

## *Trigonometry*

This course covers the topics outlined below. You can customize the scope and sequence of this course to meet your curricular needs.

Curriculum (426 topics + 501 additional topics)

- Algebra and Geometry Review (98 topics)
  - ◆ Real Numbers and Algebraic Expressions (14 topics)
    - ◇ Signed fraction addition or subtraction: Basic
    - ◇ Signed fraction subtraction involving double negation
    - ◇ Signed fraction multiplication: Basic
    - ◇ Signed fraction division
    - ◇ Computing the distance between two integers on a number line
    - ◇ Exponents and integers: Problem type 1
    - ◇ Exponents and signed fractions
    - ◇ Order of operations with integers
    - ◇ Evaluating a linear expression: Integer multiplication with addition or subtraction
    - ◇ Evaluating a quadratic expression: Integers
    - ◇ Evaluating a linear expression: Signed fraction multiplication with addition or subtraction
    - ◇ Distributive property: Integer coefficients
    - ◇ Using distribution and combining like terms to simplify: Univariate
    - ◇ Using distribution with double negation and combining like terms to simplify: Multivariate
  - ◆ Exponents (9 topics)
    - ◇ Introduction to the product rule of exponents
    - ◇ Product rule with positive exponents: Univariate
    - ◇ Introduction to the power of a power rule of exponents
    - ◇ Introduction to the power of a product rule of exponents
    - ◇ Power rules with positive exponents: Multivariate products
    - ◇ Power rules with positive exponents: Multivariate quotients
    - ◇ Simplifying a ratio of multivariate monomials: Basic
    - ◇ Introduction to the quotient rule of exponents
    - ◇ Simplifying a ratio of univariate monomials
  - ◆ Polynomial Expressions (8 topics)
    - ◇ Simplifying a sum or difference of two univariate polynomials
    - ◇ Multiplying a univariate polynomial by a monomial with a positive coefficient
    - ◇ Multiplying a univariate polynomial by a monomial with a negative coefficient
    - ◇ Multiplying binomials with leading coefficients of 1
    - ◇ Multiplying binomials with leading coefficients greater than 1
    - ◇ Multiplying conjugate binomials: Univariate
    - ◇ Squaring a binomial: Univariate
    - ◇ Multiplying binomials with negative coefficients
  - ◆ Factoring Polynomials (11 topics)
    - ◇ Greatest common factor of 2 numbers
    - ◇ Factoring a linear binomial
    - ◇ Introduction to the GCF of two monomials
    - ◇ Factoring out a monomial from a polynomial: Univariate

- ◇ Factoring a quadratic with leading coefficient 1
- ◇ Factoring out a constant before factoring a quadratic
- ◇ Factoring a quadratic with leading coefficient greater than 1: Problem type 1
- ◇ Factoring a quadratic with leading coefficient greater than 1: Problem type 2
- ◇ Factoring a perfect square trinomial with leading coefficient 1
- ◇ Factoring a difference of squares in one variable: Basic
- ◇ Factoring a difference of squares in one variable: Advanced
- ◆ Rational Expressions (28 topics)
  - ◇ Restriction on a variable in a denominator: Linear
  - ◇ Simplifying a ratio of factored polynomials: Linear factors
  - ◇ Simplifying a ratio of polynomials using GCF factoring
  - ◇ Simplifying a ratio of polynomials by factoring a quadratic with leading coefficient 1
  - ◇ Simplifying a ratio of polynomials: Problem type 1
  - ◇ Multiplying rational expressions made up of linear expressions
  - ◇ Multiplying rational expressions involving quadratics with leading coefficients of 1
  - ◇ Dividing rational expressions involving linear expressions
  - ◇ Dividing rational expressions involving quadratics with leading coefficients of 1
  - ◇ Least common multiple of 2 numbers
  - ◇ Least common multiple of 3 numbers
  - ◇ Introduction to the LCM of two monomials
  - ◇ Finding the LCD of rational expressions with linear denominators: Relatively prime
  - ◇ Writing equivalent rational expressions with polynomial denominators
  - ◇ Introduction to adding fractions with variables and common denominators
  - ◇ Adding rational expressions with common denominators and monomial numerators
  - ◇ Adding rational expressions with common denominators and binomial numerators
  - ◇ Adding rational expressions with common denominators and GCF factoring
  - ◇ Adding rational expressions with common denominators and quadratic factoring
  - ◇ Adding rational expressions with different denominators and a single occurrence of a variable
  - ◇ Adding rational expressions with denominators  $ax$  and  $bx$ : Basic
  - ◇ Adding rational expressions with denominators  $ax$  and  $bx$ : Advanced
  - ◇ Adding rational expressions with linear denominators without common factors: Basic
  - ◇ Complex fraction without variables: Problem type 1
  - ◇ Complex fraction without variables: Problem type 2
  - ◇ Complex fraction involving univariate monomials
  - ◇ Complex fraction: GCF factoring
  - ◇ Complex fraction made of sums involving rational expressions: Problem type 1
- ◆ Perfect Squares and  $n$ th Roots (6 topics)
  - ◇ Finding all square roots of a number
  - ◇ Square root of a rational perfect square
  - ◇ Square roots of perfect squares with signs
  - ◇ Introduction to solving an absolute value equation
  - ◇ Cube root of an integer
  - ◇ Finding  $n^{\text{th}}$  roots of perfect  $n^{\text{th}}$  powers with signs
- ◆ Rational Exponents (2 topics)
  - ◇ Rational exponents: Unit fraction exponents and whole number bases
  - ◇ Rational exponents: Non-unit fraction exponent with a whole number base
- ◆ Radical Expressions (15 topics)
  - ◇ Simplifying the square root of a whole number less than 100
  - ◇ Simplifying a higher root of a whole number
  - ◇ Introduction to square root addition or subtraction
  - ◇ Square root addition or subtraction
  - ◇ Introduction to square root multiplication
  - ◇ Square root multiplication: Basic

- ◇ Square root multiplication: Advanced
- ◇ Introduction to simplifying a product involving square roots using the distributive property
- ◇ Simplifying a product involving square roots using the distributive property: Basic
- ◇ Simplifying a product involving square roots using the distributive property: Advanced
- ◇ Simplifying a quotient of square roots
- ◇ Simplifying a quotient involving a sum or difference with a square root
- ◇ Rationalizing a denominator: Quotient involving square roots
- ◇ Rationalizing a denominator: Square root of a fraction
- ◇ Rationalizing a denominator using conjugates: Integer numerator
- ◆ Geometry (5 topics)
  - ◇ Area of a triangle
  - ◇ Circumference of a circle
  - ◇ Circumference and area of a circle
  - ◇ Introduction to the Pythagorean Theorem
  - ◇ Pythagorean Theorem
- Equations and Inequalities (55 topics)
  - ◆ Linear Equations and Applications (19 topics)
    - ◇ Additive property of equality with signed fractions
    - ◇ Multiplicative property of equality with signed fractions
    - ◇ Solving a multi-step equation given in fractional form
    - ◇ Solving a linear equation with several occurrences of the variable: Variables on the same side and distribution
    - ◇ Solving a linear equation with several occurrences of the variable: Variables on both sides and distribution
    - ◇ Solving a linear equation with several occurrences of the variable: Variables on both sides and two distributions
    - ◇ Solving a two-step equation with signed fractions
    - ◇ Solving a proportion of the form  $(x+a)/b = c/d$
    - ◇ Solving for a variable in terms of other variables using addition or subtraction: Basic
    - ◇ Solving for a variable in terms of other variables using addition or subtraction: Advanced
    - ◇ Solving for a variable in terms of other variables using multiplication or division: Basic
    - ◇ Solving for a variable in terms of other variables using multiplication or division: Advanced
    - ◇ Solving for a variable in terms of other variables using addition or subtraction with division
    - ◇ Solving for a variable inside parentheses in terms of other variables
    - ◇ Solving for a variable in terms of other variables in a linear equation with fractions
    - ◇ Translating a sentence into a one-step equation
    - ◇ Solving a word problem with two unknowns using a linear equation
    - ◇ Solving a decimal word problem using a linear equation of the form  $Ax + B = C$
    - ◇ Solving a one-step word problem using the formula  $d = rt$
  - ◆ Linear Inequalities and Applications (5 topics)
    - ◇ Graphing a linear inequality on the number line
    - ◇ Graphing a compound inequality on the number line
    - ◇ Set-builder and interval notation
    - ◇ Solving a two-step linear inequality: Problem type 1
    - ◇ Solving a two-step linear inequality: Problem type 2
  - ◆ Rational Equations that Simplify to Linear (5 topics)
    - ◇ Solving a rational equation that simplifies to linear: Denominator  $x$
    - ◇ Solving a rational equation that simplifies to linear: Denominator  $x+a$
    - ◇ Solving for a variable in terms of other variables in a rational equation: Problem type 1
    - ◇ Solving for a variable in terms of other variables in a rational equation: Problem type 2
    - ◇ Word problem on proportions: Problem type 1
  - ◆ Complex Numbers (5 topics)
    - ◇ Using  $i$  to rewrite square roots of negative numbers

