Unit #2: Similarity, Proof, Transformations, and Constructions

Content Area: **Mathematics**
Course(s): **Geometry**
Time Period: **Semester 1**
Length: **6 weeks**
Status: **Published**

Standards

MA.K-12.2	Reason abstractly and quantitatively.
MA.G-CO.A.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).
MA.G-CO.A.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
MA.G-CO.A.4	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
MA.G-CO.A.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.
MA.G-CO.B.6	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
MA.G-CO.B.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.
MA.G-CO.D.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).
MA.G-CO.D.13	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
MA.G-SRT.A.1	Verify experimentally the properties of dilations given by a center and a scale factor:
MA.G-SRT.A.1a	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.
MA.G-SRT.A.1b	The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
MA.G-SRT.A.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.
LA.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
MA.G-SRT.A.3	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
MA.G-SRT.B.4	Prove theorems about triangles.
MA.G-SRT.B.5	Use congruence and similarity criteria for triangles to solve problems and to prove

	relationships in geometric figures.
MA.G-C.A.1	Prove that all circles are similar.

Enduring Understandings

1. A proof is a logical argument that uses definitions, theorems, and postulates to demonstrate that a mathematical statement is true.

2. Similarity can be applied to real world situations.

3. The definition of similar figures is based on transformations.

4. Proportional relationships express how quantities change in relationship to each other.

5. Ratios can be used to compare similar figures.

6. Transformations that are rigid motions include translations, rotations, and reflections.

7. The image of a transformation after a rigid motion is congruent to the preimage.

Essential Questions

1. How can similarity be used to solve mathematical and real-world problems?

2. How does writing a proof make you a more logical thinker?

3. How can the similarity of specific two figures be applied to more general cases?

4. How does explaining my process help me to understand a problem solution better?

5. How is similarity of geometric figures applied and verified?

6. How can we construct angle bisectors, perpendicular lines, and perpendicular bisectors?

7. How can we identify transformations that are rigid motions?

8. How can we draw the image of a figure after a translation, rotation, reflection, or dilation?

Knowledge and Skills

- Recognize and work with ratios and proportions
- Calculate geometric means
- Identify the characteristics of similar figures
- Use several methods to prove triangles similar
- Use similar triangles to prove angles congruent or sides proportional
- Apply three theorems used to establish proportionality
- Identify which transformations are rigid motions.
- Draw images of figures after applying translations, rotations, reflections, or dilations.

Transfer Goals

Recognize and solve practical or theoretical problems involving Geometry, including those for which the solution approach is not obvious, by using mathematical reasoning and strategic thinking.

Knowing multiple ways to approach a problem gives you the power of choice.

Resources

Informal Geometry, by Cox

Geometry for Enjoyment and Challenge, by Rhoad

Moises Geometry, by Moise

Khan Academy

PurpleMath

KutaSoftware

CK-12

Quizlet

Albert I/O

Desmos

Problem-Attic

Classkick