

TRIGONOMETRY

PURPOSE:

Students will be able to compute trig ratios, and inverses and find missing parts for triangles. They will graph and analyze the trig functions. They will use trig identities to trig expressions. They will simplify trig equations and convert between rectangular and polar coordinates. 3 hours of college credit available.

BENCHMARKS AND INDICATORS:

1. Defines the basic trig functions using a right triangle and a unit circle
 - T11 Define trig functions in terms of opposite, adjacent and hypotenuse
 - T12 Define trig functions in terms of x and y values on a unit circle
 - T13 Given points on a rectangular coordinate system, find the trig functions defined by a circle going through the point having its center at the origin
 - T14 Given one trig function and the quadrant an angle is in, find all other trig functions
2. Solve missing parts of right triangles including special angles
 - T21 Given an acute angle and any one of the three sides of a right triangle, find the remaining angles and sides
 - T22 Given any two sides of a right triangle, find the remaining angles and side
 - T23 Given a special 45-45 or 30-60 triangle and one side, find the remaining sides in exact form
3. Uses radian measurement and uses circular functions as real-valued functions
 - T31 Define a radian as arc length divided by radius and understand that it has no units
 - T32 Convert between radians and degrees and revolutions
 - T33 Label the special angles and quadrantal angles as reduced fractions on a unit circle from 0 to 4π or from 0 to -4π
 - T34 Identify that sine is the y value and cosine is the x value and that tangent is the slope from the origin to the point on the unit circle
 - T35 Gives the sign (positive or negative) of each trig function according to the quadrant the angle is in
 - T36 Lists positive and negative angles both in degrees and radians that are coterminal
 - T37 Given a radian measure, finds the reference angle and the quadrant that it is in
 - T38 Gives the trig functions as the + or - of their reference angles or gives exact values for angles with reference angles that are in special triangles (45/45 or 30/60) or quadrantal angles (0,90)
 - T39 Uses the calculator to find all six trig values using degrees and radians
4. Analyze the graphs of the six trig functions using the concepts of period, phase shift, amplitude and displacement
 - T41 Knows the graphs of the six trig functions graphing one period and giving the domain, range, period, zeros
 - T42 Identifies how the y values of the graphs are effected by the coefficient of the trig function and the constant term (this includes a negative coefficient which flips the graph over the x axis) and gives the new y value for 1,0 and -1

- T43 Identifies how the x values of the graph are effected by the angle of the trig function Finds the new period and phase shift and lists the 5 important x values that evenly divide one period
 - T44 Graphs the trig function showing the y values and x values described giving the new period, domain, range and estimating zeros
5. Derive or verify trig identities, including but not limited to, double angle, half angle, angle sum and angle difference identities
- T51 Know the three Pythagorean identities, reciprocal identities, ratio identities, cofunction identities, negative angle identities
 - T52 Use the identities in T51 to verify other given identities
 - T53 Use the sum identities to derive the double angle identities
 - T54 Use the cosine double angle identity to derive the half angle identities
 - T55 Use the sum and difference identities to find the exact values for 15 degree reference angles
 - T56 Use the sum, difference, double, half angle identities to simplify expressions and verify given identities
6. Define, graph and analyze inverse trig functions
- T61 Restrict sine, cosine and tangent so they are one-to-one functions and define the inverse trig functions from the graphs
 - T62 Compose inverse trig functions with trig functions
 - T63 Give the domain and range of the inverse trig functions
 - T64 Given the quadrant and an inverse trig function, find all of the trig functions
7. Solve equations involving trig functions
- T71 Solve simple linear trig equations giving all answers from 0 to 360° or giving all solutions
 - T72 Solve trig equations that fit the quadratic form
 - T73 Solve trig equations that require trig identities to solve
 - T74 Solve trig equations that involve factoring
 - T75 Solve trig equations that have different angles
 - T76 Solve trig equations that have angles that involve multiplication or addition
8. Find solutions of oblique triangles using the Law of Cosines and Law of Sines
- T81 Find all missing angles and area of a triangle given SSS
 - T82 Find all missing angles and sides and area of a triangle given SAS
 - T83 Find all missing angles and sides and area of a triangle given AAS or ASA
 - T84 Find all missing angles and sides and area of two triangles given SSA
 - T85 Find all missing angles and sides of two triangles given the area and 2 sides
 - T86 Find all missing angles and sides given the area and an angle with its adjacent side
 - T87 Determine when information about a triangle is impossible
9. Solve applications, including but not limited to, vectors
- T91 Find the area and arc length of a sector
 - T92 Find velocity and angular velocity
 - T93 Add vectors using headings
 - T94 Find distances and/or angles with problems dealing with angle of elevation or angle of depression
 - T95 Solve application problems that use triangles

10. Solve problems with complex numbers using polar coordinates

- T10.1 Convert between polar and rectangular form
- T10.2 Graph on an Argand diagram both rectangular and polar
- T10.3 Add, subtract, multiply and divide using both forms
- T10.4 Raise complex numbers to powers using both forms using DeMoivre's Theorem
- T10.5 Find all of the roots in the complex number system