- ◇ Simplifying a product and quotient involving square roots of negative numbers
- ◇ Adding or subtracting complex numbers
- ◇ Multiplying complex numbers
- ◇ Dividing complex numbers
- ◆ Quadratic Equations (13 topics)
  - ◇ Solving an equation written in factored form
  - ◇ Finding the roots of a quadratic equation of the form  $ax^2 + bx = 0$
  - ◇ Finding the roots of a quadratic equation with leading coefficient 1
  - ◇ Finding the roots of a quadratic equation with leading coefficient greater than 1
  - ◇ Solving an equation of the form  $x^2 = a$  using the square root property
  - ◇ Solving a quadratic equation using the square root property: Exact answers, basic
  - ◇ Solving a quadratic equation using the square root property: Exact answers, advanced
  - ◇ Completing the square
  - ◇ Applying the quadratic formula: Exact answers
  - ◇ Applying the quadratic formula: Decimal answers
  - ◇ Solving a word problem using a quadratic equation with irrational roots
  - ◇ Solving an equation using the odd–root property: Problem type 1
  - ◇ Solving an equation using the odd–root property: Problem type 2
- ◆ Rational Equations that Simplify to Quadratic (1 topics)
  - ◇ Restriction on a variable in a denominator: Quadratic
- ◆ Radical Equations (7 topics)
  - ◇ Introduction to solving a radical equation
  - ◇ Solving a radical equation that simplifies to a linear equation: One radical, basic
  - ◇ Solving a radical equation that simplifies to a linear equation: One radical, advanced
  - ◇ Solving a radical equation that simplifies to a linear equation: Two radicals
  - ◇ Algebraic symbol manipulation with radicals
  - ◇ Solving an equation with a root index greater than 2: Problem type 1
  - ◇ Solving an equation with a root index greater than 2: Problem type 2
- Graphs and Functions (101 topics)
  - ◆ The Coordinate Plane, Distance, and Midpoint (8 topics)
    - ◇ Reading a point in the coordinate plane
    - ◇ Plotting a point in the coordinate plane
    - ◇ Naming the quadrant or axis of a point given its coordinates
    - ◇ Naming the quadrant or axis of a point given the signs of its coordinates
    - ◇ Table for a linear equation
    - ◇ Distance between two points in the plane: Exact answers
    - ◇ Identifying solutions to a linear equation in two variables
    - ◇ Finding a solution to a linear equation in two variables
  - ◆ Graphs of Equations (13 topics)
    - ◇ Graphing a linear equation of the form  $y = mx$
    - ◇ Graphing a line given its equation in slope–intercept form: Integer slope
    - ◇ Graphing a line given its equation in slope–intercept form: Fractional slope
    - ◇ Graphing a line given its equation in standard form
    - ◇ Graphing a vertical or horizontal line
    - ◇ Finding x– and y–intercepts given the graph of a line on a grid
    - ◇ Finding x– and y–intercepts of a line given the equation: Basic
    - ◇ Graphing a line by first finding its x– and y–intercepts
    - ◇ Finding intercepts of a nonlinear function given its graph
    - ◇ Graphing an absolute value equation of the form  $y = A|x|$
    - ◇ Graphing a parabola of the form  $y = ax^2$
    - ◇ Graphing a parabola of the form  $y = ax^2 + c$
    - ◇ Graphing a cubic function of the form  $y = ax^3$
  - ◆ Slope and Equations of Lines (9 topics)

- ◇ Finding slope given the graph of a line on a grid
- ◇ Finding slope given two points on the line
- ◇ Finding the slope of horizontal and vertical lines
- ◇ Finding the slope and y–intercept of a line given its equation in the form  $y = mx + b$
- ◇ Finding the slope and y–intercept of a line given its equation in the form  $Ax + By = C$
- ◇ Writing an equation of a line given its slope and y–intercept
- ◇ Writing an equation in slope–intercept form given the slope and a point
- ◇ Writing an equation of a line given the y–intercept and another point
- ◇ Writing the equation of the line through two given points
- ◆ Linear Applications (3 topics)
  - ◇ Writing and evaluating a function that models a real–world situation: Advanced
  - ◇ Writing an equation and drawing its graph to model a real–world situation: Advanced
  - ◇ Finding the initial amount and rate of change given a graph of a linear function
- ◆ Systems of Equations (3 topics)
  - ◇ Graphically solving a system of linear equations
  - ◇ Using a graphing calculator to solve a system of linear equations: Basic
  - ◇ Solving a system of linear equations using substitution
- ◆ Circles (2 topics)
  - ◇ Identifying the center and radius to graph a circle given its equation in standard form
  - ◇ Identifying the center and radius to graph a circle given its equation in general form: Basic
- ◆ Functions (18 topics)
  - ◇ Identifying functions from relations
  - ◇ Vertical line test
  - ◇ Table for a linear function
  - ◇ Evaluating functions: Linear and quadratic or cubic
  - ◇ Evaluating a rational function: Problem type 1
  - ◇ Evaluating a rational function: Problem type 2
  - ◇ Table for a square root function
  - ◇ Variable expressions as inputs of functions: Problem type 1
  - ◇ Variable expressions as inputs of functions: Problem type 2
  - ◇ Variable expressions as inputs of functions: Problem type 3
  - ◇ Domain and range from ordered pairs
  - ◇ Domain of a rational function: Excluded values
  - ◇ Domain of a rational function: Interval notation
  - ◇ Domain of a square root function: Basic
  - ◇ Domain of a square root function: Advanced
  - ◇ Finding outputs of a one–step function that models a real–world situation: Function notation
  - ◇ Finding outputs of a two–step function with decimals that models a real–world situation: Function notation
  - ◇ Finding inputs and outputs of a two–step function that models a real–world situation: Function notation
- ◆ Graphs of Functions (18 topics)
  - ◇ Finding an output of a function from its graph
  - ◇ Finding inputs and outputs of a function from its graph
  - ◇ Domain and range from the graph of a continuous function
  - ◇ Finding where a function is increasing, decreasing, or constant given the graph
  - ◇ Finding where a function is increasing, decreasing, or constant given the graph: Interval notation
  - ◇ Finding local maxima and minima of a function given the graph
  - ◇ Finding the absolute maximum and minimum of a function given the graph
  - ◇ Finding values and intervals where the graph of a function is zero, positive, or negative
  - ◇ Graphing a function of the form  $f(x) = ax + b$ : Integer slope
  - ◇ Graphing a function of the form  $f(x) = ax + b$ : Fractional slope
  - ◇ Graphing an absolute value equation in the plane: Basic

