Algebra 2 and Trigonometry

DESCRIPTION OF COURSE

The Algebra 2 and Trigonometry course offers students the opportunity to expand on topics from Algebra 1, learn advanced algebraic topics, learn and understand concepts in the study of circular and trigonometric functions, and increase problem solving skills. This course includes trigonometric applications from the physical world.

CONTENT STRAND:

Functions and Algebra
Numbers and Operations
Geometry and Measurement

PROCESS STRAND:

Problem Solving, Reasoning, and Proof
Communication, Connections, and Representation

MAJOR STEMS

Language of Algebra
Linear Relationships
Quadratic Functions
Functions
Graphing
Conic Sections
Systems, Linear Programming
Extending the Real Number System
Polynomials and Polynomial Functions
Rational Expressions, Equations, and Functions
Exponential and Logarititthmic Functions
Trigonometric Functions
Acute andles and right triangles
Radian measure and circular functions
Graphs of the circular functions
Trigonometric Identities
Inverse trigonometric functions and trig. Equations
Applications if trigonometry and vectors

Algebra 2 and Trigonometry
COURSE CONTENT COMPETENCIES:

1. Demonstrates conceptual understanding of the real number system
2. Demonstrates understanding of the relative magnitude of real numbers
3. Accurately solves problems
4. Explores field properties; algebraically/geometrically
5. ?? Creates formal proofs
6. Applies concepts of similarity; uses the ratios of the sides of special right

triangles

7. Derives and uses the formulas for lengths of arcs and areas of sectors and areas of segments of a circle.
8. Uses radian measure; converts
9. Solves problems on and off the coordinate plane
10. Solves problems using analytic geometry and circular trigonometry; explores and interprets the characteristics of conics sections graphically and algebraically.
11. Demonstrates conceptual understanding of linear and nonlinear functions and relations.
12. Demonstrates conceptual understanding of algebraic expressions
13. Demonstrates conceptual understanding of equality

Algebra 2 and Trigonometry
COURSE PROCESS COMPETENCIES:

1. Students will use problem-solving strategies to investigate and understand Increasingly complex mathematical content.
2. Students will use mathematical reasoning and proof.
3. Students will communicate their understanding of mathematics.
3. Students will create and use representations to communicate mathematical ideas and to solve problems.
4. Students will recognize, explore, and develop mathematical connections.

Functions and Algebra Strand & Numbers and Operations Strand-Stem 1

Language of Algebra

Topics	Simplify, evaluate expressions, solve equations and inequalities, use rational and irrational numbers, perform matrix operations
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Explores field properties; algebraically/geometrically
Knowledge/Skills	• Simplify and evaluate expressions using order of operations and algebraic properties. • Solve absolute value equations and inequalities • Solve literal equations for the indicated variable • Solve equations and inequalities with one variable • Write equations that model situations described in verbal problems • Identify and use rational and irrational numbers • Perform matirx operations of addition, subtraction, scalar multiplication, and multiplication
Process Skills	1. Students will use problem-solving strategies to investigate and understand Increasingly complex mathematical content. 3. Students will communicate their understanding of mathematics. 3. Students will create and use representations to communicate mathematical ideas and to solve problems. 4. Students will recognize, explore, and develop mathematical connections.

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 2
Linear Relationships

Topics	Write equations from verbal problems. Graph linear equations, linear inequalities, and absolute value equations, use different forms of a linear equation. Solve a system of inequalities. Solve problems with direct variation.
Competencies	1. Accurately solves problems 2. Applies concepts of similarity; uses the ratios of the sides of special right triangles 3. Solves problems on and off the coordinate plane 4. Demonstrates conceptual understanding of algebraic expressions 5. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Solve literal equations for the indicated variable • Write equations that model situations described in verbal problems • Graph vertical and horizontal lines • Use the slope and its relationship to solve rate of change problems • Graph linear equations with two variables by using a table of values, slope-intercept form point-slope form, and intercepts • Write linear equations in slope-intercept form point-slope form or standard form • Write linear models for verbal problems • Graph ablsolute value equations (such as y = a | x - h | + k) • Graph linear inqualities • Solve a system of linear equations by graphing, substitution, or linear combinations • Solve problems involving direct variation
Process Skills	1. Students will use problem-solving strategies to investigate and understand Increasingly complex mathematical content. 3. Students will communicate their understanding of mathematics. 3. Students will create and use representations to communicate mathematical ideas and to solve problems. 4. Students will recognize, explore, and develop mathematical connections.
Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 3	
Quadratic Functions	

