Unit 3: Similarity and Trigonometry

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **Full Year**
Status: **Published**

UNIT RATIONALE

Students apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity. They identify criteria for similarity of triangles, use similarity to solve problems, and apply similarity in right triangles to understand right triangle trigonometry, with particular attention to special right triangles and the Pythagorean Theorem. Students develop the Law of Sines and Cosines (Honors) in order to find missing measures of general triangles.

- Congruence preserves distances and angle measures while similarity only preserves angle measures.
- Trigonometry is a math tool that relates angles and the ratio of sides in triangles.
- The concepts of congruence and similarity can be used to model real world situations.

ESSENTIAL QUESTIONS

- How are congruence and similarity different?
- How does similarity in mathematics compare to similarity in everyday life?
- How do we use mathematics to model real-world situations?

STANDARDS

NEW JERSEY STUDENT LEARNING STANDARDS: CONTENT AREA

New Jersey (NJSLS) - High School - Mathematics (2020)

MA.G-CO.A.1	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.
MA.G-SRT	Similarity, Right Triangles, and Trigonometry

MA.A-CED	Creating Equations
MA.A-REI.A	Understand solving equations as a process of reasoning and explain the reasoning
MA.G-C.B	Find arc lengths and areas of sectors of circles
MA.G-MG.A	Apply geometric concepts in modeling situations

New Jersey (NJSLS) - K-12 - Math Practice Standards (2020)

MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.8	Look for and express regularity in repeated reasoning.

NEW JERSEY STUDENT LEARNING STANDARDS: CAREER READINESS, LIFE LITERACIES AND KEY SKILLS

12.9.3.ST-SM.1	Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.
12.9.3.ST-SM.2	Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
WRK.9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

NEW JERSEY STUDENT LEARNING STANDARDS: COMPUTER SCIENCE AND DESIGN THINKING

CS.9-12.8.1.12.AP.1	Design algorithms to solve computational problems using a combination of original and existing algorithms.
CS.9-12.8.1.12.AP.5	Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.

PRE-ASSESSMENTS

Non-curricular tasks to identify student readiness in respect to problem solving.

Students will collaboratively solve real- world tasks.

INSTRUCTIONAL PLAN

MODULE 1

Student Learning Intentions (SLI) WALT: (We are learning to…)	We are learning to use similarity properties to compa
Student Learning Strategies	Handout - It All Comes Full Circle Video - Intro - Life on the ISS Video - Calculating Orbit windows
Success Criteria	I can determine the circumference of a circle I can determine the distance an object travels knowi I can determine the arc length of an orbit for a given p
Formative Assessment (drives instructional decisions)	Questions included in the Packet.
Activities and Resources	https://www.nasa.gov/audience/foreducators/explorin
Suggested Modifications	Have students work either independently or in small g needed in a preview lesson.

It_All_Comes_Full_Circle-_Questions_on_intro.docx
It_all_comes_full_circle_video.docx

585033main_Geom-St_Full-Circle.pdf

585032main_Geom-ED_Full-Circle.pdf

MODULE 2

Student Learning Intentions (SLI) WALT: (We	We are learning to determine if figures are similar so we can find missing side lengths.

are learning to…)	
Student Learning Strategies	Interactive notebook pages
Success Criteria	I can compare the angles of two figures to determine if corresponding angles are congruent. I can write ratios of corresponding side pairs.
Formative Assessment (drives instructional decisions)	Formative Assessment determined by student responses to practice problems
Activities and Resources	INB pages
Suggested Modifications	Support students who are struggling with solving linear equations. Have students work with partners to complete the practice problems.

Unit9GeometrySimilarTrianglesUnitUnitBundle.pdf

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.G-SRT.A	Understand similarity in terms of similarity transformations
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.

MODULE 3

Student Learning Intentions (SLI) WALT: (We	We are learning to use ratios and proportions so tha

are learning to…)	we can expand a cooking recipe.
Student Learning Strategies	Students are presented with a real-world situation that requires them to modify a recipe.
Success Criteria	I can use ratios to find equivalent fractions. I can convert measurements. I can solve proportions by cross multiplying.
Formative Assessment (drives instructional decisions)	Formative assessment will be determined by studen responses to the questions in the activity.
Activities and Resources	Activity - McGraw Hill Workbook
Suggested Modifications	Students who require more support can work in pair or groups of three.

