Unit 08 Trigonometry

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

Brief Summary of Unit

This unit reviews the concept of trigonometric ratios and introduces the concept of periodic function. Students will learn radian measure and will discover how the trigonometric functions are define in terms of the x- and y-coordinates of the unit circle. Students will apply concepts and techniques to real world problems.

Revised Date: July 2025

Standards

Students will analyze geometric designs within trigonometry which connects to various cultures. Embracing the diversity within society incorporates the following:

Amistad Commission

This unit also reflects the goals of the Department of Education and the Amistad Commission including the infusion of the history of Africans and African-Americans into the curriculum in order to provide an accurate, complete, and inclusive history regarding the importance of of African-Americans to the growth and development of American society in a global context.

Asian American and Pacific Islander History Law

This unit includes instructional materials that highlight the history and contributions of Asian Americans and Pacific Islanders in accordance with the New Jersey Student Learning Standards in Social Studies.

1	Developing Responsibility for Learning: Cultivating independence, self-reflection, and responsibility for one's own learning.
3	Valuing Evidence in Argumentation: Constructing viable claims and evaluating, defending, challenging, and qualifying the arguments of others.
4	Building Knowledge: Building strong content knowledge and connecting ideas across disciplines using a variety of text resources and media.
5	Leveraging Technology: Employing technology and digital media thoughtfully, strategically and capably to enhance reading, writing, speaking, listening, and language use.
A.CED.A.2	Create equations in two or more variables to represent relationships between quantities;

	graph equations on coordinate axes with labels and scales.
F.TF	Trigonometric Functions
F.TF.A	Extend the domain of trigonometric functions using the unit circle
F.TF.A.1	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
F.TF.A.2	Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
F.TF.A.3	Use special triangles to determine geometrically the values of sine, cosine, tangent for □/3, □/4 and □/6, and use the unit circle to express the values of sine, cosine, and tangent for □ – □, □ + □, and 2□ – □ in terms of their values for □, where □ is any real number.
F.TF.A.4	Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.
F.TF.B	Model periodic phenomena with trigonometric functions
F.TF.B.5	Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
F.TF.B.6	Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.
F.TF.B.7	Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.
F.TF.C	Prove and apply trigonometric identities
F.TF.C.8	Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle.
F.TF.C.9	Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.
	Mathematical and computational thinking in 9–12 builds on K–8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.
	Using Mathematics and Computational Thinking

Essential Questions

- How can we determine if a trigonometric value is positive or negative based on a quadrant on a coordinate plane?
- How do geometric relationships and measurements help us solve problems involving periodic behavior and make sense in our world?
- What connections exist between trigonometry and geometry applications?
- What is the difference in drawing a positive angle vs a negative angle on the unit circle?
- Why do we need to convert between radians and degrees when analyzing the unit circle?

Enduring Understandings

- Trigonometric functions are ratios whose values can be found from right triangles or the unit circle.
- Trigonometric functions can be evaluated for any angle.

Students Will Know

- Students will know how to apply the rules of a 45-45-90 and 30-60-90 triangle to the unit circle.
- Students will know how to convert from radians to degrees and vice versa.
- Students will know how to define right triangle trigonometric functions.
- Students will know how to draw positive and negative angles on the unit circle.
- Students will know how to evaluate trigonometric functions of any angle.
- Students will know how to model using trigonometric functions.

Students Will Be Skilled At

- Students will be skilled at converting between radian and degree measure.
- Students will be skilled at defining the six trigonometric functions.
- Students will be skilled at drawing angles in standard position.
- Students will be skilled at evaluating trigonometric functions given a point of an angle.
- Students will be skilled at evaluating trigonometric functions.
- Students will be skilled at explaining the meaning of radian measure.
- Students will be skilled at solving real life problems using trigonometry.
- Students will be skilled at understanding that trigonometric functions are "circular' functions and are based on the unit circle.
- Students will be skilled at using radian measure to find arc length and area of a sector.
- Students will be skilled at using reference angles to find the exact value of a tigonometric function of special angles (multiples of 30 and 45) given in radian or degree measure.
- Students will be skilled at using trigonometric functions to find side lengths and angles of right triangles.