Topics	Identify and factor polynomials. Solve and graph quadratics by various methods, and find minimums and maximums. Write an equation that models a verbal description. Write and graph compound functions. Use the discriminant. Use a graphing calculator to graph and find the roots of a quadratic equation.
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Solves problems on and off the coordinate plane 5. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 6. Demonstrates conceptual understanding of algebraic expressions 7. Demonstrates conceptual understanding of equality
Knowledge/Skills	Write equations that model situations described in verbal problems • Solve simple quadratic equations by taking the square root on both sides • Solve quadratic equations by factoring, quadratic formula, and completing the square • Choose the best method to solve a quadratic equation • Write a quadratic equation with a given solution set • Solve equations with applications in other disciplines • Graph parabolas using scale and standard form • Identify the axis of symmetry, orientation, and vertex of a parabola • Transform between general and stardard form of an a quadratic equation • Find the minimum or maximum of a quadratic equation • Find the minimum or maximum of a quadratic equation using a graphing calculator • Write and graph functions and compound

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 4
Functions

Topics	Solve equations and inequalities with absolute value. Determine which relations are functions, determine the degree of a polynomial, evaluate functions, perform operations on functions, and find the inverse of a function. Write and graph compound functions and recursive functions. Identify and graph transformations on functions.
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Explores field properties; algebraically/geometrically 5. Solves problems on and off the coordinate plane 6. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 7. Demonstrates conceptual understanding of algebraic expressions 8. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Solve absolute value equations and inequalities • Write equations with model situations described in verbal problems • Determine whether a relation is a function • Evaluate funcitons • Perform operations of functions (add, subtract, multiply, divide and composition) • Find the inverse of a function algebraically and graphically • Write and graph function and compound functions • Use transformations to graph funcitons • Write and evaluate recrusive functions • Write the closed form of a linear and quadratic recursive functions • Identify the degree of a polynomial
Process Skills	1. Students will use problem-solving strategies to investigate and understand Increasingly complex mathematical content. 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 3. Students will create and use representations to communicate mathematical ideas and to solve problems. 4. Students will recognize, explore, and develop mathematical connections.

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 5	
Graphing	
Topics	Write equations that model verbal problems, Use transformations graph functions, sketch polynomials based on roots and degree, determine vertical and horizontal asymptotes, find holes of a function.
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 5. Demonstrates conceptual understanding of algebraic expressions 6. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Write equations that model situations described in verbal problems • Use transformations to graph functions • Sketch the graph of a polynomial based on the roots and degree • Determine vertical and horizonal asymptotes • Determine holes in a functon • Describe the roots of a polymonial based upon the graph and degree • Sketch the graph of a polynomial based on the roots and degree
Process Skills	1. Students will use problem-solving strategies to investigate and understand Increasingly complex mathematical content. 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 3. Students will create and use representations to communicate mathematical ideas and to solve problems. 4. Students will recognize, explore, and develop mathematical connections.

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 6
Conic Sections

Topics	Identify the parts of each conic section including, axis of symmetry, orientation, foci, directrix, vertex (or verticies), major and minor axes, center and asymptotes. Transform between general and standard form.
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Solves problems using analytic geometry and circular trigonometry; explores and interprets the characteristics of conics sections graphically and algebraically. 5. Solves problems on and off the coordinate plane 6. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 7. Demonstrates conceptual understanding of algebraic expressions 8. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Write equations that model situations described in verbal problems • Identify the axis of symmetry, orientation, directrix, focus, and vertex of a parabola • Identify the foci, vertices, axis of symmetry, major axis, and minor axis of a ellipse • Identify the center and radius of a circle • Idenify the foci, vertices, axis of symmetry, and asymptotes of a hyperbola • Transform between general and standard form for conic sections • Use transformations to graph the four conic sections • Determine vertical and horizonal asymptotes
Process Skills	1. Students will use problem-solving strategies to investigate and understand Increasingly complex mathematical content. 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 3. Students will create and use representations to communicate mathematical ideas and to solve problems. 4. Students will recognize, explore, and develop mathematical connections.

