

Orange Unified School District
TRIGONOMETRY
Semester Course

GRADE LEVEL: 11-12

PREREQUISITES: Algebra II “C” grade or better

INTRODUCTION TO THE SUBJECT:

This course is designed to be a rigorous mathematical elective; the next course in the sequence for students who have completed Algebra II. It provides a thorough study of trigonometry. The major themes will be the trigonometric functions, angles and the unit circle, equations and identities, graphs and applications.

PURPOSE OF THE COURSE:

This course is designed as a college prep course aimed at students who are not ready for the rigor of Pre-Calculus and yet desire to take a challenging math course their senior year. It is expected that students who are planning to attend college but perhaps not enter the field of math and engineering will benefit from the rigors of this class.

TEXT: Lial, Margaret L., John Hornsby, David I. Schneider. *Trigonometry*. (6th Edition). Addison Wesley, 1996.

COURSE OBJECTIVES: By the end of the course the student will:

Trigonometric functions:

- Verify basic trigonometric identities and make basic substitutions.
- Use the six trigonometric functions to find sides and angles of a right triangle in standard position.
- They will also be able to solve a basic right triangle.
- Be able to convert from radians to degrees and back.
- Students will completely label a unit circle in radians.
- Special angles (30-60-90 and 45-45-90) ; will be able to find their measure using a calculator and unit circle
- Students will also be able to find angle measures using inverse trigonometric functions.

Identities and Formulas (angle)

- Verify basic trigonometric identities.
- Properties of the unit circle will be investigated and circular functions will be introduced.
- Students will be able to show the connection between circular functions and trigonometric functions.
- Students will use identities to find all trigonometric functions.
- Students will be able to manipulate angle formulas

Trigonometric Equations

- Solve basic equations and inequalities.
- Graph and translate periods and amplitudes.
- Students will solve right and non-right triangles using trigonometric functions.
- Students will review Pythagorean Theorem and other useful right triangle properties.

Polar Coordinates and equations

- Students will be able to translate rectangular coordinates to polar.
- Students will solve and graph basic polar equations.

Complex numbers and Vectors

- Students will understand and be able to graph the trigonometric form of a complex number
- Students will understand the relation to vectors.

COURSE OVERVIEW AND APPROXIMATE UNIT TIME ALLOTMENTS:

FIRST QUARTER

| Standard | Concept | Text | Assessment | Projects Key Assignments |
|-----------------|--|-------------|---|--|
| 1 | Students will understand the notion of the angle in both degrees and radians. | 1.1-1.4 | Alternate daily: quiz, group warm-up problems Students will demonstrate their understanding of radian measure by using the radius of a circle. | Homework 1.1-1.4 Radian Snowman |
| 2 | Students know definition of the six trigonometric functions as x-y coordinates of the unit circle. Students will use the points on the unit circle to graph sine, cosine and tangent functions. Students review 30-60-90 and 45-45-90 triangles. Students learn to use the calculator to find the values of sine, cosine, tangent, and their reciprocals. Students learn to use the inverse key on a calculator to find the angle of the six trig functions. | 1.5 | Alt daily: quiz and group warm-ups. Students will be quizzed on the special reference angles, 30°, 60°, and 45° on the unit circle without using a calculator. Chapter 1 Test: ** Students take a calculator and non-calculator parts of the test. (1) use calcs to find trig and inverse trig $f(x)$ | Homework 1.5 Trig A |
| 7, 12, 19 | Students know the tangent of the angle that a line makes with the x-axis is equal to the slope of the line; students use trig to determine unknown sides of angles in right triangles; Students are adept at using trig in a variety of applications and word problems. | 2.1-2.4 | Alt: quiz & gp warmup Chapter 2 test ** | Homework 2.1-2.4 Similar Triangles worksheet Reference Angles The Legend of SOHCAHTOA reading |

| Standard | Concept | Text | Assessment | Projects Key Assignments |
|-----------------|---|-------------|---|--------------------------------------|
| 3, 9, 19 | Students understand the unit circle and circular functions. Be able to convert degrees to radians. Students will be able to convert from degree to radian and radian to degree without using a calculator. | 3.1-3.4 | Alt: quiz & warmups Chapter 3 test ** | Homework 3.1-3.4 Trig practice 3A |
| 4, 5, 6 | Students know the domain and range for all basic six trigonometry functions. Students graph all six trig functions in the form of $y = A\sin(Bx - C) + D$; understand period, amplitude, phase shift and translations of the graphs. | 4.1-4.3 | Alt quiz & warmups Chapter 4 test ** is Mid-semester test Students are given a timed-test on graphing all six trigonometry functions with domain and range. Students also need to be able to identify the zeros and vertical asymptotes where they apply. | Homework 4.1-4.4 Trig practice 4a |

