Geometry: Similarity and Transformations

Stage 1 Desired Results

ESTABLISHED GOALS:

Competencies:

- ***Students will demonstrate the ability to solve problems involving one- two- and three-dimensional objects by applying algebraic models and geometric formulas.***
- ***Students will demonstrate the ability to reason with definitions, properties, and theorems of geometry to create conjectures and to prove or analyze statements.***
- ***Students will demonstrate the ability to analyze and summarize text and integrate knowledge to make meaning of discipline-specific materials.***
- ***Students will demonstrate the ability to produce coherent and supported writing in order to communicate effectively for a range of discipline-specific tasks, purposes, and audiences.***
- ***Students will demonstrate the ability to speak purposefully and effectively by strategically making decisions about content, language use, and discourse style.***

Content Standards:

- G.SRT.1ab 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.
  - The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
- G.SRT.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
- G.SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
- G.SRT.4 Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
- G.SRT.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
- G.CO.2 Represent transformations in the plane using, e.g. transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g.. translation versus horizontal stretch).
- G.CO.3 Given a rectangle, parallelogram, trapezoid, or regular

Transfer

*Students will be able to independently use their learning to **manipulate objects to create a desired outcome.***

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- if similarity is maintained, the relationships between the components stay constant.
- similarity is an important tool in indirect measurement.
- similarity can be proven through geometric transformations.

ESSENTIAL QUESTIONS

- What consequences can result from manipulation?
- How do geometric transformations uncover the relationships in similar figures?

Acquisition

Students will know…

- *that equality refers to values and measurements whereas congruence refers to objects.*
- *that polygons can be proven similar using proportions.*
- *that the distance from the center of dilation to each corresponding vertex of similar figures retains the scale factor between the figures.*
- *that special segments will split a triangle proportionally.*
- *that an angle bisector cuts an angle into two equal halves.*
- *that the altitude drawn to the hypotenuse of a right triangle creates two similar right triangles, each similar to the original right triangle and similar to each other.*
- *that similar triangles can create a geometric mean.*
- *the following postulates and theorems:*
  - *AA, SAS, SSS Triangle postulates*
  - *Side-splitter Theorem and its corollary*
  - *Triangle-Angle-Bisector Theorem*

Students will be skilled at…

- *writing and solving proportions based on given information.*
- *applying similarity theorems to prove triangle similarity.*
- *transforming pre-images to their images both on and off the coordinate plane using translations, reflections, rotations, and dilations for figures.*
- *determining new coordinates after any given transformation.*
- *identifying congruence transformations and proving congruence using isometries.*
- *identifying similarity transformations and verifying properties of similarity.*
- *using triangle similarity to prove the Pythagorean Theorem.*
- *using congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.*

polygon, describe the rotations and reflections that carry it onto itself. • G.C0.4 Develop definitions of rotations, reflections, and lines, parallel lines, and line segments. • G.CO.5 Given a geometric figure and a rotation. reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. • G.CO.6 Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they arc congruent. • MP1 Make sense of problems and persevere in solving them. • MP2 Reason abstractly and quantitatively. • MP6 Attend to precision. • MP7 Look for and make use of structure. • MP8 Look for and express regularity in repeated reasoning.	*<u>vocabulary:</u> extremes of a proportion, geometric mean, indirect measurement, means of a proportion, ratio, extended ratio, proportion, extended proportion, scale, scale drawing, scale factor, similar, similar polygons, indirect measurement, congruence transformation, dilation, image, isometry, preimage, reflection, rigid motion, rotation, similarity transformation, translation, compositions of transformations*	
Content Area Literacy Standards		***21st Century Skills***
• RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. • RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.		• *reason effectively* • *use systems thinking* • *make judgments and decisions* • *solve problems* • *communicate clearly* • *access and evaluate information*

Stage 2 - Evidence

Evaluative Criteria	***Assessment Evidence***
	PERFORMANCE TASK(S):
	OTHER EVIDENCE:

Stage 3 – Learning Plan

Summary of Key Learning Events and Instruction

Language Arts Integration	***Mathematics Integration***
• 1.OA.1 Use	• 1.OA.1 Use
Technology Integration	***District Materials***
• 1.OA.1 Use	