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 7
Systems, Linear Programming

Topics	Write a system of equations that models a verbal problems. Perform matrix operations. Solve systems of equations by graphing, substitution, linear combinations, Cramer's rule, and the inverse matrix method with and without the graphing calculator. Write and solve a system of inequalities. Find the inverse of a 2x2 matrix. Find the determinant of a matrix. Solve problems involving inverse variation.
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Explores field properties; algebraically/geometrically 5. Solves problems on and off the coordinate plane 6. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 7. Demonstrates conceptual understanding of algebraic expressions 8. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Write equations that model situations described in verbal problems • Perform matrix operations of addition, subtraction, scalar multiplication, and multiplication • Write linear quations in slope intercept form point slope form or standard form • Graph linear inqualities • Solve a system of linear equations by graphing, substitution, linear combinations, Cramers rule or the inverse matrix method • Solve a system of equations with three equations by using linear combinations • Solve a system of linear equations by graphing, Cramers rule, and the inverse matrix method using a graphing calcuator. • Write a system of linear quations or inequalities to model verbal problems • Use linear programming to solve problems • Understand the concepts of linear progamming in more complex situations • Interpret and use matirces to store data • Calcuate the inverse of a 2 x 2 matrix • Calculate the value of both 2 x 2 and 3 x 3 determinates • Use the graphing calculator to find the inverse of any matrix • Use the graphing calculator to find the determinate of any matrix • Use the inverse matirx method to solve a system of two equations • Use Cramer's rule to solve a system of equations with two equations

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 8	
Extending the Real Number System	
Topics	Identify and use rational, irrational, and complex numbers. Solve equations that have complex solutions. Perform operations on and rationalize complex numbers. Simplify and evaluate expressions with rational exponents. Solve equations involving rational exponents.
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Explores field properties; algebraically/geometrically 5. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 6. Demonstrates conceptual understanding of algebraic expressions 7. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Identify and use rational, irrational, and complex numbers • Solve equations that have complex solutions • Add, subtract, multiply, divide, simplify, and rationalize with complex numbers • Simplify and evaluate expressions with rational exponents (positive, negative, zero, and fractinal) • Solve equations that involve radicals and powers
Process Skills	1. Students will use problem-solving strategies to investigate and understand Increasingly complex mathematical content. 3. Students will communicate their understanding of mathematics. 3. Students will create and use representations to communicate mathematical ideas and to solve problems. 4. Students will recognize, explore, and develop mathematical connections.

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 9
Polynomials and Polynomial Functions

Topics	Identify the degree and perform operations on polynomials. Factor polynomials, Use synthetic division, and substitution. Describe the number and type of roots based on a graph. Solve polynomials over the complex numbers. Determine holes, vertical asymptotes, and horizontal asymptotes.
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Explores field properties; algebraically/geometrically 5. Solves problems on and off the coordinate plane 6. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 7. Demonstrates conceptual understanding of algebraic expressions 8. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Identify the degree of a polynomial • Multiply, add, divide, subtract with polynomials • Factor polynomials using various methods (greatest common facor, grouping, F.O.I.L., difference of squares, difference of cubes, sum of cubes, and synthetic division) • Use synthetic substitution to evaluate a polynomial • Use synthetic division and the rational root theorem to factor a plynomial • Use synthietic division to find the dividend and remainder • Describe the roots of a polymonial based upon the graph and degree • Sketch the graph of a polynomial based on the roots and degree • Determine vertical and horizonal asymptotes • Determine holes in a funciton • Solve equations over complex numbers by various methods
Process Skills	1. Students will use problem-solving strategies to investigate and understand Increasingly complex mathematical content. 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 3. Students will create and use representations to communicate mathematical ideas and to solve problems. 4. Students will recognize, explore, and develop mathematical connections.

