explore the effects of rigid motion on a figure(s).	**Eureka Math:** Module 1 Lesson 12 - 21 **IXL:** Transformations **Texas Instruments:** Exploring Transformations Reflections Rotations Translations

G.CO.B.7	**B. Understand congruence in terms of rigid motions** Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.	**G.CO.7** Use the definition of congruence, based on rigid motion, to show two triangles are congruent if and only if their corresponding sides and corresponding angles are congruent. A rigid motion is a transformation of points in space consisting of a sequence of one or more translations, reflections, and/or rotations. Rigid motions are assumed to preserve distances and angle measures. Congruence of triangles Two triangles are said to be congruent if one can be exactly superimposed on the other by a rigid motion, and the congruence theorems specify the conditions under which this can occur.	**Eureka Math:** Module 1 Lesson 20-27 **Texas Instruments:** Congruent Triangles Angle-side Relationships Corresponding Parts Side-Side-Angle
G.CO.B.8	**B. Understand congruence in terms of rigid motions** Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.		**Eureka Math:** Module 1 Lesson 22-27
G.CO.C.9	**C. Prove Geometric Theorems** 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.*	Precise definitions are important as students begin to formulate proofs about lines and angles as described in G-CO.C.9. (Definitions related to a circle will be addressed in another unit.) Find the measure of each labeled angle. Give reasons for your solution.    	**Eureka Math:** Module 1 Lesson 6-11 **Texas Instruments:** Creating Parallel lines and transversals Alternate Interior Angles

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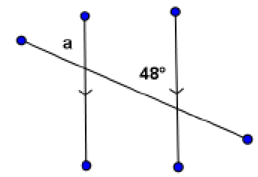
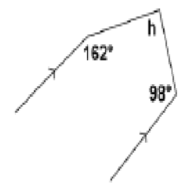
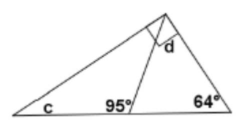
Vertical angles, angle addition postulate, linear pairs form supplementary angles, consecutive adjacent angles, angles at a point, corresponding angles, interior angles are supplementary, alternate interior angles

Discuss the auxiliary line:


$m\angle a = 48°$


$m\angle h = 100°$, *If parallel lines are cut by a transversal, then interior angles on the same side are supplementary*

Angles in a triangle:


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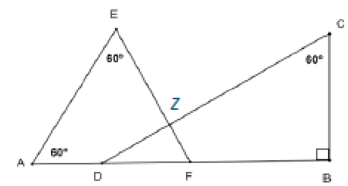
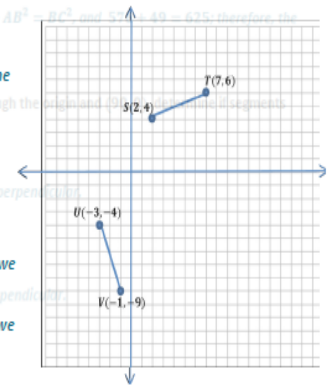
		Writing unknown angle proofs: Instead of solving for a numeric answer, students need to justify a particular relationship. Opening exercise: Sherlock Holmes  In the figure at the right, prove that $\overline{DC} \perp \overline{EF}$. *Draw in label Z.* $m\angle E + m\angle A + m\angle EFA = 180^\circ$ — *Sum of the angle measures in a triangle is 180°* $m\angle EFA = 60^\circ$ — *Subtraction Property of Equality* $m\angle B + m\angle C + m\angle CDB = 180^\circ$ — *Sum of the angle measures in a triangle is 180°* $m\angle CDB = 30^\circ$ — *Subtraction Property of Equality* $m\angle CDB + m\angle EFA + m\angle EZC = 180^\circ$ — *Sum of the angle measures in a triangle is 180°* $m\angle EZC = 90^\circ$ — *Subtraction Property of Equality* $\overline{DC} \perp \overline{EF}$ — *Perpendicular lines form 90° angles*	
G.CO.D.12 ▲	**D. Make geometric constructions** 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.	We saw two different scenarios where we used the construction of an equilateral triangle to help determine a needed location (i.e., the friends playing catch in the park and the sitting cats). Can you think of another scenario where the construction of an equilateral triangle might be useful? Articulate how you would find the needed location using an equilateral triangle. Write a clear set of steps for the construction of an equilateral triangle. Use Euclid's Proposition 1 as a guide. *1. Draw circle J: center J, radius≡.* *2. Draw circle S: center S, radius≡.* *3. Label the intersection as M.* *4. Join S, J, M.*	**Eureka Math:** Module 1 Lesson 1-5, 17-21 **Other:** Copying an Angle Bisect an angle **Illuminations:** Angle Bisector Perpendicular Bisector