- ◇ Graphing an absolute value equation in the plane: Advanced
- ◇ Graphing a function of the form  $f(x) = ax^2$
- ◇ Graphing a function of the form  $f(x) = ax^2 + c$
- ◇ Graphing a parabola of the form  $y = (x-h)^2 + k$
- ◇ Graphing a square root function: Problem type 1
- ◇ Graphing a square root function: Problem type 2
- ◇ Matching parent graphs with their equations
- ◆ Transformations (12 topics)
  - ◇ Translating the graph of a parabola: One step
  - ◇ Translating the graph of a parabola: Two steps
  - ◇ Translating the graph of an absolute value function: One step
  - ◇ Translating the graph of an absolute value function: Two steps
  - ◇ Writing an equation for a function after a vertical translation
  - ◇ Translating the graph of a function: One step
  - ◇ Translating the graph of a function: Two steps
  - ◇ Transforming the graph of a function by reflecting over an axis
  - ◇ Transforming the graph of a function by shrinking or stretching
  - ◇ Transforming the graph of a function using more than one transformation
  - ◇ Transforming the graph of a quadratic, cubic, square root, or absolute value function
  - ◇ Writing an equation for a function after a vertical and horizontal translation
- ◆ Combining Functions; Composite Functions; Inverse Functions (10 topics)
  - ◇ Introduction to the composition of two functions
  - ◇ Composition of two functions: Basic
  - ◇ Horizontal line test
  - ◇ Determining whether two functions are inverses of each other
  - ◇ Inverse functions: Linear, discrete
  - ◇ Inverse functions: Quadratic, square root
  - ◇ Inverse functions: Cubic, cube root
  - ◇ Inverse functions: Rational
  - ◇ Graphing the inverse of a function given its graph
  - ◇ Finding, evaluating, and interpreting an inverse function for a given linear relationship
- ◆ Quadratic Functions (5 topics)
  - ◇ Graphing a parabola of the form  $y = x^2 + bx + c$
  - ◇ Graphing a parabola of the form  $y = a(x-h)^2 + k$
  - ◇ Graphing a parabola of the form  $y = ax^2 + bx + c$ : Integer coefficients
  - ◇ Finding the maximum or minimum of a quadratic function
  - ◇ Word problem involving the maximum or minimum of a quadratic function
- Trigonometric Functions (36 topics)
  - ◆ Angles and Their Measure (9 topics)
    - ◇ Converting degrees–minutes–seconds to decimal degrees
    - ◇ Converting a decimal degree to degrees–minutes–seconds
    - ◇ Converting between degree and radian measure: Problem type 1
    - ◇ Converting between degree and radian measure: Problem type 2
    - ◇ Sketching an angle in standard position
    - ◇ Coterminal angles
    - ◇ Arc length and central angle measure
    - ◇ Area of a sector of a circle
    - ◇ Angular and linear speed
  - ◆ The Unit Circle and Evaluating Trigonometric Functions (10 topics)
    - ◇ Finding coordinates on the unit circle for special angles
    - ◇ Finding a point on the unit circle given one coordinate
    - ◇ Trigonometric functions and special angles: Problem type 1
    - ◇ Finding trigonometric ratios from a point on the unit circle

- ◇ Trigonometric functions and special angles: Problem type 2
- ◇ Trigonometric functions and special angles: Problem type 3
- ◇ Evaluating expressions involving sine and cosine
- ◇ Even and odd properties of trigonometric functions
- ◇ Using a calculator to approximate sine, cosine, and tangent values
- ◇ Evaluating a sinusoidal function that models a real–world situation
- ◆ Right Triangle Trigonometry (10 topics)
  - ◇ Special right triangles: Exact answers
  - ◇ Sine, cosine, and tangent ratios: Variables for side lengths
  - ◇ Using the Pythagorean Theorem to find a trigonometric ratio
  - ◇ Finding trigonometric ratios given a right triangle
  - ◇ Using a trigonometric ratio to find a side length in a right triangle
  - ◇ Using trigonometry to find a length in a word problem with one right triangle
  - ◇ Using a trigonometric ratio to find an angle measure in a right triangle
  - ◇ Using trigonometry to find angles of elevation or depression in a word problem
  - ◇ Solving a right triangle
  - ◇ Using trigonometry to find a length in a word problem with two right triangles
- ◆ Trigonometric Functions of Angles (7 topics)
  - ◇ Reference angles: Problem type 1
  - ◇ Reference angles: Problem type 2
  - ◇ Determining the location of a terminal point given the signs of trigonometric values
  - ◇ Finding values of trigonometric functions given information about an angle: Problem type 1
  - ◇ Finding values of trigonometric functions given information about an angle: Problem type 2
  - ◇ Finding values of trigonometric functions given information about an angle: Problem type 3
  - ◇ Finding values of trigonometric functions given information about an angle: Problem type 4
- Trigonometric Graphs (20 topics)
  - ◆ Graphs of Sine and Cosine Functions (14 topics)
    - ◇ Sketching the graph of  $y = a \sin(x)$  or  $y = a \cos(x)$
    - ◇ Sketching the graph of  $y = \sin(bx)$  or  $y = \cos(bx)$
    - ◇ Sketching the graph of  $y = \sin(x) + d$  or  $y = \cos(x) + d$
    - ◇ Sketching the graph of  $y = \sin(x+c)$  or  $y = \cos(x+c)$
    - ◇ Sketching the graph of  $y = a \sin(x+c)$  or  $y = a \cos(x+c)$
    - ◇ Sketching the graph of  $y = a \sin(bx)$  or  $y = a \cos(bx)$
    - ◇ Sketching the graph of  $y = a \sin(bx+c)$  or  $y = a \cos(bx+c)$
    - ◇ Sketching the graph of  $y = a \sin(bx) + d$  or  $y = a \cos(bx) + d$
    - ◇ Amplitude and period of sine and cosine functions
    - ◇ Amplitude, period, and phase shift of sine and cosine functions
    - ◇ Writing the equation of a sine or cosine function given its graph: Problem type 1
    - ◇ Writing the equation of a sine or cosine function given its graph: Problem type 2
    - ◇ Word problem involving a sine or cosine function: Problem type 1
    - ◇ Word problem involving a sine or cosine function: Problem type 2
  - ◆ Graphs of Other Trigonometric Functions (6 topics)
    - ◇ Domains and ranges of trigonometric functions
    - ◇ Matching graphs and equations for secant, cosecant, tangent, and cotangent functions
    - ◇ Sketching the graph of a secant or cosecant function: Problem type 1
    - ◇ Sketching the graph of a secant or cosecant function: Problem type 2
    - ◇ Sketching the graph of a tangent or cotangent function: Problem type 1
    - ◇ Sketching the graph of a tangent or cotangent function: Problem type 2
- Trigonometric Identities and Equations (47 topics)
  - ◆ Inverse Trigonometric Functions (9 topics)
    - ◇ Values of inverse trigonometric functions
    - ◇ Composition of a trigonometric function with its inverse trigonometric function: Problem type 1
    - ◇ Composition of a trigonometric function with its inverse trigonometric function: Problem type 2