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 10
Rational Expressions, Equations, and Functions

Topics	Write equations that model verbal problems. Simplify and perform operations on rational expressions. Determine vertical and horizontal asymptotes and holes. Simplify complex problems. Solve equations with rational expressions and complex fractions. Solve problems with direct and inverse variation.
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Explores field properties; algebraically/geometrically 5. Solves problems on and off the coordinate plane 6. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 7. Demonstrates conceptual understanding of algebraic expressions 8. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Write equations with model situations described in verbal problems • Simplify and perform operations (add, subract, multiply, and divide) rational expressions • Determine vertical and horizontal asymptotes • Solve proportions • Solve problems involving direct and inverse variation • Simplify complex fractions • Solve equations involving rational expressions
Process Skills	1. Students will use problem-solving strategies to investigate and understand Increasingly complex mathematical content. 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 3. Students will create and use representations to communicate mathematical ideas and to solve problems. 4. Students will recognize, explore, and develop mathematical connections.

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 11
Exponential and Logaritithmic Functions

Topics	Identify rational, and irrational numbers. Identify and use equations that are exponential. Convert between logarithmic and exponential notation. Evaluate and graph logarithmic functions. Use properties of logarithms to expand, condense, simplify and evaluate expressions. Use the change of base formula to evaluate logarithmic expressions. Solve equations with logarithms.
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Explores field properties; algebraically/geometrically 5. Solves problems on and off the coordinate plane 6. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 7. Demonstrates conceptual understanding of algebraic expressions 8. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Identify and use rational and irrational numbers • Identify and use equations that model exponential growth and decay • Convert between logarithmic and exponential notation • Evaluate and graph logarithmic functions • Use the properties of logarithms to expand and condense logarithmic functions • Use common and natural logarithms to solve equations • Use the change of base formula to evaluate logarithms • Solve equations contining logarithms or exponents
Process Skills	1. Students will use problem-solving strategies to investigate and understand Increasingly complex mathematical content. 2. Students will communicate their understanding of mathematics. 3. Students will create and use representations to communicate mathematical ideas and to solve problems. 4. Students will recognize, explore, and develop mathematical connections.

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 12	
Trigonometric Functions	
Topics	Draw angles in standard position, find coterminal angles, and use the definition of the six trigonometric functions to write their ratios. Convert between decimal degrees and degree, minute, second notation and back.
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Explores field properties; algebraically/geometrically 5. Solves problems on and off the coordinate plane 6. Solves problems using analytic geometry and circular trigonometry; explores and interprets the characteristics of conics sections graphically and algebraically. 7. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 8. Demonstrates conceptual understanding of algebraic expressions 9. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Identify and use rational and irrational numbers • Draw an angles in standard position • Find coterminal angles • Use the definition of the six trigonometric funcitons to write the trigonometric ratios • Convert between decimal degrees and degree, minute, second notation
Process Skills	1. Students will use problem-solving strategies to investigate and understand Increasingly complex mathematical content. 2. Students will communicate their understanding of mathematics. 3. Students will create and use representations to communicate mathematical ideas and to solve problems. 4. Students will recognize, explore, and develop mathematical connections.

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 13
Acute andles and right triangles

Topics	Use the definition of the six trigonometric functions to write their ratios for acute angles. Find coterminal angles and solve problems using cofunction identities. Memorize and use the special angle values for the six trigonometric ratios. Use related angles and special triangle relationships to find the trigonometric ratios and solve problems. Use trigonometric functions to solve indirect measure and navigation problems. Use a calculator to find the value of trigonometric ratios and their inverse values for acute angles.
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Explores field properties; algebraically/geometrically 5. ?? Creates formal proofs 6. Applies concepts of similarity; uses the ratios of the sides of special right triangles 7. Derives and uses the formulas for lengths of arcs and areas of sectors and areas of segments of a circle. 8. Uses radian measure; converts 9. Solves problems on and off the coordinate plane 10. Solves problems using analytic geometry and circular trigonometry; explores and interprets the characteristics of conics sections graphically and algebraically. 11. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 12. Demonstrates conceptual understanding of algebraic expressions 13. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Use the definition of the six trigonometric funcitons to write the trigonometric ratios • Solve probems using the cofunction identies • Use trigonometric functions to solve right triangles • Memorize and use the six trigonometric functions for special angles and the coterminal angles (0°, 30°, 45°, 60°, 90°, 120°, 135°, 150°, 180°, 210°, 225°, 240°, 270°, 300°, 315°, 330°…) • Use the related angles to help find the value of the special trigometric functions • use special triangle relationships (30-60-90 and 45-45-90) to solve problems • Use the trigonometic functions to solve indirect measure and navigation problems • Use a calculator to find values fo the trigonometric ratios and their inverse for acute angles

