

# Unit 11: Trigonometric Identities and Formulas

Content Area: **Mathematics**  
Course(s):  
Time Period: **Marking Period 4**  
Length: **1-2 weeks**  
Status: **Published**

## **Brief Summary of Unit**

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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.

## **Standards**

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Students will analyze geometric designs 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 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.

### New Jersey Diversity and Inclusion Law

In accordance with New Jersey's Chapter 32 Diversity and Inclusion Law, this unit includes instructional materials that highlight and promote diversity, including:

economic diversity, equity, inclusion, tolerance, and belonging in connection with gender and sexual orientation, race and ethnicity, disabilities, and religious tolerance.

LA.K-12.NJSLSA.L4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.
LA.K-12.NJSLSA.L5	Demonstrate understanding of word relationships and nuances in word meanings.
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.F-TF.C.9	Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.
TEC.K-12.8.1	All students will use computer applications to gather and organize information and to solve problems.
TEC.K-12.8.2	All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world as they relate to the individual society, and the environment.
WORK.K-12.9.1	All students will develop career awareness and planning, employability skills and foundational knowledge necessary for success in the workplace.
WORK.K-12.9.2	All students will develop career awareness and planning, employability skills and foundational knowledge necessary for success in the workplace.

## Transfer

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- Creating addition and subtraction formulas for trigonometric equations.
- Using new identities to solve for trigonometric ratios in any quadrant.
- Using Pythagorean Theorem to set up trigonometric identities.

## Essential Questions

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

## Essential Understandings

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- From the basic identities, an endless list of identities can be made.
- How to derive and apply double-angle and half-angle formulas.
- How to derive and apply the formulas for  $\cos(A \pm B)$  and  $\sin(A \pm B)$
- How to derive and apply the formulas for  $\tan(A \pm B)$ .
- How to simplify trigonometric expressions and how to prove trigonometric identities.
- How to use identities to simplify trigonometric expressions.
- How to use trigonometric identities and/or technology to solve more difficult trigonometric equations.
- Identities can be used to simplify trigonometric equations and expressions
- Several special angles exist that the exact value of a trigonometric function can be found.
- The trigonometric functions are interrelated through basic identities.

## Students Will Know

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- How to derive and apply double-angle and half-angle formulas.
- How to derive and apply the formulas for  $\cos(A \pm B)$  and  $\sin(A \pm B)$ .
- How to derive and apply the formulas for  $\tan(A \pm B)$ .
- 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

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- 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.

## Evidence/Performance Tasks

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### 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
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- Class discussion of daily topic
  - Classwork and homework that assess the essential questions
  - Discover why  $\sin x \csc y = 1$  is true for more than  $x = y$ .
  - Prove trigonometric identities.
  - Provide alternative means of assessments for certain students
  - Simplify trigonometric expressions using the reciprocal and Pythagorean identities.
  - Solve trigonometric equations involving quadratic and other algebraic techniques.
  - Utilize and apply the sum/difference and double angle trigonometric identities.

- Written assignments that assess the essential questions that involves providing explanations

## Learning Plan

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- A graphing calculator can extend the equation solving with the use of the ZERO button.
- Apply the double angle and half angle formulas.
- Apply the sum and difference formulas.
- Preview the essential questions and connect to learning throughout the unit.
- Prove trigonometric identities.
- Simplify trigonometric expressions.
- Solve more difficult trigonometric equations both algebraically and through the use of a graphing calculator
- Solve the trigonometric equations and simplifying the trigonometric expressions.

## Materials

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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

## Suggested Strategies for Modifications

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[Possible accommodations/modification for CP PreCalc & Trig](#)