- ◇ Composition of a trigonometric function with the inverse of another trigonometric function: Problem type 1
- ◇ Composition of a trigonometric function with the inverse of another trigonometric function: Problem type 2
- ◇ Composition of a trigonometric function with the inverse of another trigonometric function: Problem type 3
- ◇ Composition of trigonometric functions with variable expressions as inputs: Problem type 1
- ◇ Composition of trigonometric functions with variable expressions as inputs: Problem type 2
- ◇ Using a calculator to approximate inverse trigonometric values
- ◆ Verifying Trigonometric Identities (7 topics)
  - ◇ Simplifying trigonometric expressions
  - ◇ Using cofunction identities
  - ◇ Verifying a trigonometric identity
  - ◇ Proving trigonometric identities: Problem type 1
  - ◇ Proving trigonometric identities: Problem type 2
  - ◇ Proving trigonometric identities: Problem type 3
  - ◇ Proving trigonometric identities using odd and even properties
- ◆ Sum and Difference Formulas (6 topics)
  - ◇ Sum and difference identities: Problem type 1
  - ◇ Sum and difference identities: Problem type 2
  - ◇ Sum and difference identities: Problem type 3
  - ◇ Sum and difference identities: Problem type 4
  - ◇ Proving trigonometric identities using sum and difference properties: Problem type 1
  - ◇ Proving trigonometric identities using sum and difference properties: Problem type 2
- ◆ Double–Angle, Half–Angle, and Product–to–Sum Formulas (8 topics)
  - ◇ Double–angle identities: Problem type 1
  - ◇ Double–angle identities: Problem type 2
  - ◇ Power–reducing identities
  - ◇ Half–angle identities: Problem type 1
  - ◇ Half–angle identities: Problem type 2
  - ◇ Product–to–sum and sum–to–product identities: Problem type 1
  - ◇ Product–to–sum and sum–to–product identities: Problem type 2
  - ◇ Proving trigonometric identities using double–angle properties
- ◆ Trigonometric Equations (17 topics)
  - ◇ Finding solutions in an interval for a basic equation involving sine or cosine
  - ◇ Finding solutions in an interval for a basic tangent, cotangent, secant, or cosecant equation
  - ◇ Solving a basic trigonometric equation using a calculator
  - ◇ Solving a basic trigonometric equation involving sine or cosine
  - ◇ Solving a basic trigonometric equation involving tangent, cotangent, secant, or cosecant
  - ◇ Finding solutions in an interval for a trigonometric equation in factored form
  - ◇ Finding solutions in an interval for a trigonometric equation with a squared function: Problem type 1
  - ◇ Finding solutions in an interval for a trigonometric equation with a squared function: Problem type 2
  - ◇ Finding solutions in an interval for a trigonometric equation using Pythagorean identities: Problem type 1
  - ◇ Finding solutions in an interval for an equation with sine and cosine using double–angle identities
  - ◇ Solving a trigonometric equation modeling a real–world situation
  - ◇ Using a graphing calculator to solve a trigonometric equation
  - ◇ Solving a trigonometric equation involving a squared function: Problem type 1
  - ◇ Solving a trigonometric equation involving a squared function: Problem type 2
  - ◇ Solving a trigonometric equation involving an angle multiplied by a constant
  - ◇ Finding solutions in an interval for a trigonometric equation with an angle multiplied by a constant
  - ◇ Finding solutions in an interval for an equation with sine and cosine using sum and difference identities



- Triangles and Vectors (34 topics)
  - ◆ Laws of Sines and Cosines (8 topics)
    - ◇ Solving a triangle with the law of sines: Problem type 1
    - ◇ Solving a triangle with the law of sines: Problem type 2
    - ◇ Solving a word problem using the law of sines
    - ◇ Solving a triangle with the law of cosines
    - ◇ Solving a word problem using the law of cosines
    - ◇ Using trigonometry to find the area of a right triangle
    - ◇ Finding the area of a triangle using trigonometry
    - ◇ Heron's formula
  - ◆ Vectors (19 topics)
    - ◇ Writing a position vector in  $a_i + b_j$  form given its graph
    - ◇ Writing a vector in  $a_i + b_j$  form given its initial and terminal points
    - ◇ Writing a vector in component form given its initial and terminal points
    - ◇ Magnitude of a vector given in  $a_i + b_j$  form
    - ◇ Magnitude of a vector given in component form
    - ◇ Vector addition and scalar multiplication:  $a_i + b_j$  form
    - ◇ Linear combination of vectors:  $a_i + b_j$  form
    - ◇ Vector addition and scalar multiplication: Component form
    - ◇ Linear combination of vectors: Component form
    - ◇ Unit vectors
    - ◇ Multiplication of a vector by a scalar: Geometric approach
    - ◇ Vector addition: Geometric approach
    - ◇ Vector subtraction: Geometric approach
    - ◇ Finding the magnitude and direction of a vector given its graph
    - ◇ Finding the components of a vector given its graph
    - ◇ Finding the direction angle of a vector given in  $a_i + b_j$  form
    - ◇ Writing a vector given its magnitude and direction angle
    - ◇ Writing a vector to represent a force pushing or pulling an object
    - ◇ Finding the magnitude and direction angle of the resultant force of two vectors
  - ◆ The Dot Product (7 topics)
    - ◇ Dot product of vectors given in  $a_i + b_j$  form
    - ◇ Dot product of vectors given in component form
    - ◇ Finding the angle between two vectors given in component form
    - ◇ Classifying vector relationships by finding the angle between two vectors given in  $a_i + b_j$  form
    - ◇ Decomposing a vector into two orthogonal vectors
    - ◇ Finding the amount of work done given a force vector and a distance
    - ◇ Finding magnitudes of forces related to an object on a ramp
- Polar Coordinates and Complex Numbers (22 topics)
  - ◆ Polar Coordinates and Equations (7 topics)
    - ◇ Plotting points in polar coordinates
    - ◇ Multiple representations of polar coordinates
    - ◇ Converting rectangular coordinates to polar coordinates: Special angles
    - ◇ Converting polar coordinates to rectangular coordinates
    - ◇ Converting an equation written in rectangular form to one written in polar form
    - ◇ Converting an equation written in polar form to one written in rectangular form: Problem type 1
    - ◇ Converting an equation written in polar form to one written in rectangular form: Problem type 2
  - ◆ Graphs of Polar Equations (6 topics)
    - ◇ Graphing a polar equation: Basic
    - ◇ Graphing a polar equation: Circle
    - ◇ Graphing a polar equation: Limacon
    - ◇ Graphing a polar equation: Rose
    - ◇ Graphing a polar equation: Lemniscate

- ◇ Matching polar equations with their graphs
- ◆ Complex Numbers and De Moivre's Theorem (9 topics)
  - ◇ Plotting complex numbers
  - ◇ Writing a complex number in standard form given its trigonometric form
  - ◇ Writing a complex number in trigonometric form: Special angles
  - ◇ Writing a complex number in trigonometric form: Decimal answers
  - ◇ Multiplying and dividing complex numbers in trigonometric form
  - ◇ De Moivre's Theorem: Answers in trigonometric form
  - ◇ De Moivre's Theorem: Answers in standard form
  - ◇ Finding the  $n$ th roots of a number: Problem type 1
  - ◇ Finding the  $n$ th roots of a number: Problem type 2
- Conic Sections (13 topics)
  - ◆ Parabolas (2 topics)
    - ◇ Graphing a parabola of the form  $y^2 = ax$  or  $x^2 = ay$
    - ◇ Graphing a parabola of the form  $x=a(y-k)^2+h$  or  $y=a(x-h)^2+k$
  - ◆ Ellipses (1 topics)
    - ◇ Graphing an ellipse given its equation in standard form
  - ◆ Parametric Equations (10 topics)
    - ◇ Completing a table and choosing a graph given a pair of parametric equations
    - ◇ Writing the equation of a line and sketching its graph given its parametric equations
    - ◇ Writing the equation of a parabola and sketching its graph given its parametric equations
    - ◇ Writing the equation of a circle or ellipse and sketching its graph given its parametric equations
    - ◇ Graphing a pair of parametric equations with a restricted domain: Line or parabola
    - ◇ Graphing a pair of parametric equations with a restricted domain: Circle
    - ◇ Graphing a pair of parametric equations with a restricted domain: Ellipse
    - ◇ Completing pairs of parametric equations
    - ◇ Word problem involving parametric equations for projectile motion: Problem type 1
    - ◇ Word problem involving parametric equations for projectile motion: Problem type 2
- Other Topics Available(\*) (501 additional topics)
  - ◆ Algebra and Geometry Review (182 topics)
    - ◇ Fractional position on a number line
    - ◇ Plotting rational numbers on a number line
    - ◇ Ordering integers
    - ◇ Estimating a square root
    - ◇ Ordering real numbers
    - ◇ Identifying numbers as integers or non-integers
    - ◇ Identifying numbers as rational or irrational
    - ◇ Signed fraction addition or subtraction: Advanced
    - ◇ Addition and subtraction of 3 fractions involving signs
    - ◇ Signed fraction multiplication: Advanced
    - ◇ Operations with absolute value: Problem type 2
    - ◇ Exponents and integers: Problem type 2
    - ◇ Order of operations with integers and exponents
    - ◇ Converting between temperatures in Fahrenheit and Celsius
    - ◇ Properties of addition
    - ◇ Properties of real numbers
    - ◇ Identifying properties used to simplify an algebraic expression
    - ◇ Understanding the product rule of exponents
    - ◇ Product rule with positive exponents: Multivariate
    - ◇ Understanding the power rules of exponents
    - ◇ Power and product rules with positive exponents