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 14
Radian measure and circular functions

Topics	Draw angles in standard position, find coterminal angles, and use the definition of the six trigonometric functions to write their ratios as circular functions. Find coterminal angles and solve problems using cofunction identities. Memorize and use the special angle values for the six trigonometric ratios in radian measure. Use related angles and special triangle relationships to find the trigonometric ratios and solve problems. Use a calculator to find the value of trigonometric ratios and their inverse values in radian measure. Convert between degree and radian measure. Know and use the relationship between circular and triangular definitions for the trigonometric functions. Solve linear and angular rotation and velocity problems.
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Explores field properties; algebraically/geometrically 5. Applies concepts of similarity; uses the ratios of the sides of special right triangles 6. Derives and uses the formulas for lengths of arcs and areas of sectors and areas of segments of a circle. 7. Uses radian measure; converts 8. Solves problems on and off the coordinate plane 9. Solves problems using analytic geometry and circular trigonometry; explores and interprets the characteristics of conics sections graphically and algebraically. 10. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 11. Demonstrates conceptual understanding of algebraic expressions 12. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Find coterminal angles • Solve probems using the cofunction identities • Use the definition of the six trigonometric functions to write the trigonometric ratios • Use the measure of the central angle to find the area of a sector and length of an arc • Memorize and use the six trigonometric functions for special angles and the coterminal angles • Use the related angles to help find the value of the special trigometric functions (π°, π/6°, π/4°, π/3°, π/2…) • Use the six trigonometric functions to define six circular functions • Know the relatinship between the circular and triangular definitions of the six trigonometric functions • Solve linear and angular velocity problems

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 15
Graphs of the circular functions

Topics	Memorize and use the domain and range of the six trigonometric functions. Use translation, and dialation to graph the six trigonometric functions. Identify and use the period, amplitude, vertical translation, phase shift, domain, and range to graph and solve problems. Graph and analyze the sum, difference and the product of two or more functions by computing the applicable coordinates by hand and with the aid of a graphing calculator.
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Explores field properties; algebraically/geometrically 5. Applies concepts of similarity; uses the ratios of the sides of special right triangles 6. Derives and uses the formulas for lengths of arcs and areas of sectors and areas of segments of a circle. 7. Uses radian measure; converts 8. Solves problems on and off the coordinate plane 9. Solves problems using analytic geometry and circular trigonometry; explores and interprets the characteristics of conics sections graphically and algebraically. 10. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 11. Demonstrates conceptual understanding of algebraic expressions 12. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Memorize and use the domain and range of the six trigomometric functions • Use translation, and dialation to graph the six trigonometric functions • Identify the period, amplitude, vertical translation, and phase shift (when applicable) for the graphs and equations of the six trigometric functions • Graph the six trigonometric functions using period, amplitude, vertical translation, and phase shift • Graph and analyze the sum, difference, and the product of two or more functions by computing the applicable ordinates • Graph and analyze the sum, difference, and the product of two or more functions by using a graphing calculator
Process Skills	1. Students will use problem-solving strategies to investigate and understand Increasingly complex mathematical content.

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 16
Trigonometric Identities

