Unit 08 - Right Triangles & Trigonometry

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 3**
Length: **3-4 weeks**
Status: **Published**

Brief Summary of Unit

In this unit, students will discuss right triangles regarding how to solve for them versus other types of triangles, as well as to solve for missing side and angle measures using basic trigonometry. We will apply this new knowledge in real world applications.

Revision Date: July 2024

Standards

ELA.L.KL.9–10.2.A	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level.
MATH.9-12.G.SRT.B.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.
MATH.9-12.G.SRT.B.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
MATH.9-12.G.SRT.C.6	Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
MATH.9-12.G.SRT.C.7	Explain and use the relationship between the sine and cosine of complementary angles.
MATH.9-12.G.SRT.C.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
ELA.SL.PE.11–12.1.A	Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
WRK.9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
WRK.9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.

Essential Questions

- How do you find Pythagorean Triples and how do these patterns hold great importance in trigonometry?
- How do you solve for an angle of elevation or an angle of depression?
- How do you solve for the geometric mean and what role do they hold in real world settings?

- What are special right triangles and how can their properties be applied when solving trigonometric problems?
- What are the three trigonometric ratios and how do they connect the relationships between sides and angles of right triangles?
- When do you use the inverse trigonometry ratios given real world situations?
- Why is the Pythagorean Theorem and its converse important?

Enduring Understandings

- Find unknown side lengths and angles measures of right triangles.
- Understand and apply the Pythagorean Theorem to solve for unknown sides and angles of right triangles.
- Understand and use properties of special right triangles to solve for unknown sides and angles of right triangles.
- Understand and use the sine and cosine ratios to solve for unknown sides and angles of right triangles.
- Understand and use the tangent ratio to solve for unknown sides and angles of right triangles.
- Use proportional relationships in right triangles to solve for unknown sides and angles.

Students Will Know

- How to explain how similar triangles are used with trigonometric ratios.
- How to find side lengths in special right triangles.
- How to use the Pythagorean Theorem to solve problems.
- How to use trigonometric rations to solve problems.

Students Will Be Skilled At

- Classifying a triangle as acute, right, or obtuse given its side lengths.
- Explaining and finding the sine and cosine ratios.
- Explaining and finding the tangent ratio.
- Explaining and using inverse trigonometric ratios to approximate angle measures.
- Explaining the Right Triangle Similarity Theorem.
- Finding missing dimensions in right triangles.
- Finding missing lengths of right triangles.
- Finding side lengths in 30-60-90 triangles.
- Finding side lengths in 45-45-90 triangles.
- Finding the geometric mean of two numbers.
- Listing common Pythagorean triples.
- Solving real-life problems by solving right triangles.
- Using sine and cosine ratios to solve real-life problems.

- Using special right triangles to solve real-life problems.
- Using tangent ratios to solve real-life problems.

Evidence/Performance Tasks

Assessments

- Formative: Daily assessments using examples from class notes, NJSLA test bank problems, and/or Albert/AP Classroom assessments
- Summative: Teacher-created assessments, NJSLA test bank problems, Big Ideas Math online platform problems, Albert/AP Classroom and/or Big Ideas Math unit assessments
- Benchmark: IXL or teacher created diagnostic assessments in addition to unit assessments from Big Ideas Math
- Alternative Assessments: Student-centered activities such as scavenger hunts, various projects involving real world applications, and differentiated learning tasks in Khan Academy, DeltaMath, and IXL

- Answer essential questions
- Class discussion of daily topic
- Classwork and homework that assess the essential questions
- Provide alternative means of assessments for certain students
- Teacher Observation
- Tests and quizzes that assess the essential questions
- Written assignments that assess the essential questions that involves providing explanations

Learning Plan

The following list is meant to create a day-to-day plan. Teachers are encouraged to slow down or condense days as appropriate to the student population in the class. Assessment(s) should be given when appropriate.

- Begin by recalling the Pythagorean Theorem to prove a right triangle. Have students discover Pythagorean Triples and their multiples. Remind students that they should always check if three measures can make a triangle first ($c<a+b$). Introduce the converse of the Pythagorean Theorem to help identify if a triangle is acute or obtuse instead of right.
- Allow one day of word problems involving the Pythagorean Theorem. (Continue to integrate these types of problems throughout the chapter.)
- Define a 45-45-90 triangle and a 30-60-90 with the relationships of their side measures. You may need to quickly refresh their algebra skills involving radicals.
- Students will likely need additional time to practice the special right triangles.
- Set up the Right Triangle Similarity Theorem to show the three similar triangles in one diagram. Build into setting up the geometric mean and solving for missing segments of the diagram.
- Introduce the tangent ratio of trigonometry. Be specific when labeling sides of the triangle depending on which angle is being focused on. Problems should find segment lengths, with and without special

right triangles. Apply this idea to finding the angle of elevation in word problems.

- Introduce the sine and cosine ratios of trigonometry. Be specific when labeling sides of the triangle depending on which angle is being focused on. Briefly mention the complementary relationship between these ratios. Problems should find segment lengths, with and without special right triangles. Apply this idea to finding the angle of depression in word problems.
- Students will likely need additional time to practice trigonometry algebraically and in word problems.
- Introduce the inverse trigonometry ratios to be able to solve for angle measures in a right triangle. Extend this to solving a right given two side measures, or given one side measure and one angle measure. Weave in word problems to apply this concept.

Materials

Core instructional materials: Core Book List including Big Ideas Math Common Core Geometry

Supplemental materials: Khan Academy, Edia, DeltaMath

- District approved textbook
- Khan Academy
- Teacher created activiites
- Teacher created notes
- Whiteboard tables

Suggested Strategies for Modifications

Possible accommodations/modification for Geometry