- ◇ Quotient of expressions involving exponents
- ◇ Simplifying a ratio of multivariate monomials: Advanced
- ◇ Power and quotient rules with positive exponents
- ◇ Evaluating expressions with exponents of zero
- ◇ Evaluating an expression with a negative exponent: Whole number base
- ◇ Evaluating an expression with a negative exponent: Positive fraction base
- ◇ Evaluating an expression with a negative exponent: Negative integer base
- ◇ Rewriting an algebraic expression without a negative exponent
- ◇ Introduction to the product rule with negative exponents
- ◇ Product rule with negative exponents
- ◇ Quotient rule with negative exponents: Problem type 1
- ◇ Quotient rule with negative exponents: Problem type 2
- ◇ Power of a power rule with negative exponents
- ◇ Power rules with negative exponents
- ◇ Power and quotient rules with negative exponents: Problem type 1
- ◇ Power and quotient rules with negative exponents: Problem type 2
- ◇ Power, product, and quotient rules with negative exponents
- ◇ Scientific notation with positive exponent
- ◇ Scientific notation with negative exponent
- ◇ Converting between scientific notation and standard form in a real–world situation
- ◇ Multiplying numbers written in scientific notation: Basic
- ◇ Multiplying numbers written in scientific notation: Advanced
- ◇ Multiplying numbers written in decimal form or scientific notation in a real–world situation
- ◇ Dividing numbers written in scientific notation: Basic
- ◇ Dividing numbers written in scientific notation: Advanced
- ◇ Finding the scale factor between numbers given in scientific notation in a real–world situation
- ◇ Degree and leading coefficient of a univariate polynomial
- ◇ Degree of a multivariate polynomial
- ◇ Simplifying a sum or difference of three univariate polynomials
- ◇ Simplifying a sum or difference of multivariate polynomials
- ◇ Multiplying a multivariate polynomial by a monomial
- ◇ Multiplying binomials in two variables
- ◇ Multiplying conjugate binomials: Multivariate
- ◇ Squaring a binomial: Multivariate
- ◇ Multiplication involving binomials and trinomials in one variable
- ◇ Multiplication involving binomials and trinomials in two variables
- ◇ Prime numbers
- ◇ Prime factorization
- ◇ Greatest common factor of three univariate monomials
- ◇ Greatest common factor of two multivariate monomials
- ◇ Factoring out a monomial from a polynomial: Multivariate
- ◇ Factoring out a binomial from a polynomial: GCF factoring, basic
- ◇ Factoring a univariate polynomial by grouping: Problem type 1
- ◇ Factoring a univariate polynomial by grouping: Problem type 2
- ◇ Factoring a multivariate polynomial by grouping: Problem type 1
- ◇ Factoring a multivariate polynomial by grouping: Problem type 2
- ◇ Factoring a quadratic in two variables with leading coefficient 1
- ◇ Factoring a quadratic with leading coefficient greater than 1: Problem type 3
- ◇ Factoring a quadratic by the ac–method
- ◇ Factoring a quadratic in two variables with leading coefficient greater than 1
- ◇ Factoring a quadratic with a negative leading coefficient
- ◇ Factoring a perfect square trinomial with leading coefficient greater than 1
- ◇ Factoring a perfect square trinomial in two variables

- ◇ Factoring a difference of squares in two variables
- ◇ Factoring a polynomial involving a GCF and a difference of squares: Univariate
- ◇ Factoring a polynomial involving a GCF and a difference of squares: Multivariate
- ◇ Factoring a product of a quadratic trinomial and a monomial
- ◇ Factoring with repeated use of the difference of squares formula
- ◇ Factoring a sum or difference of two cubes
- ◇ Factoring out binomials from a polynomial: GCF factoring, advanced
- ◇ Using substitution to factor polynomials
- ◇ Simplifying a ratio of factored polynomials: Factors with exponents
- ◇ Simplifying a ratio of linear polynomials: 1,  $-1$ , and no simplification
- ◇ Simplifying a ratio of polynomials: Problem type 2
- ◇ Simplifying a ratio of polynomials: Problem type 3
- ◇ Simplifying a ratio of multivariate polynomials
- ◇ Multiplying rational expressions involving multivariate monomials
- ◇ Multiplying rational expressions involving quadratics with leading coefficients greater than 1
- ◇ Multiplying rational expressions involving multivariate quadratics
- ◇ Dividing rational expressions involving multivariate monomials
- ◇ Dividing rational expressions involving quadratics with leading coefficients greater than 1
- ◇ Dividing rational expressions involving multivariate quadratics
- ◇ Multiplication and division of 3 rational expressions
- ◇ Least common multiple of two monomials
- ◇ Finding the LCD of rational expressions with linear denominators: Common factors
- ◇ Finding the LCD of rational expressions with quadratic denominators
- ◇ Writing equivalent rational expressions with monomial denominators
- ◇ Writing equivalent rational expressions involving opposite factors
- ◇ Adding rational expressions with denominators  $ax^n$  and  $bx^m$
- ◇ Adding rational expressions with multivariate monomial denominators: Basic
- ◇ Adding rational expressions with multivariate monomial denominators: Advanced
- ◇ Adding rational expressions with linear denominators without common factors: Advanced
- ◇ Adding rational expressions with linear denominators with common factors: Basic
- ◇ Adding rational expressions with linear denominators with common factors: Advanced
- ◇ Adding rational expressions with denominators  $ax-b$  and  $b-ax$
- ◇ Adding rational expressions involving different quadratic denominators
- ◇ Adding 3 rational expressions with different quadratic denominators
- ◇ Complex fraction involving multivariate monomials
- ◇ Complex fraction: Quadratic factoring
- ◇ Complex fraction made of sums involving rational expressions: Problem type 2
- ◇ Complex fraction made of sums involving rational expressions: Problem type 3
- ◇ Complex fraction made of sums involving rational expressions: Problem type 4
- ◇ Complex fraction made of sums involving rational expressions: Problem type 5
- ◇ Complex fraction made of sums involving rational expressions: Problem type 6
- ◇ Square roots of integers raised to even exponents
- ◇ Introduction to simplifying a radical expression with an even exponent
- ◇ Square root of a perfect square monomial
- ◇ Using absolute value to simplify square roots of perfect square monomials
- ◇ Finding the  $n^{\text{th}}$  root of a perfect  $n^{\text{th}}$  power fraction
- ◇ Finding the  $n^{\text{th}}$  root of a perfect  $n^{\text{th}}$  power monomial
- ◇ Using absolute value to simplify higher radical expressions
- ◇ Converting between radical form and exponent form
- ◇ Rational exponents: Unit fraction exponents and bases involving signs
- ◇ Rational exponents: Negative exponents and fractional bases
- ◇ Rational exponents: Product rule
- ◇ Rational exponents: Quotient rule

