Unit 6: Trigonometric Functions

Content Area: **Mathematics**
Course(s): **Algebra 3CP**
Time Period: **Semester 2**
Length: **2 weeks**
Status: **Published**

Transfer Goals

Students will independently apply their understanding of trigonometric functions and transformations to analyze patterns, interpret graphical information, and solve authentic problems involving periodic behavior. Through reflection and synthesis, students will recognize connections among mathematical concepts, evaluate their own learning processes, and transfer their knowledge to new mathematical and real-world contexts.

Knowledge and Skills

- Compare and contrast sine, cosine, and tangent functions.
- Identify amplitude, period, phase shifts, vertical shifts, and asymptotes.
- Interpret and analyze transformed trigonometric graphs.
- Connect equations to graphical representations.
- Evaluate the effectiveness of trigonometric models in real-world situations.
- Communicate mathematical reasoning using appropriate vocabulary and representations.
- Apply previously learned concepts to solve multi-step problems involving trigonometric functions.

Essential Questions

How do transformations change the behavior of trigonometric functions?

What key features must be considered when interpreting or creating a trigonometric model?

How can trigonometric functions be used to solve real-world problems?

What strategies help improve understanding of challenging mathematical concepts?

Why are trigonometric functions useful for modeling real-world situations?

Enduring Understanding

Students will understand that:

- Trigonometric functions provide powerful tools for modeling cyclical and periodic behavior.
- Graphical, algebraic, and contextual representations of functions are interconnected.

- Transformations affect the appearance and behavior of trigonometric graphs in predictable ways.
- Reflection on learning strengthens mathematical understanding and problem-solving abilities.
- Mathematical models can be used to describe and interpret real-world phenomena.

Unit Description

This unit introduces students to the graphical representations of sine, cosine, and tangent functions, including transformations involving translations and changes in period. Students will revisit key concepts, analyze connections among trigonometric functions, evaluate their own learning, and apply their knowledge to interpret and model periodic phenomena. Through discussion, problem-solving, multiple visual models, and real-world applications involving cyclical phenomena, students will develop an understanding of how sine and cosine functions model periodic behavior.

Standards

MA.F-IF.B.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
MA.F-IF.C	Analyze functions using different representations
MA.F-IF.C.7e	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
MA.F-TF.A	Extend the domain of trigonometric functions using the unit circle
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.B	Model periodic phenomena with trigonometric functions
MA.F-TF.B.5	Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
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.

Resources

Intermediate Algebra with Applications 5/6th ed by Aufmann/Barker/Lockwood

Online resources which include, but are not limited to: Desmos Graphing Calculator, Class Kick, Delta Math,

Khan Academy, and CK-12 Foundation's Algebra 2 with Trigonometry Concepts by CK-12/Gloag/ Rawley, last modified April 12, 2024