

**Newport-Mesa Unified School District
Course Description**

TRIGONOMETRY

(Course meets University of California A-F requirements)

Content covered in this course is described in the Course of Study below. Based upon student needs, teachers select appropriate materials from the Instructional Materials List. Classroom presentations of course content are determined by the instructor and described under Teacher Activities. A more detailed outline of the course can be obtained from the instructor.

OVERVIEW:

This course is a one-semester course in trigonometry as described in the Mathematics Content Standards for California Public Schools. The course is designed for students who are planning to study calculus and other higher mathematics at the college level. The content of this course includes defining the six basic trigonometric ratios, circular functions, graphing variations of trigonometric functions, verifying trigonometric identities, solving trigonometric equations, Law of Sines and Law of Cosines, polar forms of complex numbers, polar equations as well as vectors in a plane. Care will be taken to use scientific calculators as well as graphing utilities appropriately. Students mastering the competencies specified in this course should be successful in precalculus

Course of Study Objectives:

1.0 The student understands the notion of angle and how to measure it, in both degrees and radians. The student can convert between degrees and radians.

1.1 SUGGESTED STUDENT ACTIVITIES:

- The student will be able to locate and label common angles on the unit circle (in radians and degrees)
- The student will be able to convert common angles from radians to degrees or degrees to radians without a calculator
- The student will be able to convert any angle from radians to degree or degrees to radians with a calculator

1.2 SUGGESTED INSTRUCTIONAL MATERIALS USED:

- Adopted textbook
- Supplemental handouts
- Unit Circle blanks

1.3 SUGGESTED TEACHER ACTIVITIES:

- Direct instruction
- Facilitate group discussions
- Facilitate cooperative learning

2.0 The student will know the definition of sine and cosine as y- and x-coordinates of points on the unit circle and are familiar with the graphs of the sine and cosine functions.

2.1 SUGGESTED STUDENT ACTIVITIES:

- The student will measure sides of similar right triangles and write ratios
- The student will be able to graph the sine and cosine functions on the Cartesian plane
- The student will use graphing utilities to graph variations on these functions
- The student will graph the sine and cosine functions on a mastery quiz

2.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:

- Adopted textbook
- Supplemental handouts

- Graph paper
- 2.3 SUGGESTED TEACHER ACTIVITIES:
- Direct instruction
 - Facilitate group discussions
 - Facilitate cooperative learning
- 3.0 **The student will know the identity $\cos^2(x) + \sin^2(x) = 1$: Students prove that this identity is equivalent to the Pythagorean theorem (i.e., students can prove this identity by using the Pythagorean theorem and conversely, they can prove the Pythagorean theorem is a consequence of this identity). Students prove other trigonometric identities and simplify others by using the identity $\cos^2(x) + \sin^2(x) = 1$. For example, students use this identity to prove that $\sec^2(x) = \tan^2(x) + 1$**
- 3.1 SUGGESTED STUDENT ACTIVITIES:
- The student will verify this identity on a mastery quiz
 - The student will derive the sec and csc identities from the cos identity
- 3.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:
- Adopted textbook
 - Supplemental handouts
- 3.3 SUGGESTED TEACHER ACTIVITIES:
- Direct instruction
 - Facilitate group discussions
 - Facilitate cooperative learning
- 4.0 **The student will graph functions of the form $f(t) = A\sin(Bt + C)$ or $f(t) = A\cos(Bt + C)$ and interpret A, B, C in terms of amplitude, frequency, period and phase shift.**
- 4.1 SUGGESTED STUDENT ACTIVITIES:
- The student will discuss variations of graphs of trigonometric functions from analytical geometry point of view
 - The student will sketch graphs of trigonometric functions without graphing utilities
 - The student will use graphing utilities as appropriate
- 4.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:
- Adopted textbook
 - Graphing Calculators
- 4.3 SUGGESTED TEACHER ACTIVITIES:
- Direct instruction
 - Demonstration
 - Facilitate group discussions
 - Facilitate cooperative learning
- 5.0 **The student will know the definitions of tangent and cotangent functions and can graph them.**
- 5.1 SUGGESTED STUDENT ACTIVITIES:
- The student will measure sides of similar right triangles and write ratios
 - The student will sketch graphs of trigonometric functions without a graphing utility
 - The student will use a graphing utility when appropriate
- 5.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:
- Adopted textbook
 - Graphing calculators
- 5.3 SUGGESTED TEACHER ACTIVITIES:
- Direct instruction
 - Facilitate group discussions and cooperative learning