Proportion_and_Ratio_-_Cooking.pdf

MODULE 4

Student Learning Intentions (SLI) WALT: (We are learning to…)	We are learning to use similar triangles to find distance that are difficult to measure.
Student Learning Strategies	Students will use mirrors and similar triangles to determine the heights of objects that they would not ordinarily be able to measure.
Success Criteria	I can determine corresponding parts of similar triangles. I can set up a proportion correctly I can solve a proportion

Formative Assessment (drives instructional decisions)	Formative assessment will be determined by student responses to the questions in the activity.
Activities and Resources	Meter sticks, masking tape, project handouts
Suggested Modifications	Students who require more support can work in small groups of three. Students will benefit from an initial demonstration of the task.

Mirror_Project.pdf

Similar_Triangle_Learning_Activity.pdf

MODULE 5

Student Learning Intentions (SLI) WALT: (We are learning to…)	We are learning to apply geometric mean proportion rules to similar right triangles.
Student Learning Strategies	Use index cards, ruler and scissors to create three similar right triangles. Label all the parts of each triangle so that ratios can be formed and corresponding sides can be identified.
Success Criteria	I can determine corresponding sides of similar right triangles. I can set up proportions correctly I can use the geometric mean to set up a proportion
Formative Assessment (drives instructional decisions)	Formative assessment will be determined by studen responses to the questions in the activity.
Activities and Resources	Students will create the triangles on index cards and use them as a resource along with the INB
Suggested Modifications	Have a set of triangles created so the relationships can be modeled. Have students work in pairs to design the triangles.

visualizingsimilartriangles.pdf

MODULE 6

Student Learning Intentions (SLI) WALT: (We are learning to…)	Today we are learning to solve proportions.
Student Learning Strategies	Students will be a part of a relay team. All students will solve a proportion and then pass the "baton" to the next person in the relay. The first team finished is the winner.
Success Criteria	Students can cross multiply. Students can solve linear equations for a single variable.
Formative Assessment (drives instructional decisions)	Formative assessment will be determined by studen responses to the questions in the activity.
Activities and Resources	Set up teams of students in rows.
Suggested Modifications	Pair students together for each problem.

Pass_It_Down_-_Ratios_and_Proportions.pdf

MODULE 7

Student Learning Intentions (SLI) WALT: (We are learning to…)	We are learning to use trigonometric ratios to find lengths or angle measures
Student Learning Strategies	Students will complete interactive notebook pages
Success Criteria	I can determine the reference angle

	I can determine the opposite and adjacent sides I can determine which trig functions to use I can set up and solve the trig equation.
Formative Assessment (drives instructional decisions)	Formative assessment will be determined by studen responses to the questions in the activity.
Activities and Resources	INB pages
Suggested Modifications	Have students work in pairs to complete the practice problems for each topic.

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ACFrOgBSMKIvpqe2wewd4HZY2MhfOUgmIA4FC_cltV-wW0djYIRW6ZRZaGQ_oefYt9_7oskbfOJOzRjgfiu-Sh4aQvSvEnUEWUz_0PIMlzyVTDY70IMEy_-rYIhGCwEbb7L1B-xeayvantoeHNzh.pdf

MODULE 8

Student Learning Intentions (SLI) WALT: (We are learning to…)	We are learning to use the properties of special righ triangles
Student Learning Strategies	Students will play a game that involves choosing values for the sides of special right triangles.
Success Criteria	I can solve for the missing sides of a 45-45-90 right triangle I can solve for the missing sides of a 30-60-90 right triangle.
Formative Assessment (drives instructional decisions)	Formative assessment will be determined by studen responses to the questions in the activity.
Activities and Resources	Students will play the game.

Suggested Modifications	Write the rules for special right triangles on the board or allow students to use their INB pages.

Special_Right_Triangle_Game.pdf

REFLECTIONS

Mirror project - This project can be modified to measure different object heights around the school and classroom depending on weather.

INTERDISCIPLINARY CONNECTIONS: NEW JERSEY STUDENT LEARNING STANDARDS FOR ELA, SOCIAL STUDIES, SCIENCE AND/OR MATHEMATICS

LA.K-12.NJSLSA.R3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
LA.K-12.NJSLSA.R9	Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.
LA.K-12.NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.K-12.NJSLSA.W4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LA.K-12.NJSLSA.W5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
LA.K-12.NJSLSA.W6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
LA.K-12.NJSLSA.L4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.
LA.K-12.NJSLSA.L5	Demonstrate understanding of word relationships and nuances in word meanings.
SCI.HS-ESS1-4	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
SCI.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
TECH.9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social

	Studies Practice: Gathering and Evaluating Sources.
TECH.9.4.12.IML.6	Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity (e.g., NJSLSA.SL5).
TECH.9.4.12.IML.8	Evaluate media sources for point of view, bias, and motivations (e.g., NJSLSA.R6, 7.1.AL.IPRET.6).