03 Similarity

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **3-4 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

NJSLS Geometry Overview

In this unit, students use dilations and rigid transformations to justify triangle similarity theorems including the Angle-Angle Triangle Similarity Theorem. Students explicitly build on their work with congruence and rigid motions, establishing that triangles are similar by dilating them strategically. The unit balances a focus on proof with a focus on using similar triangles to find unknown side lengths and angle measurements. (IM)

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Objectives:

Throughout this unit students will need to blend computational skills, Algebraic techniques, and Geometric relationships to determine and analyze the similarity of figures.

Essential Questions:

- What conditions need to exist for two figures to be similar?
- What conclusions can be drawn from determining that two figures are similar?
- How can similarity be used to help model and solve problems?

Enduring Understandings:

- Dilations create similar figures
- Triangles can be proven similar through: AAA, AA, SAS, SSS, and HL
- Corresponding lengths in similar polygons are proportional
- Similarity preservers the congruence of angles
- All circles are similar

CONTENT AREA STANDARDS

G.C

A. Understand and apply theorems about circles

B. Find arc lengths and areas of sectors of circles

G.CO

A. Experiment with transformations in the plane

B. Understand Congruence in terms of rigid motions

C. Prove geometric theorems

D. Make geometric constructions

G.GMD

A. Explain volume formulas and use them to solve problems

B. Visualize relationships between two-dimensional and three-dimensional objects

G.GPE

A. Translate between the geometric description and the equation for a conic section

B. Use coordinates to prove simple geometric theorems algebraically

G.MG

A. Apply geometric concepts in modeling situations

G.SRT

A. Understand similarity in terms of similarity transformations

B. Prove theorems involving similarity

C. Define trigonometric ratios and solve problems involving right triangles

D. Apply trigonometry to general triangles

MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.8	Look for and express regularity in repeated reasoning.
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.
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	Prove theorems involving similarity
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.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

LA.K-12.NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
LA.RH.9-10.4	Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history and the social sciences; analyze the cumulative impact of specific word choices on meaning and tone.
LA.RH.9-10.7	Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text, to analyze information presented via different mediums.
LA.RST.9-10.2	Determine the central ideas, themes, or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
LA.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.
LA.RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
LA.RST.9-10.5	Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
CS.K-12.1.a	Include the unique perspectives of others and reflect on one's own perspectives when designing and developing computational products.
CS.K-12.2.c	Solicit and incorporate feedback from, and provide constructive feedback to, team members and other stakeholders.
CS.K-12.2.d	Evaluate and select technological tools that can be used to collaborate on a project.
CS.K-12.3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.

CS.K-12.3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
CS.K-12.3.c	Evaluate whether it is appropriate and feasible to solve a problem computationally.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- Two figures are similar if one can be mapped onto the other by a dilation and a series of rigid motions
- If two figures are similar then the lengths of all corresponding sides are in an equal ratio and all corresponding angle measures are congruent

Procedural Knowledge

Students will be able to:

- Prove theorems about triangles. *Knowledge Utilization*
- Verify experimentally that 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. *Analysi*
- Verify experimentally that the dilation of a line segment is longer or shorter in the ratios given by the scale factor. *Analysis*
- Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar. *Comprehension*
- Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. *Comprehension*
- Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. *Comprehension*

EVIDENCE OF LEARNING

Benchmark Assessments

Benchmark Assessments conducted three times per year, using Pear Assessment (Standards Based Assessments)

Alternate Assessments

Formative Assessments

- Student feedback/questioning/observation
- Exit Ticket
- Error analysis
- Specific skill assessment/questions
- Survey/polling
- Reflection questions
- Scored/evaluated class work or homework
- Task completion

Summative Assessments

Lesson Quizzes
Unit Test
Performance Tasks

RESOURCES (Instructional, Supplemental, Intervention Materials)

Core Instructional Materials

Envisions Geometry

Kuta Software

Supplemental Materials

NJ DOE Model Curriculum unit: Similarity and Proof

Illustrative Mathematics unit: Similarity

Khan Academy unit: Similarity

NJCTL unit: Similar Triangles and Trigonometry

INTERDISCIPLINARY CONNECTIONS

Interdisciplinary connections are frequently addressed through modeling and application problems whereby students solve and analyze situations taken from business, physics, engineering, biology, statistics, geography, and numerous other fields. Examples can be found in topic specific textbook problems and digital resources.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.