6.0 The student will know the definitions of the secant and cosecant functions and can graph them.**6.1 SUGGESTED STUDENT ACTIVITIES:**

- The student will measure sides of similar right triangles and write ratios
- The student will sketch graphs of trigonometric functions without a graphing utility
- The student will use a graphing utility when appropriate
- The student will graph the six functions on a mastery quiz

6.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:

- Adopted textbook
- Graphing calculators

6.3 SUGGESTED TEACHER ACTIVITIES:

- Direct instruction
- Facilitate group discussions
- Facilitate cooperative learning

7.0 The student will know that the tangent of the angle that a line makes with the x-axis is equal to the slope of the line**7.1 SUGGESTED STUDENT ACTIVITIES:**

- The student will estimate tangent values for given angles
- The student will estimate angle sizes for given tangent values
- The student will find the equation of a line given the tangent and a point on the line

7.2 SUGGESTED INSTRUCTIONAL MATERIALS USED:

- Adopted textbook
- Graph paper

7.3 SUGGESTED TEACHER ACTIVITIES:

- Direct instruction
- Demonstration
- Facilitate group discussions
- Facilitate cooperative learning

8.0 The student will know the definitions of the inverse trigonometric functions and can graph the functions.**8.1 SUGGESTED STUDENT ACTIVITIES:**

- The student will find the angle sizes for standard inverse trigonometric functional values
- The student will graph the inverse trigonometric functions without a graphing utility
- The student will use the graphing utility to explore the behavior of the inverse trigonometric functions

8.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:

- Adopted textbook
- Graph paper
- Graphing calculator

8.3 SUGGESTED TEACHER ACTIVITIES:

- Direct instruction
- Demonstration
- Facilitate group discussions
- Facilitate cooperative learning

9.0 The student will compute, by hand, the values of the trigonometric functions and the inverse trigonometric functions at various standard points.**9.1 SUGGESTED STUDENT ACTIVITIES:**

- The student will write the values of the six trigonometric functions and the six inverse trigonometric functions for common angles on a mastery quiz

- 9.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:
- Adopted textbook
- 9.3 SUGGESTED TEACHER ACTIVITIES:
- Direct instruction
 - Facilitate group discussions
 - Facilitate cooperative learning
- 10.0 The student will demonstrate an understanding of the addition formulas for sines and cosines and their proofs and can use those formulas to prove and/or simplify other trigonometric identities.**
- 10.1 SUGGESTED STUDENT ACTIVITIES:
- The student will derive the addition formulas for sines and cosines
 - The student will use the addition formulas to verify identities
 - The student will use the addition formulas to find the sine and cosine of nonstandard angles
- 10.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:
- Adopted textbook
- 10.3 SUGGESTED TEACHER ACTIVITIES:
- Direct instruction
 - Demonstration
 - Facilitate group discussions
 - Facilitate cooperative learning
- 11.0 The student will demonstrate an understanding of half-angle and double-angle formulas for sines and cosines and can use those formulas to prove and/or simplify other trigonometric identities.**
- 11.1 SUGGESTED STUDENT ACTIVITIES:
- The student will derive the half and double angle formulas for sines and cosines
 - The student will use the half and double angle formulas to verify identities
 - The student will use the half and double angle formulas to find the sine and cosine of nonstandard angles
- 11.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:
- Adopted textbook
- 11.3 SUGGESTED TEACHER ACTIVITIES:
- Direct instruction
 - Facilitate group discussions
 - Facilitate cooperative learning
- 12.0 The student will use trigonometry to determine unknown sides or angles in right triangles.**
- 12.1 SUGGESTED STUDENT ACTIVITIES:
- The student will solve right triangles for missing sides and angles
- 12.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:
- Adopted textbook
 - Calculator
- 12.3 SUGGESTED TEACHER ACTIVITIES:
- Direct instruction
 - Facilitate group discussions
 - Facilitate cooperative learning

13.0 The student will know the law of sines and the law of cosines and apply those laws to them.**13.1 SUGGESTED STUDENT ACTIVITIES:**