		Every angle has two angle measurements corresponding to the interior and exterior regions of the angle: the angle measurement that corresponds to the number of degrees between 0° and 180°, and the angle measurement that corresponds to the number of degrees between 180° and 360°. To ensure there is absolutely no ambiguity about which angle measurement is being referred to in proofs, the angle measurement of an angle is always taken to be the number of degrees between 0° and 180°. This deliberate choice is analogous to how the square root of a number is defined: every positive number x has two square roots: √ x and -√x . So while -√ x is a square root of , the square root of is always taken to be √x . For the most part, there is very little need to measure the number of degrees of an exterior region of an angle in this course. Virtually (if not all) of the angles measured in this course will either be angles of triangles or angles formed by two lines (both measurements guaranteed to be less than 180°. Investigate how to bisect an angle: http://youtu.be/EBP3I8O9gIM Investigate how to copy an angle Construct a perpendicular bisector	
G.CO.D.13	**D. Make geometric constructions** Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.	Students may use geometric software to make geometric constructions. Using the skills you have practiced, construct three equilateral triangles, where the first and second triangles share a common side, and the second and third triangles share a common side. Clearly and precisely list the steps needed to accomplish this construction. Is triangle ABC an equilateral triangle? Justify your response.	**Eureka Math:** Module 1 Lesson 1-2 **Other:** Construct Eq Triangle **Texas Instruments:** Constructing an EQ Triangle Constructing a hexagon inscribed in a circle Congruence Worksheet Worksheet answers

			Other: [Inscribing and Circumscribing Right Triangles]
G.SRT.B.5 ●	**B. Prove theorems involving similarity** Use congruence ~~and similarity~~ criteria for triangles to solve problems and to prove relationships in geometric figures.	In this unit, students will only use **congruence** criteria for triangles to solve problems and to prove relationships in geometric figures.	**Eureka Math:** Module 1 Lessons 22-27
G.GPE.B.5 ●	**B. Use coordinates to prove simple geometric theorems algebraically** 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).	Given points $S(2,4)$, $T(7,6)$, $U(-3,-4)$, and $V(-1,-9)$: a. Translate segments $\overline{ST}$ and $\overline{UV}$ so that the image of each segment has an endpoint at the origin. *Answers can vary slightly. Students will have to choose one of the first two and one of the second two.* *If we translate $\overline{ST}$ so that the image of S is at the origin, we get $S'(0,0)$, $T'(5,2)$.* *If we translate $\overline{ST}$ so that the image of T is at the origin, we get $S'(-5,-2)$, $T'(0,0)$.* *If we translate $\overline{UV}$ so that the image of U is at the origin, we get $U'(0,0)$, $V'(2,-5)$.* *If we translate $\overline{UV}$ so that the image of V is at the origin, we get $V'(0,0)$, $U'(-2,5)$.*  b. Are the segments perpendicular? Explain. *Yes. By choosing any two of the translated segment $\overline{S'T'}$ and $\overline{U'V'}$, we determine whether the equation yields a true statement: $(b_1 - a_1)(d_1 - c_1) + (b_2 - a_2)(d_2 - c_2) = 0$.* *For example, using $S(-5,-2)$, $T'(0,0)$, and $U'(0,0)$, $V'(2,-5)$:* $-5(2) + (-2)(5) = 0$ *is a true statement; therefore,* $\overline{S'T'} \perp \overline{U'V'}$ *and* $\overline{ST} \perp \overline{UV}$. c. Are the lines $\overleftrightarrow{ST}$ and $\overleftrightarrow{UV}$ perpendicular? Explain. *Yes, lines containing perpendicular segments are also perpendicular.*	**Eureka Math:** Module 4 Lesson 5-8 This standard could be introduced in this unit when you are teaching **G-CO.C.9.** **It will be revisited 2nd Quarter in Unit 3: Coordinate Geometry.**

