

09 Trigonometric Relationships and Functions

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **4 - 5 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

This unit will focus on strengthening the prerequisite skills and conceptual understanding needed to graph trigonometric functions and identify key components of trigonometric function. Lesson activities will reinforce new content and address common misconceptions and errors to support students' progress toward analyzing trigonometric functions and solving trigonometric equations.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Objectives/Enduring Understandings:

- Trigonometric relationships are applied to both triangles and the unit circle.
- Trigonometric functions model periodic behavior.

Essential Questions:

- How can the domain and range be described when viewing the graph of a trigonometric function?
- How does the unit circle help understand the concept of domain and range in terms of a trigonometric function?
- How does the unit circle help answer questions that apply to trigonometry?

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- The trigonometric ratios within a special right triangle are directly related to the values in a unit circle

- Trigonometric identities and relationships are derived from applying the Pythagorean Theorem
- Precision of language and terminology (amplitude, period of trigonometric functions, odd/even etc) helps comprehend concepts within trigonometric functions.

Procedural Knowledge

Students will be able to:

- Simplify a radicand when it is not a perfect square
- Apply the ratios of special right triangles
- Apply the Pythagorean Theorem
- Convert between radians and degrees
- Fill out the unit circle with accuracy
- State the domain and range of a trigonometry function by inspecting the graph of the function
- Extend the domain of trigonometric functions by inspecting the unit circle
- Determine value of Trigonometric functions with exact values and approximate values using technology
- Simply and evaluate expressions containing trigonometric function
- Solve trigonometric equations

CONTENT AREA STANDARDS

MA.F-TF.A.1	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
MA.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.
MA.F-TF.A.3	Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosines, and tangent for $\pi - x$, $\pi + x$, and $2\pi - x$ in terms of their values for x , where x is any real number.
MA.F-TF.A.4	Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.
MA.F-TF.B.5	Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
MA.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.
MA.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.
MA.F-TF.C.8	Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.
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.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

CS.K-12.3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
CS.K-12.3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
CS.K-12.3.c	Evaluate whether it is appropriate and feasible to solve a problem computationally.
LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
TECH.9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8).
TECH.9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience (e.g., S-ID.B.6b, HS-LS2-4).
TECH.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
TECH.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

EVIDENCE OF LEARNING

Formative Assessments

- Student feedback/questioning/observation
- Error analysis
- Specific skill assessment/questions
- Survey/polling
- Task completion and review of quizzes and material presented in the Algebra II class

Summative Assessments

There will be no formal assessments in this course.

RESOURCES (Instructional, Supplemental, Intervention Materials)

Desmos Activities: [Pythagorean Theorem Practice](#), [Pythagorean Triples and Similar Triangles](#), [Special Right Triangle Practice](#), [Building the unit circle](#), [Know your unit circle](#), [Applying the unit circle](#), [Graphing the Sine Function](#), [Graphing the Sine and Cosine Function](#), [Graphing the Tangent Function](#), [Solving Trigonometric Equations](#), [Solving Trigonometric Equations 2](#),

Kuta Software worksheets,

Approved course textbook

INTERDISCIPLINARY CONNECTIONS

Interdisciplinary connections are frequently addressed through modeling and application problems whereby students solve and analyze situations taken from business, physics, engineering, biology, statistics, geography, and numerous other fields. Examples can be found in topic specific textbook problems and digital resources.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.