- The student will derive the law of sines
- The student will derive the law of cosines
- The student will solve any triangle for missing sides and angles
- The student will find inaccessible distances using the laws of sine and cosine

13.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:

- Adopted textbook
- Calculator

13.3 SUGGESTED TEACHER ACTIVITIES:

- Direct instruction
- Demonstration
- Facilitate group discussions
- Facilitate cooperative learning

14.0 The student will determine the area of a triangle, given one angle and the two adjacent sides.**14.1 SUGGESTED STUDENT ACTIVITIES:**

- The student will derive the formula for the area of a triangle
- The student will use the formula to find the area of a triangle with given sides and the included angle

14.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:

- Adopted textbook
- Calculator

14.3 SUGGESTED TEACHER ACTIVITIES:

- Direct instruction
- Facilitate group discussions
- Facilitate cooperative learning

15.0 The student is familiar with polar coordinates. In particular, they can determine polar coordinates of a point given in rectangular coordinates and vice versa.**15.1 SUGGESTED STUDENT ACTIVITIES:**

- The student will graph polar coordinates on a polar plane
- The student will convert polar coordinates to rectangular and vice versa

15.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:

- Adopted textbook
- Polar graph paper

15.3 SUGGESTED TEACHER ACTIVITIES:

- Direct instruction
- Demonstration
- Facilitate group discussions
- Facilitate cooperative learning

16.0 The student will represent equations given in rectangular coordinates in terms of polar coordinates.**16.1 SUGGESTED STUDENT ACTIVITIES:**

- The student will graph simple polar equations in a polar plane
- The student will write rectangular equations as polar equations

16.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:

- Adopted textbook
- Polar graph paper

16.3 SUGGESTED TEACHER ACTIVITIES:

- Direct instruction

- Demonstration
- Facilitate group discussions
- Facilitate cooperative learning

17.0 The student is familiar with complex numbers. They can represent a complex number in polar form and know how to multiply complex numbers in their polar form.

17.1 SUGGESTED STUDENT ACTIVITIES:

- The student will simplify expressions involving complex numbers
- The student will write complex numbers in polar form
- The student will simplify expressions involving complex numbers in polar form

17.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:

- Adopted textbook

17.3 SUGGESTED TEACHER ACTIVITIES:

- Direct instruction
- Facilitate group discussions
- Facilitate cooperative learning

18.0 The student will know DeMoivre's theorem and can give nth roots of a complex number given in polar form.

18.1 SUGGESTED STUDENT ACTIVITIES:

- The student will discuss DeMoivre's theorem
- The student will apply DeMoivre's theorem to find nth roots of complex numbers

18.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:

- Adopted textbook
- Supplemental handouts

18.3 SUGGESTED TEACHER ACTIVITIES:

- Direct instruction
- Facilitate group discussions
- Facilitate cooperative learning

19.0 The student is adept at using trigonometry in a variety of applications and word problems.

19.1 SUGGESTED STUDENT ACTIVITIES:

- The student will use trigonometry to find: the area of a triangle, the bearing of a ship, the height of a building and the angle a ladder makes with the ground.

19.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:

- Adopted textbook
- Calculator

19.3 SUGGESTED TEACHER ACTIVITIES:

- Direct instruction
- Facilitate group discussions
- Facilitate cooperative learning

20.0 The student will solve trigonometric equations reporting both specific solutions and general solutions (Not a state standard)

20.1 SUGGESTED STUDENT ACTIVITIES:

- The student will use algebraic properties to solve trigonometric equations
- The student will use a general solution formula to find all solutions on a given interval

20.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:

- Adopted textbook

20.3 SUGGESTED TEACHER ACTIVITIES:

- Direct instruction
- Facilitate group discussions

- Facilitate cooperative learning

21.0 The student will graph and perform the basic operations on vectors in the plane as well as apply vectors to solve navigation and work problems (Not a state standard)

21.1 SUGGESTED STUDENT ACTIVITIES:

- The student will draw and solve vector problems on graph paper
- The student will use vector notation and the properties of vectors to perform operations on vectors

21.2 SUGGESTED INSTRUCTIONAL MATERIALS NEEDED:

- Adopted textbook
- Graph paper

21.3 SUGGESTED TEACHER ACTIVITIES:

- Direct instruction
- Facilitate group discussions
- Facilitate cooperative learning

The Math Standards have been integrated into this course description.

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