- ◇ Rational exponents: Products and quotients with negative exponents
- ◇ Rational exponents: Power of a power rule
- ◇ Rational exponents: Powers of powers with negative exponents
- ◇ Simplifying the square root of a whole number greater than 100
- ◇ Simplifying a radical expression with an even exponent
- ◇ Introduction to simplifying a radical expression with an odd exponent
- ◇ Simplifying a radical expression with an odd exponent
- ◇ Simplifying a radical expression with two variables
- ◇ Introduction to simplifying a higher radical expression
- ◇ Simplifying a higher radical expression: Univariate
- ◇ Simplifying a higher radical expression: Multivariate
- ◇ Square root addition or subtraction with three terms
- ◇ Introduction to simplifying a sum or difference of radical expressions: Univariate
- ◇ Simplifying a sum or difference of radical expressions: Univariate
- ◇ Simplifying a sum or difference of radical expressions: Multivariate
- ◇ Simplifying a sum or difference of higher roots
- ◇ Simplifying a sum or difference of higher radical expressions
- ◇ Introduction to simplifying a product of radical expressions: Univariate
- ◇ Simplifying a product of radical expressions: Univariate
- ◇ Simplifying a product of radical expressions: Multivariate
- ◇ Simplifying a product of radical expressions: Multivariate, fractional expressions
- ◇ Introduction to simplifying a product of higher roots
- ◇ Simplifying a product of higher radical expressions
- ◇ Special products of radical expressions: Conjugates and squaring
- ◇ Classifying sums and products as rational or irrational
- ◇ Rationalizing a denominator: Quotient involving a monomial
- ◇ Rationalizing a denominator using conjugates: Square root in numerator
- ◇ Rationalizing a denominator using conjugates: Variable in denominator
- ◇ Rationalizing a denominator: Quotient involving a higher radical
- ◇ Rationalizing a denominator: Quotient involving higher radicals and monomials
- ◇ Simplifying products or quotients of higher radicals with different indices: Univariate
- ◇ Simplifying products or quotients of higher radicals with different indices: Multivariate
- ◇ Area of a piecewise rectangular figure
- ◇ Word problem involving the area between two rectangles
- ◇ Area of a parallelogram
- ◇ Area of a trapezoid
- ◇ Perimeter involving rectangles and circles
- ◇ Circumference and area of a circle: Exact answers in terms of pi
- ◇ Area involving rectangles and circles
- ◇ Word problem involving the area between two concentric circles
- ◇ Area involving inscribed figures
- ◇ Volume of a rectangular prism
- ◇ Volume of a triangular prism
- ◇ Volume of a pyramid
- ◇ Volume of a cylinder
- ◇ Word problem involving the rate of filling or emptying a cylinder
- ◇ Volume of a cone
- ◇ Volume of a cone: Exact answers in terms of pi
- ◇ Volume of a sphere
- ◇ Surface area of a cube or a rectangular prism
- ◇ Surface area of a triangular prism
- ◇ Surface area of a cylinder
- ◇ Surface area of a cylinder: Exact answers in terms of pi

- ◇ Surface area of a sphere
- ◇ Word problem involving the Pythagorean Theorem
- ◆ Equations and Inequalities (100 topics)
  - ◇ Identifying properties used to solve a linear equation
  - ◇ Solving a linear equation with several occurrences of the variable: Fractional forms with monomial numerators
  - ◇ Solving a linear equation with several occurrences of the variable: Variables on both sides and fractional coefficients
  - ◇ Solving a linear equation with several occurrences of the variable: Fractional forms with binomial numerators
  - ◇ Solving equations with zero, one, or infinitely many solutions
  - ◇ Translating a sentence into a multi-step equation
  - ◇ Solving a decimal word problem using a linear equation with the variable on both sides
  - ◇ Solving a fraction word problem using a linear equation with the variable on both sides
  - ◇ Solving a word problem with three unknowns using a linear equation
  - ◇ Solving a word problem involving consecutive integers
  - ◇ Writing a multi-step equation for a real-world situation
  - ◇ Solving a value mixture problem using a linear equation
  - ◇ Solving a distance, rate, time problem using a linear equation
  - ◇ Finding the perimeter or area of a rectangle given one of these values
  - ◇ Circumference ratios
  - ◇ Finding angle measures of a triangle given angles with variables
  - ◇ Finding the multiplier to give a final amount after a percentage increase or decrease
  - ◇ Finding the sale price given the original price and percent discount
  - ◇ Finding the total cost including tax or markup
  - ◇ Finding the original price given the sale price and percent discount
  - ◇ Computing a percent mixture
  - ◇ Solving a percent mixture problem using a linear equation
  - ◇ Finding simple interest without a calculator
  - ◇ Solving an absolute value equation: Problem type 1
  - ◇ Solving an absolute value equation: Problem type 2
  - ◇ Solving an absolute value equation: Problem type 3
  - ◇ Solving an absolute value equation: Problem type 4
  - ◇ Solving an absolute value equation of the form  $|ax+b| = |cx+d|$
  - ◇ Translating a sentence into a one-step inequality
  - ◇ Translating a sentence into a multi-step inequality
  - ◇ Writing an inequality for a real-world situation
  - ◇ Writing an inequality given a graph on the number line
  - ◇ Translating a sentence into a compound inequality
  - ◇ Writing a compound inequality given a graph on the number line
  - ◇ Set-builder notation
  - ◇ Union and intersection of finite sets
  - ◇ Union and intersection of intervals
  - ◇ Identifying solutions to a two-step linear inequality in one variable
  - ◇ Additive property of inequality with signed fractions
  - ◇ Multiplicative property of inequality with signed fractions
  - ◇ Solving a two-step linear inequality with a fractional coefficient
  - ◇ Solving a linear inequality with multiple occurrences of the variable: Problem type 1
  - ◇ Solving a linear inequality with multiple occurrences of the variable: Problem type 2
  - ◇ Solving a linear inequality with multiple occurrences of the variable: Problem type 3
  - ◇ Solving inequalities with no solution or all real numbers as solutions
  - ◇ Solving a compound linear inequality: Graph solution, basic
  - ◇ Solving a compound linear inequality: Interval notation

- ◇ Solving a decimal word problem using a two–step linear inequality
- ◇ Solving a decimal word problem using a linear inequality with the variable on both sides
- ◇ Solving an absolute value inequality: Problem type 1
- ◇ Writing an absolute value inequality given a graph on the number line
- ◇ Solving an absolute value inequality: Problem type 2
- ◇ Solving an absolute value inequality: Problem type 3
- ◇ Solving an absolute value inequality: Problem type 4
- ◇ Solving an absolute value inequality: Problem type 5
- ◇ Solving a proportion of the form  $a/(x+b) = c/x$
- ◇ Solving a rational equation that simplifies to linear: Denominators a, x, or ax
- ◇ Solving a rational equation that simplifies to linear: Denominators ax and bx
- ◇ Solving a rational equation that simplifies to linear: Like binomial denominators
- ◇ Solving a rational equation that simplifies to linear: Unlike binomial denominators
- ◇ Solving for a variable in terms of other variables in a rational equation: Problem type 3
- ◇ Word problem on proportions: Problem type 2
- ◇ Similar polygons
- ◇ Similar right triangles
- ◇ Indirect measurement
- ◇ Word problem involving multiple rates
- ◇ Solving a work problem using a rational equation
- ◇ Solving a distance, rate, time problem using a rational equation
- ◇ Simplifying a power of  $i$
- ◇ Solving a quadratic equation needing simplification
- ◇ Roots of a product of polynomials
- ◇ Writing a quadratic equation given the roots and the leading coefficient
- ◇ Solving a word problem using a quadratic equation with rational roots
- ◇ Using the Pythagorean Theorem and a quadratic equation to find side lengths of a right triangle
- ◇ Solving a quadratic equation by completing the square: Exact answers
- ◇ Solving a quadratic equation with complex roots
- ◇ Discriminant of a quadratic equation
- ◇ Discriminant of a quadratic equation with parameter
- ◇ Solving a quadratic inequality written in factored form
- ◇ Solving a quadratic inequality
- ◇ Solving a rational equation that simplifies to linear: Factorable quadratic denominator
- ◇ Solving a rational equation that simplifies to quadratic: Proportional form, basic
- ◇ Solving a rational equation that simplifies to quadratic: Denominator x
- ◇ Solving a rational equation that simplifies to quadratic: Binomial denominators, constant numerators
- ◇ Solving a rational equation that simplifies to quadratic: Binomial denominators and numerators
- ◇ Solving a rational equation that simplifies to quadratic: Factorable quadratic denominator
- ◇ Solving a rational equation that simplifies to quadratic: Proportional form, advanced
- ◇ Solving a radical equation that simplifies to a quadratic equation: One radical, basic
- ◇ Solving a radical equation that simplifies to a quadratic equation: One radical, advanced
- ◇ Solving a radical equation with a quadratic expression under the radical
- ◇ Solving a radical equation with two radicals that simplifies to  $\sqrt{x} = a$
- ◇ Solving a radical equation that simplifies to a quadratic equation: Two radicals
- ◇ Word problem involving radical equations: Basic
- ◇ Word problem involving radical equations: Advanced
- ◇ Solving an equation with exponent  $1/a$ : Problem type 1
- ◇ Solving an equation with exponent  $1/a$ : Problem type 2
- ◇ Solving an equation with positive rational exponent
- ◇ Solving an equation with negative rational exponent
- ◇ Solving an equation that can be written in quadratic form: Problem type 1
- ◇ Solving an equation that can be written in quadratic form: Problem type 2