		Write the equation of the line through $(-5, 3)$ and: a. Parallel to $x = -1$. $x = -5$ b. Perpendicular to $x = -1$. $y = 3$ c. Parallel to $y = \frac{3}{5}x + 2$. $3x - 5y = -30$ d. Perpendicular to $y = \frac{3}{5}x + 2$. $5x + 3y = -16$ **Write the equation of the line through $\left(\sqrt{3}, \frac{5}{4}\right)$ and:** a. Parallel to $y = 7$. $y = \frac{5}{4}$ b. Perpendicular to $y = 7$. $x = \sqrt{3}$ c. Parallel to $\frac{1}{2}x - \frac{3}{4}y = 10$. $8x + 12y = 15 + 8\sqrt{3}$	
MP.3	**Construct viable arguments and critique the reasoning of others.**	Students articulate steps needed to construct geometric figures, using relevant vocabulary. Students develop and justify conclusions about unknown angles and defend their arguments with geometric reasons.	**Eureka Math:** Module 1
MP.4	**Model with mathematics.**	Students apply geometric constructions and knowledge of rigid motions to solve problems arising with issues of design or location of facilities.	**Eureka Math:** Module 1

MP.5	**Use appropriate tools strategically**.	Students consider and select from a variety of tools in constructing geometric diagrams, including (but not limited to) technological tools.	**Eureka Math:** Module 1 Lesson 1-5, 13-14, 17
MP.6	**Attend to precision**.	Students precisely define the various rigid motions. Students demonstrate polygon congruence, parallel status, and perpendicular status via formal and informal proofs. In addition, students will clearly and precisely articulate steps in proofs and constructions throughout the module.	**Eureka Math:** Module 1 Lesson 3-4,6, 13-14, 17
MP.7	**Look for and make use of structure.**	Students explore geometric processes through patterns and proof.	**Eureka Math:** Module 1 Lesson 6-11, 12-13, 17-18
MP.8	**Look for and express regularity in repeated reasoning.**	Students look for general methods and shortcuts. Teachers should attend to and listen closely to their students' observations and "a-ha moments," and follow those a-ha moments so that they generalize to the classroom as a whole.	**Eureka Math:** Module 1 Lesson 9, 12

HS Geometry Semester 1 (2nd Quarter)

Unit 2: Similarity, Proof, and Trigonometry

Just as rigid motions are used to define congruence in Unit 1, so dilations are added to define similarity in Unit 2. To be able to define similarity, there must be a definition of similarity transformations and consequently a definition for dilations. Students are introduced to the progression of terms beginning with scale drawings, which they first study in Grade 7, but in a more observational capacity than in Grade 10. Students determine the scale factor between a figure and a scale drawing or predict the lengths of a scale drawing, provided a figure and a scale factor. The study of scale drawings, specifically the way they are constructed under the ratio and parallel methods, gives us the language to examine dilations. The comparison of why both construction methods (MP.7) result in the same image leads to two theorems: the triangle side splitter theorem and the dilation theorem. (**G-SRT.A.1**, **G-SRT.A.4**).

As opposed to work done in Grade 8 on dilations, where students observed how dilations behaved and experimentally verified properties of dilations by examples, high school Geometry is anchored in explaining why these properties are true by reasoned argument. Grade 8 content focused on *what* was going on, high school Geometry content focuses on explaining *why* it occurs. Students prove that a dilation maps a line to itself or to a parallel line and, furthermore, dilations map segments to segments, lines to lines, rays to rays, circles to circles, and an angle to an angle of equal measure. Students build arguments based on the structure of the figure in question and a handful of related facts that can be applied to the situation (e.g., the triangle side splitter theorem is called on frequently to prove that dilations map segments to segments, lines to lines, etc.) (MP.3, MP.7). Students apply their understanding of dilations to divide a line segment into equal pieces and explore and compare dilations from different centers (**G-GPE.B.6**)

