Unit 11: Trigonometric Identities & Formulas

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

Brief Summary of Unit

Students will be able to apply the trigonometric identities to a variety of different problems. Teacher will emphasize the use of trigonometric identities to simplify advanced expressions.

Revised Date: July 2025

Standards

ELA.L.SS.11–12.1	Demonstrate command of the system and structure of the English language when writing or speaking.
ELA.L.VL.11–12.3	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, including technical meanings, choosing flexibly from a range of strategies.
MATH.9-12.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.
MATH.9-12.F.TF.C.9	Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.
WRK.9.2.12.CAP.5	Assess and modify a personal plan to support current interests and post-secondary plans.
WRK.9.2.12.CAP.13	Analyze how the economic, social, and political conditions of a time period can affect the labor market.
TECH.9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

Essential Questions

- How are all trigonometric functions interrelated?
- How can trigonometric identities be used to solve problems?

Enduring Understandings

- Both algebraic techniques and technology can be used strategically to solve complex trigonometric equations, depending on the context.

- Double-angle and half-angle formulas provide alternate forms of trigonometric expressions that are useful for simplification and problem-solving.
- From the basic identities, an endless list of identities can be made.
- Identities can be used to simplify trigonometric equations and expressions.
- Recognizing and applying appropriate identities allows for simplification of expressions and solution of challenging trigonometric equations.
- Several special angles exist that the exact value of a trigonometric function can be found.
- The sum and difference formulas for sine, cosine, and tangent describe how trigonometric functions behave under angle addition or subtraction.
- The trigonometric functions are interrelated through basic identities.
- Trigonometric expressions can be simplified and manipulated using identities to reveal underlying structure and relationships.
- Trigonometric identities are tools for proving equivalencies and solving complex problems.

Students Will Know

- How to derive and apply double-angle and half-angle formulas.
- How to derive and apply the formulas for cos (A +- B) and sin (A +- B).
- How to derive and apply the formulas for tan (A +- B).
- How to simplify trigonometric expressions and how to prove trigonometric identities.
- How to use identities to simplify trigonometric expressions
- How to use identities to solve trigonometric equations.
- How to use trigonometric identities and/or technology to solve more difficult trigonometric equations.

Students Will Be Skilled At

- Applying formulas for double and half angles in trigonometry.
- Applying formulas for non-special angles with sine, cosine, and tangent.
- Identifying trigonometric identities and using them in expressions and equations.
- Using technology to solve more challenging trigonometric equations.

Assessment

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

- Class discussion of daily topic
- Classwork and homework that assess the essential questions
- Provide alternative means of assessments for certain students
- 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.

- Define trigonometric identities. As needed write proofs for why the equations work.
- Simplify trigonometric expressions using identities. Answers should be in simplest terms of sines and cosines.
- Verify equations with trigonometry on both sides by simplify the expression on one side.
- Introduce the sum and difference formulas. Use these to verify equations.
- Introduce the double and half formulas. Use these to verify equations.
- Solve trigonometric equations using identities and formulas. These should be completed with and without the calculator.

Graphing calculators are encouraged to be used as an extension of these topics.

Materials

Core instructional materials: Core Book List including PreCalculus Enhanced with Graphing Utilities, Sullivan, Savvas

Supplemental materials: Khan Academy, Edia, and DeltaMath

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

Integrated Accommodation & Modifications

Possible accommodations/modification for CP PreCalc & Trig