## Graphs and Functions (111 topics)

- ◇ Finding the area of a triangle or parallelogram in the coordinate plane
- ◇ Distance between two points in the plane: Decimal answers
- ◇ Identifying scalene, isosceles, and equilateral triangles given coordinates of their vertices
- ◇ Midpoint of a line segment in the plane
- ◇ Finding an endpoint of a line segment given the other endpoint and the midpoint
- ◇ Finding x- and y-intercepts of a line given the equation: Advanced
- ◇ Graphing a line given its x- and y-intercepts
- ◇ Finding x- and y-intercepts of the graph of a nonlinear equation
- ◇ Determining if graphs have symmetry with respect to the x-axis, y-axis, or origin
- ◇ Testing an equation for symmetry about the axes and origin
- ◇ Classifying slopes given graphs of lines
- ◇ Finding the coordinate that yields a given slope
- ◇ Graphing a line given its slope and y-intercept
- ◇ Graphing a line through a given point with a given slope
- ◇ Identifying linear equations: Advanced
- ◇ Identifying linear functions given ordered pairs
- ◇ Rewriting a linear equation in the form  $Ax + By = C$
- ◇ Graphing a line by first finding its slope and y-intercept
- ◇ Writing an equation and graphing a line given its slope and y-intercept
- ◇ Finding the slope, y-intercept, and equation for a linear function given a table of values
- ◇ Finding the slope and a point on a line given its equation in point-slope form
- ◇ Graphing a line given its equation in point-slope form
- ◇ Writing an equation in point-slope form given the slope and a point
- ◇ Writing an equation in standard form given the slope and a point
- ◇ Writing the equations of vertical and horizontal lines through a given point
- ◇ Comparing linear functions to the parent function  $y=x$
- ◇ Finding slopes of lines parallel and perpendicular to a line given in slope-intercept form
- ◇ Finding slopes of lines parallel and perpendicular to a line given in the form  $Ax + By = C$
- ◇ Identifying parallel and perpendicular lines from equations
- ◇ Writing equations of lines parallel and perpendicular to a given line through a point
- ◇ Identifying parallel and perpendicular lines from coordinates
- ◇ Identifying coordinates that give right triangles
- ◇ Graphing ordered pairs and writing an equation from a table of values in context
- ◇ Finding the initial amount and rate of change given a table for a linear function
- ◇ Combining functions to write a new function that models a real-world situation
- ◇ Comparing properties of linear functions given in different forms
- ◇ Interpreting the parameters of a linear function that models a real-world situation
- ◇ Application problem with a linear function: Finding a coordinate given the slope and a point
- ◇ Application problem with a linear function: Finding a coordinate given two points
- ◇ Identifying solutions to a system of linear equations
- ◇ Using a graphing calculator to solve a system of linear equations: Advanced
- ◇ Writing a system of linear equations given its graph
- ◇ Solving a system of linear equations using elimination with addition
- ◇ Solving a system of linear equations using elimination with multiplication and addition
- ◇ Solving a word problem involving a sum and another basic relationship using a system of linear equations
- ◇ Identifying the center and radius to graph a circle given its equation in general form: Advanced
- ◇ Writing the equation of a circle centered at the origin given its radius or a point on the circle
- ◇ Writing an equation of a circle and identifying points that lie on the circle
- ◇ Writing an equation of a circle given its center and radius or diameter
- ◇ Deriving the equation of a circle using the Pythagorean Theorem
- ◇ Writing an equation of a circle given its center and a point on the circle



- ◇ Writing an equation of a circle given the endpoints of a diameter
- ◇ Evaluating a cube root function
- ◇ Evaluating functions: Absolute value, rational, radical
- ◇ Table for an exponential function
- ◇ Evaluating a piecewise-defined function
- ◇ Domains of higher root functions
- ◇ Finding the domain of a fractional function involving radicals
- ◇ Determining whether an equation defines a function: Basic
- ◇ Determining whether an equation defines a function: Advanced
- ◇ Domain and range of a linear function that models a real-world situation
- ◇ Rewriting a multivariate function as a univariate function given a relationship between its variables
- ◇ Finding a difference quotient for a linear or quadratic function
- ◇ Finding a difference quotient for a rational function
- ◇ Domain and range from the graph of a discrete relation
- ◇ Finding domain and range from a linear graph in context
- ◇ Domain and range from the graph of a piecewise function
- ◇ Choosing a graph to fit a narrative: Basic
- ◇ Choosing a graph to fit a narrative: Advanced
- ◇ Graphing an integer function and finding its range for a given domain
- ◇ Graphing a square root function: Problem type 3
- ◇ Graphing a cube root function
- ◇ Graphing an exponential function and its asymptote:  $f(x)=b^x$
- ◇ Graphing a piecewise-defined function: Problem type 1
- ◇ Graphing a piecewise-defined function: Problem type 2
- ◇ Graphing a piecewise-defined function: Problem type 3
- ◇ Even and odd functions: Problem type 1
- ◇ Even and odd functions: Problem type 2
- ◇ Finding the average rate of change of a function
- ◇ Finding the average rate of change of a function given its graph
- ◇ Word problem involving average rate of change
- ◇ Writing the equation of a secant line
- ◇ How the leading coefficient affects the shape of a parabola
- ◇ How the leading coefficient affects the graph of an absolute value function
- ◇ Sum, difference, and product of two functions
- ◇ Quotient of two functions: Basic
- ◇ Quotient of two functions: Advanced
- ◇ Combining functions: Advanced
- ◇ Composition of a function with itself
- ◇ Expressing a function as a composition of two functions
- ◇ Composition of two functions: Domain and range
- ◇ Composition of two functions: Advanced
- ◇ Composition of two rational functions
- ◇ Word problem involving composition of two functions
- ◇ Finding the vertex, intercepts, and axis of symmetry from the graph of a parabola
- ◇ Graphing a parabola of the form  $y = ax^2 + bx + c$ : Rational coefficients
- ◇ Finding the zeros of a quadratic function given its equation
- ◇ Using a graphing calculator to find the zeros of a quadratic function
- ◇ Writing a quadratic function given its zeros
- ◇ Finding the x-intercept(s) and the vertex of a parabola
- ◇ Using a graphing calculator to find the x-intercept(s) and vertex of a quadratic function
- ◇ Rewriting a quadratic function in standard form
- ◇ Rewriting a quadratic function to find its vertex and sketch its graph
- ◇ Word problem involving optimizing area by using a quadratic function