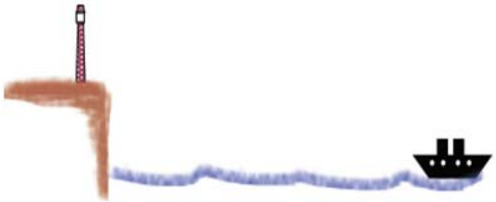
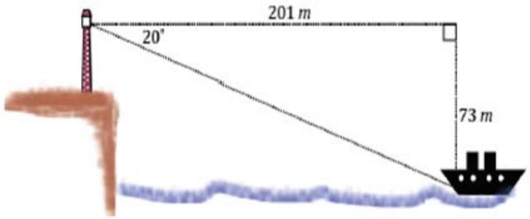
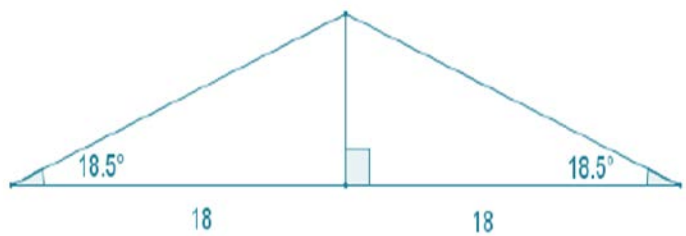
Students learn what a similarity transformation is and why, provided the right circumstances, both rectilinear and curvilinear figures can be classified as similar (**G-SRT.A.2**). After discussing similarity in general, the scope narrows, and students study criteria for determining when two triangles are similar(**G-SRT.A.3**). Part of studying triangle similarity criteria includes understanding side length ratios for similar triangles, which begins to establish the foundation for trigonometry (**G-SRT.B.5**). Students focus on similarity between right triangles in particular; laying the foundation for trigonometry. Students discover that a right triangle can be divided into two similar sub-triangles (MP.2) to prove the Pythagorean theorem (**G-SRT.B.4**). Students extend their work on rigid motions and proof to establish properties of triangles. They use their knowledge from Unit 1 to prove properties of triangles (**G-CO.C.10)** Students construct the inscribed and circumscribed circles of a triangle. (**G-C.A.3**)

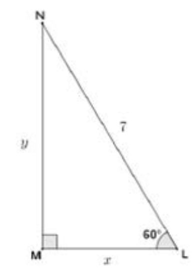
An introduction to trigonometry, specifically right triangle trigonometry and the values of side length ratios within right triangles, is provided by defining the sine, cosine, and tangent ratios and using them to find missing side lengths of a right triangle (**G-SRT.B.6**). This is in contrast to studying trigonometry in the context of functions, as is done in Algebra II. Students explore the relationships between sine, cosine, and tangent using complementary angles and the Pythagorean theorem (**G-SRT.B.7**, **G-SRT.B.8**).

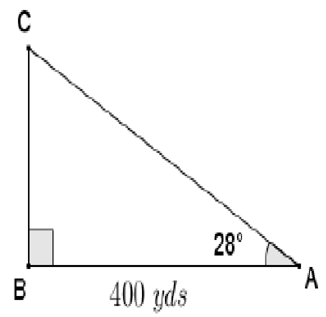
Big Ideas:	• A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged, and that the dilation of a line segment is longer or shorter in the ratio given by the scale factor of the dilation. • Two geometric figures are similar if there is a sequence of similarity transformations (dilation along with rotations, reflections, or translations) that carries one onto the other. • Any everyday object that is divided into equal parts can be produced using dilation. • Dilations differ from other transformations in that they use reasoned arguments to confirm the properties of dilations. • Dilations involve a rule assignment for each point in the plane and also have inverse functions that return each dilated point back to itself. • Underlying any geometric theorem is an invariance-something that does not change while something else does. • Ratios within figures can be used to find lengths of sides in another triangle when those triangles are known to be similar. • Pythagorean theorem can be proved using similarity. • Triangles occur in nature and everyday life. • Mathematical principles involving triangles are the cornerstone of architectural design.

Essential Questions:	• How are scale drawings and dilations related? • How can the Triangle Side Splitter Theorem be used to prove the Dilation Theorem? • What do dilations have in common with translations, reflections and rotations? • What distinguishes dilations from translations, reflections, and rotations? • What are similarity transformations, and why do we need them? • How do congruence and similarity transformations compare to each other? • What does it mean for similarity to be reflexive? Symmetric? • What does it mean to use between-figure and within figures ratios of corresponding sides of similar triangles? • What is an altitude, and what happens when an altitude is drawn from the right angle of a right triangle? • What is the relationship between the original right triangle and the two similar sub-triangles? • How do you use the ratios of the similar right triangles to determine the unknown lengths of a triangle? • What situations in real life require the use of trigonometry?		
Vocabulary	Scale drawing, scale factor, Ratio Method, dilation, Parallel Method, Triangle Side Splitter Theorem, Dilation Theorem, Rigid motions, Dilation Theorem of Rays, Dilation Theorem for Lines, Dilation Theorem for Circles, Similarity transformation, similarity, similar, angle bisector theorem, Similarity transformation, similarity, similar, angle bisector theorem, Pythagorean Theorem, Sides of a right triangle, sine, cosine, tangent		
Standard	**AZ College and Career Readiness Standards**	**Explanations & Examples**	**Resources**
G.SRT.A.1	**A. Understand similarity in terms of similarity transformations** Verify experimentally the properties of dilations given by a center and a scale factor: a. Dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	Lesson 3 Note: setsquares can be made in class; refer to Grade 7, Module 6, Lesson 7	**Eureka Math:** Module 2 Lesson 1 - 11
G.SRT.A.2	**A. Understand similarity in terms of similarity transformations** 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		**Eureka Math:** Module 2 Lesson 12-20