Topics	Memorize and use the reciprocal, Pythagorean, quotient, cofunction, and negative angle identities for six trigonometric functions. Memorize and use the sum, difference, double angle, half angle identities for sine, cosine, and tangent functions. Prove trigonometric identities and properties. Solve problems using the properties and identities.
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Explores field properties; algebraically/geometrically 5. Creates formal proofs 6. Applies concepts of similarity; uses the ratios of the sides of special right triangles 7. Uses radian measure; converts 8. Solves problems on and off the coordinate plane 9. Solves problems using analytic geometry and circular trigonometry; explores and interprets the characteristics of conics sections graphically and algebraically. 10. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 11. Demonstrates conceptual understanding of algebraic expressions 12. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Memorize the reciprocal, Pythagorean, quotient, cofunction, negative angle identities • Memorize the sum, difference, double-angle, half-angle identies for sine, cosine and tangent • Calculate the exact value for trigonometric valuse for angles using the sum, diffence, double-angle, and half-angle Identities for the six trigometric functions • Prove trigonometric identities • Solve problems with the use of trigonometric identies
Process Skills	1. Students will use problem-solving strategies to investigate and understand Increasingly complex mathematical content. 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 3. Students will create and use representations to communicate mathematical ideas and to solve problems. 4. Students will recognize, explore, and develop mathematical connections.

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 17
Inverse trigonometric functions and trig. Equations

Topics	Find the inverse of a one to one function. Memorize and use the domains and ranges of the six inverse trigonometric functions. Find the value of an inverse trigonometric function in radians and degrees with and without the use of a calculator. Solve trigonometric equations with or without the use of properties with and without a calculator
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Explores field properties; algebraically/geometrically 5. Applies concepts of similarity; uses the ratios of the sides of special right triangles 6. Derives and uses the formulas for lengths of arcs and areas of sectors and areas of segments of a circle. 7. Uses radian measure; converts 8. Solves problems on and off the coordinate plane 9. Solves problems using analytic geometry and circular trigonometry; explores and interprets the characteristics of conics sections graphically and algebraically. 10. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 11. Demonstrates conceptual understanding of algebraic expressions 12. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Determine whether a function is one-to-one • Find the inverve of a one-to-one function • Memorize and use the domains and ranges of the six inverse trigonometric functions • Find the value of an inverse trigonmetric function in radians and degrees • Find the value of an inverse trigonmetric function in radians and degrees using a calculator • Solve trigonometric equations (may require identities or a calculator) • Solve trigonometric equations with multiple angles (may require identities or a calculator)
Process Skills	1. Students will use problem-solving strategies to investigate and understand Increasingly complex mathematical content. 2. Students will use mathematical reasoning and proof. 3. Students will communicate their understanding of mathematics. 3. Students will create and use representations to communicate

Functions and Algebra Strand, Numbers and Operations & Geometry and Measurement Strand-Stem 18
Applications if trigonometry and vectors

Topics	Memorize and use the law of sines and law of cosines. Know and solve problems when the use of the law of sines results in more than one solution. Solve oblique triangle problems with the use of the law of sines or cosines. Find the area of a triangle using the area with sines or Heron's formula. Find the sum, difference, dot product, negative and scalar product of two-dimensional vectors. Find vertical and horizontal components of vectors. Use the parallelogram rule to find the resultant vector. Use position vectors <a, b> and i, and j vectors. Solve problems using vectors with physics and navigation (may require properties or laws)
Competencies	1. Demonstrates conceptual understanding of the real number system 2. Demonstrates understanding of the relative magnitude of real numbers 3. Accurately solves problems 4. Explores field properties; algebraically/geometrically 5. Applies concepts of similarity; uses the ratios of the sides of special right triangles 6. Derives and uses the formulas for lengths of arcs and areas of sectors and areas of segments of a circle. 7. Solves problems on and off the coordinate plane 8. Solves problems using analytic geometry and circular trigonometry; explores and interprets the characteristics of conics sections graphically and algebraically. 9. Demonstrates conceptual understanding of linear and nonlinear functions and relations. 10. Demonstrates conceptual understanding of algebraic expressions 11. Demonstrates conceptual understanding of equality
Knowledge/Skills	• Memorize the law of sines and the law of cosines • Know when the the use of the law of sines results in an ambiguous case where more than one solution exists • Use the law of sines oblique triangle probems when more than one solution exists • Solve oblique triangle problems using the law of sines and law of cosines • Find the area of a triangle using the A=.5bc[sin(A)] formula or Heron's Formula • Find the sum, difference, dot product, negative and scalar multiple for two dimensional vectors • Find the vertical and horizontal components of a vector • Use the parallelogram rule to draw and find the resultant vector • Use the position vector <a, b> • Use I and j vectors • Solve problems using vectors with physics and navigation problems (may require law of sines