Unit #10: Triangle Trigonometry

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

Unit Overview

- Determine whether a triangle is right, obtuse, or acute based on the Converse of the Pythagorean Theorem and its associated theorems.
- understand how to use various methods to solve real life problems involving right triangle
- Use pythagorean theorem and sine, cosine, and tangent ratios to solve right triangles
- Use the 45-45-90 and 30-60-90 triangle theorems to solve special right triangles.
- Use the Pythagorean theorem and trigonometric ratios to solve real life problems.

Enduring Understandings

- Algebra is used with geometric formulas and properties to find unknown values.
- Geometric relationships can be used to describe and measure a variety of phenomena in non-mathematical fields.
- Mathematics can be learned through problem solving, inquiry, and discovery.
- Technology can be used to construct and measure parts of geometric figures.

Essential Questions

- How do trigonometric ratios relate to similar right triangles?
- How do you find a side length or angle measure in a right triangle?
- How does learning various problem-solving methods improve foster success in other subjects?
- What are the benefits of finding different methods for solving problems?

Student Learning Objectives

- apply the Law of Sines to solve non-right triangles
- use angles of elevation and depression to solve application problems
- use the converse of the Pythagorean Theorem to determine if a triangle is a right triangle.
- use the properties of 45°-45°-90° and 30°-60°-90° triangles
- use the Pythagorean Theorem to find side lengths in a right triangle
- use the sine, cosine, and tangent ratios to determine side lengths and angle measures in right triangles

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.C	Define trigonometric ratios and solve problems involving right triangles
MA.G-SRT.D	Apply trigonometry to general triangles
	Connections to Equations.

Indicators

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-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.
MA.G-SRT.C.7	Explain and use the relationship between the sine and cosine of complementary angles.
MA.G-SRT.C.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
MA.G-SRT.D.9	Derive the formula $A = (1/2)ab\ sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
MA.G-SRT.D.10	Prove the Laws of Sines and Cosines and use them to solve problems.

MA.G-SRT.D.11	Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces). 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. 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. 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.)

Lesson Titles

- Angles in Right Triangles
- Applications of Right Triangles & Trigonometry
- Law of Sines
- Sides of Right Triangles
- Special Right Triangles
- The Pythagorean Theorem & its Converse
- Trigonometric Ratios

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: Inclinometer Group Project
- Marking Period Assessment
- Mini Assessment on Pythagorean Theorem & trig ratios
- 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.