	corresponding pairs of angles and the proportionality of all corresponding pairs of sides.		
G.SRT.A.3 ●	**A. Understand similarity in terms of similarity transformations** Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.		**Eureka Math:** Module 2 Lesson 15
G.SRT.B.4 ●	**B. Prove theorems involving similarity** 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.*	Students may use geometric simulation software to model transformations and demonstrate a sequence of transformations to show congruence or similarity of figures.	**Eureka Math:** Module 2 Lesson 4-11, 21-24
G.SRT.B.5 ●	**B. Prove theorems involving similarity** Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.		**Eureka Math:** Module 2 Lesson 15-18
G.SRT.C.6 ●	**C. Define trigonometric ratios and solve problems involving right triangles.** 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.		**Eureka Math:** Module 2 Lesson 25,26

		Standing on the gallery of a lighthouse (the deck at the top of a lighthouse), a person spots a ship at an angle of depression of 20°. The lighthouse is 28 m tall and sits on a cliff 45 m tall as measured from sea level. What is the horizontal distance between the lighthouse and the ship? Sketch a diagram to support your answer. *Approximately* 201 *m.*   Tim is designing a roof truss in the shape of an isosceles triangle. The design shows the base angles of the truss to have measures of $18.5°$. If the horizontal base of the roof truss is 36 ft. across, what is the height of the truss?  *Let* h *represent the height of the truss in feet. Using tangent,* $\tan 18.5 = \frac{h}{18}$, *and thus* $h = 18(\tan 18.5)$ $h \approx 6.$ *The height of the truss is approximately* 6 ft.	

G.SRT.C.7	**C. Define trigonometric ratios and solve problems involving right triangles.** Explain and use the relationship between the sine and cosine of complementary angles.	Find the values for θ that make each statement true. a. $\sin\theta = \cos 32$ $\theta = 90 - 32$ $\theta = 58$ b. $\cos\theta = \sin(\theta + 20)$ $\sin(90 - \theta) = \sin(\theta + 20)$ $90 - \theta = \theta + 20$ $70 = 2\theta$ $35 = \theta$ Triangle LMN is a 30–60–90 right triangle. Find the unknown lengths x and y. $\sin 60 = \frac{\sqrt{3}}{2}$ $\frac{\sqrt{3}}{2} = \frac{y}{7}$ $7\sqrt{3} = 2y$ $y = \frac{7\sqrt{3}}{2}$ $\cos 60 = \frac{1}{2}$ $\frac{1}{2} = \frac{x}{7}$ $7 = 2x$ $\frac{7}{2} = x$  $\sin\theta = \cos(3\theta + 20)$ $\cos(90 - \theta) = \cos(3\theta + 20)$ $90 - \theta = 3\theta + 20$ $70 = 4\theta$ $17.5 = \theta$	**Eureka Math:** Module 2 Lesson 27, 28, 29