SECOND QUARTER

| Standard | Concept | Text | Assessment | Projects Key Assignments |
|-----------------|---|-------------|--|---|
| 3, 10, 11 | Students know the Pythagorean, reciprocal, quotient, periodic, and even-odd identities. They can use them to find trig functions and to verify/establishing identities. Students know and can use the half and double angle formulas to simplify and find the value of specific trigonometry angles. | 5.1-5.6 | Alt quiz & warmups Informal assessment on all identities throughout the class period. Chapter 5 Test** Students show how to rewrite more complex angle using sum and difference formulas. | Homework 5.1-5.6 Trig practice 5A,B |
| 8, 9 | Students know the definitions of the inverse trig $f(x)$ and can graph them; compute by hand values of the trig $f(x)$ and the inverse trig $f(x)$ at various standard points. | 6.1-6.4 | Alt quiz & warmups Chapter 6 Test** | Homework 6.1-6.4 Trig practice 6A Christmas Project: Algebra Review study guide.(2) |

| Standard | Concept | Text | Assessment | Projects Key Assignments |
|----------------|--|---------|---|--|
| 13, 14 | Students can identify SAS, SSS, ASA, and SSA cases. Students know the law of sines and cosines and use them to solve triangles and triangle problems. | 7.1-7.3 | Alt quiz & warmups Chapter 7 Test ** | Homework 7.1-7.3 Trig practice 7A |
| 14, 15, 17, 18 | Students can find the area of a triangle; can represent a complex number in polar form and how to multiply their polar form; know DeMoivre's theorem and can give nth roots; familiar with polar coordinates of a point given in rectangular coordinates and represent equations in both rectangular and polar form. | 8.1-8.6 | Alt quiz & warmups Chapter 8 Test Semester Final: Cumulative Students express a complex number in polar form. They find the n^{th} root using DeMoivre's theorem. Students convert from rectangular coordinates to polar coordinates and vice versa. | Homework 8.1-8.6 Trig practice 8A Trig Cards- project: create playing cards of key formulas and /or concepts for final. |

** Tests: Tests include both a multiple choice section and a free response where students show their work and receive partial credit for correct work. All assessments include an open ended question that allows students to explain their understanding of a major (standard) concept. Students who do not pass with a 70% or better can retake for a max grade of 70%.

*** Assessment driven instruction: Each test is gone over with students; problems that many students missed are reviewed and placed on the next test. Students know this and prepare using chapter review suggested problems. This in turn makes possible 'spiraling' and make tests partly cumulative.

- (1) Technology is used to find trig functions, graph to examine the changes in period and amplitude.
 (2) Projects: Students will compose a Review Study Guide for Algebra II. This is planned because many seniors will be taking ACT and SAT tests. In addition they will take placement test at Jr. College and the ELM and EPT.

DATE OF CONTENT REVISION: February 2009

DATE OF CURRENT CONTENT REVISION: August 2010

DATE OF BOARD APPROVAL: February 12, 2009

TRIGONOMETRY CONTENT STANDARDS

Trigonometry uses the techniques that students have previously learned from the study of algebra and geometry. The trigonometric functions studied are defined geometrically rather than in terms of algebraic equations. Facility with these functions as well as the ability to prove basic identities regarding them is especially important for students intending to study calculus, more advanced mathematics, physics and other sciences, and engineering in college.

1.0 Students understand the notion of angle and how to measure it, in both degrees and radians. They can convert between degrees and radians.

2.0 Students 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.

3.0 Students know the identity $\cos^2(x) + \sin^2(x) = 1$:

3.1 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 as a consequence of this identity).

3.2 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 $\sec^2(x) = \tan^2(x) + 1$.

4.0 Students graph functions of the form $f(t) = A \sin(Bt + C)$ or $f(t) = A \cos(Bt + C)$ and interpret A , B , and C in terms of amplitude, frequency, period, and phase shift.

5.0 Students know the definitions of the tangent and cotangent functions and can graph them.

6.0 Students know the definitions of the secant and cosecant functions and can graph them.

7.0 Students know that the tangent of the angle that a line makes with the x -axis is equal to the slope of the line.

8.0 Students know the definitions of the inverse trigonometric functions and can graph the functions.

9.0 Students compute, by hand, the values of the trigonometric functions and the inverse trigonometric functions at various standard points.

10.0 Students 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.

11.0 Students 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.

12.0 Students use trigonometry to determine unknown sides or angles in right triangles.

13.0 Students know the law of sines and the law of cosines and apply those laws to solve problems.

14.0 Students determine the area of a triangle, given one angle and the two adjacent sides.

15.0 Students are familiar with polar coordinates. In particular, they can determine polar coordinates of a point given in rectangular coordinates and vice versa.

16.0 Students represent equations given in rectangular coordinates in terms of polar coordinates.

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

18.0 Students know DeMoivre's theorem and can give n th roots of a complex number given in polar form.

19.0 Students are adept at using trigonometry in a variety of applications and word problems.