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
- Benchmark: teacher created diagnostic assessments
- Alternative Assessments: Student-centered activities such as scavenger hunts, various projects

involving real world applications, and differentiated learning tasks in Khan Academy, and DeltaMath

- 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

Unit 7 Trigonometry (Chapter 10 3-4 weeks, depending on background right triangle knowledge):

10.1: Right Triangle Trig (3-4 days)

- Review Right Triangle Trig with all 6 Trig functions. Students should be familiar with Sine, Cosine and Tangent. Introduce Cosecant, Secant and Cotangent as reciprocal functions.
- Students should build on previous geometry knowledge and incorporate Algebra 2 concepts of functions, by defining the 6 trig functions where the independent variable/input is the acute angle of a right triangle and the dependent variable/output is the value of the trig ratio of that angle.
- Evaluate 6 Trig functions of an acute angle given a right triangle. Use Pythagorean Theorem to find missing length. Review simplifying radicals and rationalizing denominators.
- Use proportions to solve for missing lengths given one side of a right triangle and one acute angle.
- Use inverse functions to find angle of right triangle given two lengths
- Review special right triangles, solving for sides of 30-60-90 and 45-45-90 triangles.
- Find Trig values for special angles. Students should realize that since the triangles are similar, the ratios of their sides will be equal. They should begin to memorize, or be able to find it relatively quickly. There is a lot of material for students to remember, but making sure that they have a strong foundation is paramount.
- Solve a Right Triangle using technology.
- Use trig functions to solve real world problems.

Possible assessment on Right Triangle Trig with 6 Trig Functions

10.2 Angles and Radian Measure (2-3 days)

- Students will expand on their use of trig functions from acute angles to any angle.
- Introduce radian measure. Use technology or videos to visually explain the concept of radian measure. Discuss how calculators can change modes between radian to degree.
- Convert from radians to degrees and degrees to radians
- Write special angles, multiples of 30 and 45 in radian measure.
- Draw angles (radian and degree) in standard position.
- Find coterminal angles (radian and degree measure).
- Sector area and arc length
- Real world problems using angles.

Possible assessment on first two sections

10.3 Trig Functions of any Angle (3 days)

- Define unit circle and name 6 Trig functions using x and y when radius/hypotenuse is 1.
- Evaluate 6 Trig functions given a point on the unit circle. Students will need to rationalize denominators.
- Define Quadrantal Angles; find trig functions of quadrantal angles.
- Define and find reference angles for each quadrant. This is one area where students should understand conceptually the idea of reference angle instead of memorizing the rule for each Quadrant. Students should find reference angles for positive and negative angles given in degree and radian measure.
- Reference angles allow a student to find a trig function for any angle. Students should also recognize that the sign of each trig function depends on the quadrant where the terminal side of the angle lies. (use mnemonic device, ASTC, All Students Think Clearly, to support this conceptual idea).
- Finally, use concepts from this section and prior knowledge to find the trig function of a given angle (multiple of 30 or 45) given in degree or radian measure by:
    - Sketching the angle
    - Finding the reference angle
    - Evaluating the trig function of the angle
    - Determining the sign of the value depending on the quadrant
    - Students should complete these steps without the use of a calculator as they are finding exact

values.

Assessment

Materials

Core instructional materials:Core Book List including Algebra & Trigonometry 4E by Stewart

Supplemental materials: Khan Academy, Edia, and DeltaMath

- District approved textbook and ancillary materials.
- Online programs and technology: Khan Academy, Edia, Delta Math, Ed Puzzle, Desmos.
- Teacher created activiites
- Teacher created notes

Integrated Accommodation & Modifications

Integrated Accommodation & Modifications for Algebra 2/Intro to Trig Honors