G.SRT.C.8 ●	**C. Define trigonometric ratios and solve problems involving right triangles.** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.	If $\cos\theta = \frac{4}{5}$, find $\sin\theta$ and $\tan\theta$. *Using the identity* $\sin^2\theta + \cos^2\theta = 1$: $\sin^2\theta + \left(\frac{4}{5}\right)^2 = 1$ $\sin^2\theta = 1 - \left(\frac{4}{5}\right)^2$ $\sin^2\theta = 1 - \left(\frac{16}{25}\right)$ $\sin^2\theta = \frac{9}{25}$ $\sin\theta = \sqrt{\frac{9}{25}}$ $\sin\theta = \frac{3}{5}$ *Using the identity* $\tan\theta = \frac{\sin\theta}{\cos\theta}$: $\tan\theta = \frac{\frac{3}{5}}{\frac{4}{5}} = \frac{3}{4}$ A surveying crew has two points A and B marked along a roadside at a distance of 400 yd. A third point C is marked at the back corner of a property along a perpendicular to the road at B. A straight path joining C to A forms a 28° angle with the road. Find the distance from the road to point C at the back of the property and the distance from A to C using sine, cosine, and/or tangent. Round your answer to three decimal places.  $\tan 28 = \frac{BC}{400}$ $BC = 400(\tan 28)$ $BC \approx 212.684$ *The distance from the road to the back of the property is approximately 212.684 yds.* $\cos 28 = \frac{400}{AC}$ $AC = \frac{400}{\cos 28}$ $AC \approx 453.028$ *The distance from point C to point A is approximately 453.028 yd.*	**Eureka Math:** Module 2 Lesson 29,30

G.CO.D.10 ●	**C. Prove geometric theorems** 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.	Students may use geometric simulations (computer software or graphing calculator) to explore theorems about triangles.	**Eureka Math:** Module 1 Lesson 29-30, 33-34 **Other:** Company Logo Floodlights
G.C.A.3 ▲	**Understand and apply theorems about circles.** Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.		**Eureka Math:** Module 5 Lesson 3 This standard will be revisited in Unit 5: Circles With and Without Coordinates.
G.GPE.B.6 ●	**B. Use coordinates to prove simple geometric theorems algebraically** Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	Students may use geometric simulation software to model figures or line segments.	**Eureka Math:** Module 4 Lesson 12-15 This standard will be revisited in Unit 3: Coordinate Geometry

		Find the midpoint of $\overline{ST}$ given $S(-2,8)$ and $T(10,-4)$. $M\left(\frac{1}{2}(-2+10), \frac{1}{2}(8-4)\right) = M(4,2)$ Find the point on the directed segment from $(-2,0)$ to $(5,8)$ that divides it in the ratio of $1:3$. *A ratio of* $1:3$ *means* $\frac{1}{4}$ *of the way from* $(-2,0)$ *to* $(5,8)$. $\left(-2+\frac{1}{4}(5-(-2)), 0+\frac{1}{4}(8-0)\right) = \left(-\frac{1}{4}, 2\right)$ Given $\overline{PQ}$ and point R that lies on $\overline{PQ}$ such that point R lies $\frac{7}{9}$ of the length of $\overline{PQ}$ from point P along $\overline{PQ}$. a. Sketch the situation described.  	
MP.1	**Make sense of problems and persevere in solving them.**	Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.	**Eureka Math:** Module 2 Lesson 3-4,8,11,13,21,28-29,31
MP.2	**Reason abstractly and quantitatively.**	Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—	**Eureka Math:** Module 2 Lesson 3, 10,15,21,27,31

		and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved	
MP.3	**Construct viable arguments, and critique the reasoning of others.**	Critical to this unit is the need for dilations in order to define similarity. In order to understand dilations fully, the proofs to establish the Triangle Side Splitter and the Dilation Theorems require students to build arguments based on definitions and previously established results.	**Eureka Math:** Module 2 Lesson 2, 4-5, 7-10,14-15,17,22-23,26,30,32-33
MP.5	**Use appropriate tools strategically.**	Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, or dynamic geometry software.	**Eureka Math:** Module 2 Lesson 1-2
MP.6	**Attend to precision.**	Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. Students examine claims and make explicit use of definitions.	**Eureka Math:** Module 2 Lesson 4, 26
MP.7	**Look for and make use of structure.**	Much of the reasoning in Unit 2 centers around the interaction between figures and dilations. It is unsurprising then that students must pay careful attention to an existing structure and how it changes under a dilation, for example why it is that dilating the key points of a figure by the ratio method results in the dilation of the segments that join them. The math practice also ties into the underlying idea of trigonometry: how to relate the values of corresponding ratio lengths between similar right triangles and how the value of a trigonometric ratio hinges on a given acute angle within a right triangle.	**Eureka Math:** Module 1 21,23,25,27,30-31
MP.8	**Look for and express regularity in repeated reasoning.**	Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.	**Eureka Math:** Module 2 Lesson 5,11,26,29