Unit 7: Similarity

Content Area: **Mathematics**
Course(s): **Geometry, Honors Geometry**
Time Period: **February**
Length: **3 weeks**
Status: **Published**

Unit Overview

- Apply the Triangle Proportionality and Triangle Angle-Bisector Theorems.
- Express a proportion in an equivalent form
- Expressing Geometric Properties with Equations
- Solve for an unknown term in a given proportion.
- State and apply the properties of similar polygons in proofs.
- Use indirect measurement to find lengths that a difficult to measure directly
- Use similar triangle to deduce information about segments or angles.
- Use the AA, SAS, and SSS Similarity Theorems to prove triangles similar.

Enduring Understandings

- A variety of techniques of indirect measurement can be used to represent and solve problems
- Geometric and algebraic procedures are interconnected and build on one another.
- Integration of various mathematical procedures builds a stronger foundation for finding solutions.
- There are various computational methods, including mental math, pencil and paper techniques and use of calculators to find the solution

Essential Questions

- How can you use algebra to make solving problems in geometry both effective and efficient?
- How do you identify corresponding parts of similar triangles?
- How do you show two triangles are similar?
- How do you use proportions to find side lengths in similar polygons?

Student Learning Objectives

- use the Side-Splitter Theorem and the Triangle-Angle-Bisector Theorem
- identify and apply similar polygons
- use similarity to find indirect measurements
- write ratios and solve proportions

Standards

	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. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. 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. Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
MA.G-CO.C	Prove geometric theorems
MA.G-SRT	Similarity, Right Triangles, and Trigonometry
MA.G-SRT.A	Understand similarity in terms of similarity transformations
MA.G-SRT.B	Prove theorems involving similarity
MA.G-MG.A.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).
	Connections to Equations.

Indicators

MA.N-Q.A	Reason quantitatively and use units to solve problems.
MA.N-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
MA.N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MA.G-CO.C.10	Prove theorems about triangles.
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.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
	During high school, students begin to formalize their geometry experiences from elementary and middle school, using more precise definitions and developing careful proofs. Later in college some students develop Euclidean and other geometries carefully from a small set of axioms.
	Although there are many types of geometry, school mathematics is devoted primarily to plane Euclidean geometry, studied both synthetically (without coordinates) and analytically (with coordinates). Euclidean geometry is characterized most importantly by the Parallel Postulate, that through a point not on a given line there is exactly one parallel line. (Spherical geometry, in contrast, has no parallel lines.)
	An understanding of the attributes and relationships of geometric objects can be applied in diverse contexts—interpreting a schematic drawing, estimating the amount of wood needed to frame a sloping roof, rendering computer graphics, or designing a sewing pattern for the most efficient use of material.

Lesson Titles

- Directed Line Segments
- Proportions in Triangles
- Ratios & Proportions
- Scale and Indirect Measurement
- Similarity

Career Readiness, Life Literacies & Key Skills

TECH.9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
TECH.9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
TECH.9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
TECH.9.4.2.DC.3	Explain how to be safe online and follow safe practices when using the internet (e.g., 8.1.2.NI.3, 8.1.2.NI.4).
TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.2.TL.3	Enter information into a spreadsheet and sort the information.

Inter-Disciplinary Connections

LA.RL.9-10.1	Cite strong and thorough textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
LA.RL.9-10.4	Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).
LA.RI.9-10.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.) and make relevant connections, to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
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.RI.9-10.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).
LA.WHST.9-10.1.E	Provide a concluding paragraph or section that supports the argument presented.
ARCH.9-12.9.4.12.B.(1).3	Integrate structural, environmental, safety, building envelope, and building service systems in the design of buildings and structures.

Instructional Strategies. Learning Activities. and Levels of Blooms/DOK:

- Demonstrate how to solve algebraic proofs
- Demonstrate how to solve basic congruence proofs
- Intro. applying special angles to proofs
- Intro. biconditional statements
- Intro. complementary angles
- Intro. Conclusions
- Intro. Conditional Statements
- Intro. Converse statements
- Intro. counterexamples
- Intro. finding measures of missing angles using theorems of specials angles
- Intro. finidng angle measurement with perpendicular lines
- Intro. Hypothesis
- Intro. perpendicular lines
- Intro. planning a proof
- Intro. proofs and how to use them to solve problems
- Intro. properties of congruence
- Intro. proving theorems
- Intro. reasons used in proofs
- Intro. students to algebraic proofs

- Intro. supplementary angles
- Intro. the Angle Bisector theorem
- Intro. the midpoint theorem
- Intro. theorems of perpendicular lines
- Intro. vertical angles
- Intro. what you can deduce from given information
- make connections between verbal statements and equations
- make connections definitions and equality statements-analyze given information
- Review anticipatory Set
- Review Homework
- Review properties of equality from algebra
- Review Quiz
- Review standardized-test practice questions for warmup
- students will be introduced to the concept of deductive reasoning
- Students will work independently on developing deductive reasoning skills
- Students will work independently on solving problems involving complementary and supplementary angles
- use mathematical properties to deduce new informationstandards

Modifications:

G&T Modifications

- Ask students' higher level questions that require students to look into causes, experiences, and facts to draw a conclusion or make connections to other areas of learning.
- CTE - Additional reinforcement activities soliciting a deeper understanding of curriculum.
- Employ differentiated curriculum to keep interest high.
- Generating and testing hypotheses
- Tutoring during Delsea One

ELLs Modifications

- 1:1 testing
- Digital translators
- Focus on domain specific vocabulary and keywords
- Offer alternate/or modify assessments
- Tutoring during Delsea One

IEP & 504 Modifications

- Cue Attention
- Extra time
- Family Communication
- Focus on domain specific vocabulary and keywords
- Frequent Check of Work/Reminders
- Modify homework expectations
- Preferential Seating
- Provide Study Guides/Notes
- providing students with content vocabulary prior to teaching a lesson including that vocabulary (pre-teaching)
- Repeat/Reword/Clarify
- Small group testing
- State Expectations Clearly
- Tutoring during Delsea One
- Use of calculator

At Risk Modifications

- Additional help during tutoring/Delsea One/Academic Enrichment
- Family Communication
- Retesting
- Study Guides
- Tutoring during Delsea One

Alternate Assessment

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Benchmark Assessment

Skills-based assessment- math practice

Formative Assessment

- anticipatory set
- closure
- group work
- pass out of class
- think-pair-share
- warm up

Summative Assessment

- Alternate Assessment: Indirect Measurement Group Project
- Marking Period Assessment
- Mini Assessment on Ratios, Proportions, Partitions of Directed Line Segments
- Unit Assessment
- Vocab Assessment

Resources & Technology

Resources and Materials

- Geometry Text Book- McDougal – Littell
- Manipulatives
- Protractor
- Ruler
- Study Guide and Practice Sheet – Glencoe/McGraw Hill
- Teacher Created worksheets
- Teacher Generated worksheets

Technology

- deltamath.com
- desmos.com
- edpuzzle.com
- Geometer sketchpad
- Gimkit.com
- IXL.com
- Kahoot.com
- Mathxl
- Peardeck
- Smart Board
- Ti-84 calculator
- Videos

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.