- ◆ ◇ Domain and range from the graph of a quadratic function
- ◆ ◇ Range of a quadratic function
- ◆ ◇ Writing the equation of a quadratic function given its graph
- ◆ ◇ Finding zeros of a polynomial function written in factored form
- ◆ ◇ Finding x- and y-intercepts given a polynomial function
- ◆ ◇ Using a graphing calculator to find local extrema of a polynomial function
- ◆ ◇ Using a graphing calculator to find zeros of a polynomial function
- ◆ Trigonometric Functions (5 topics)
  - ◆ ◇ Using a calculator to approximate cosecant, secant, and cotangent values
  - ◆ ◇ Sine, cosine, and tangent ratios: Numbers for side lengths
  - ◆ ◇ Understanding trigonometric ratios through similar right triangles
  - ◆ ◇ Relationship between the sines and cosines of complementary angles
  - ◆ ◇ Using similar right triangles to find trigonometric ratios
- ◆ Trigonometric Graphs (1 topics)
  - ◆ ◇ Sketching a graph of a damped sine or cosine function
- ◆ Trigonometric Identities and Equations (9 topics)
  - ◆ ◇ Proving trigonometric identities: Problem type 4
  - ◆ ◇ Double-angle identities: Problem type 3
  - ◆ ◇ Proving trigonometric identities using sum-to-product formulas
  - ◆ ◇ Finding solutions in an interval for a trigonometric equation using Pythagorean identities: Problem type 2
  - ◆ ◇ Using a graphing calculator to solve a trigonometric inequality
  - ◆ ◇ Solving a trigonometric equation involving more than one function
  - ◆ ◇ Solving a trigonometric equation using sum and difference identities
  - ◆ ◇ Solving a trigonometric equation using double-angle identities
  - ◆ ◇ Solving a trigonometric equation using half-angle identities
- ◆ Triangles and Vectors (7 topics)
  - ◆ ◇ Proving the law of sines
  - ◆ ◇ Proving the law of cosines
  - ◆ ◇ Expressing the area of a triangle in terms of the sine of one of its angles
  - ◆ ◇ Finding magnitudes of forces related to a sum of three vectors
  - ◆ ◇ Finding magnitudes of forces related to an object suspended by cables
  - ◆ ◇ Using the dot product to find perpendicular vectors
  - ◆ ◇ Finding the component of a vector along another vector
- ◆ Polar Coordinates and Complex Numbers (2 topics)
  - ◆ ◇ Converting rectangular coordinates to polar coordinates: Decimal answers
  - ◆ ◇ Identifying symmetries of graphs given their polar equations
- ◆ Conic Sections (24 topics)
  - ◆ ◇ Graphing a parabola of the form  $ay^2 + by + cx + d = 0$  or  $ax^2 + bx + cy + d = 0$
  - ◆ ◇ Writing an equation of a parabola given the vertex and the focus
  - ◆ ◇ Writing an equation of a parabola given the focus and the directrix
  - ◆ ◇ Deriving the equation of a parabola given its focus and directrix
  - ◆ ◇ Finding the vertex, focus, directrix, and axis of symmetry of a parabola
  - ◆ ◇ Finding the focus of a parabola of the form  $ay^2 + by + cx + d = 0$  or  $ax^2 + bx + cy + d = 0$
  - ◆ ◇ Writing an equation of a parabola given its graph
  - ◆ ◇ Word problem involving a parabola
  - ◆ ◇ Graphing an ellipse centered at the origin:  $Ax^2 + By^2 = C$
  - ◆ ◇ Graphing an ellipse given its equation in general form
  - ◆ ◇ Finding the center, vertices, and foci of an ellipse
  - ◆ ◇ Finding the foci of an ellipse given its equation in general form
  - ◆ ◇ Writing an equation of an ellipse given the center, an endpoint of an axis, and the length of the other axis
  - ◆ ◇ Writing an equation of an ellipse given the foci and the major axis length

- ◇ Word problem involving an ellipse
- ◇ Graphing a hyperbola given its equation in standard form
- ◇ Graphing a hyperbola centered at the origin:  $Ax^2 + By^2 = C$
- ◇ Graphing a hyperbola given its equation in general form
- ◇ Finding the center, vertices, foci, and asymptotes of a hyperbola
- ◇ Finding the foci of a hyperbola given its equation in general form
- ◇ Writing an equation of a hyperbola given the foci and the vertices
- ◇ Writing an equation of a hyperbola given the foci and the asymptotes: Basic
- ◇ Writing an equation of a hyperbola given the foci and the asymptotes: Advanced
- ◇ Classifying conics given their equations
- ◆ Exponential and Logarithmic Functions (60 topics)
  - ◇ Graphing an exponential function and its asymptote:  $f(x) = a(b)^x$
  - ◇ Graphing an exponential function and its asymptote:  $f(x) = b^{-x}$  or  $f(x) = -b^{ax}$
  - ◇ Translating the graph of an exponential function
  - ◇ Finding domain and range from the graph of an exponential function
  - ◇ The graph, domain, and range of an exponential function
  - ◇ Transforming the graph of a natural exponential function
  - ◇ Graphing an exponential function and its asymptote:  $f(x) = a(e)^{x-b} + c$
  - ◇ Using a calculator to evaluate exponential expressions
  - ◇ Evaluating an exponential function that models a real-world situation
  - ◇ Using a calculator to evaluate exponential expressions involving base e
  - ◇ Evaluating an exponential function with base e that models a real-world situation
  - ◇ Introduction to compound interest
  - ◇ Calculating and comparing simple interest and compound interest
  - ◇ Finding a final amount in a word problem on exponential growth or decay
  - ◇ Finding the final amount in a word problem on compound interest
  - ◇ Finding the initial amount and rate of change given an exponential function
  - ◇ Writing an equation that models exponential growth or decay
  - ◇ Writing an exponential function rule given a table of ordered pairs
  - ◇ Comparing linear, polynomial, and exponential functions
  - ◇ Using a calculator to evaluate natural and common logarithmic expressions
  - ◇ Converting between logarithmic and exponential equations
  - ◇ Converting between natural logarithmic and exponential equations
  - ◇ Evaluating logarithmic expressions
  - ◇ Solving an equation of the form  $\log_b a = c$
  - ◇ Translating the graph of a logarithmic function
  - ◇ Graphing a logarithmic function: Basic
  - ◇ The graph, domain, and range of a logarithmic function
  - ◇ Domain of a logarithmic function: Advanced
  - ◇ Graphing a logarithmic function: Advanced
  - ◇ Basic properties of logarithms
  - ◇ Using properties of logarithms to evaluate expressions
  - ◇ Expanding a logarithmic expression: Problem type 1
  - ◇ Expanding a logarithmic expression: Problem type 2
  - ◇ Expanding a logarithmic expression: Problem type 3
  - ◇ Writing an expression as a single logarithm
  - ◇ Change of base for logarithms: Problem type 1
  - ◇ Change of base for logarithms: Problem type 2
  - ◇ Solving a multi-step equation involving a single logarithm: Problem type 1
  - ◇ Solving a multi-step equation involving a single logarithm: Problem type 2
  - ◇ Solving a multi-step equation involving natural logarithms
  - ◇ Solving an equation involving logarithms on both sides: Problem type 1
  - ◇ Solving an equation involving logarithms on both sides: Problem type 2

- ◇ Solving an exponential equation by finding common bases: Linear exponents
- ◇ Solving an exponential equation by finding common bases: Linear and quadratic exponents
- ◇ Solving an exponential equation by using logarithms: Decimal answers, basic
- ◇ Solving an exponential equation by using natural logarithms: Decimal answers
- ◇ Solving an exponential equation by using logarithms: Decimal answers, advanced
- ◇ Solving an exponential equation by using logarithms: Exact answers in logarithmic form
- ◇ Solving an exponential equation by using substitution and quadratic factoring
- ◇ Using a graphing calculator to solve an exponential or logarithmic equation
- ◇ Finding the time to reach a limit in a word problem on exponential growth or decay
- ◇ Finding the time in a word problem on compound interest
- ◇ Finding the time given an exponential function with base  $e$  that models a real-world situation
- ◇ Finding the final amount in a word problem on continuous compound interest
- ◇ Finding the final amount in a word problem on continuous exponential growth or decay
- ◇ Finding the initial amount in a word problem on continuous compound interest
- ◇ Finding the rate or time in a word problem on continuous exponential growth or decay
- ◇ Finding half-life or doubling time
- ◇ Writing and evaluating a function modeling continuous exponential growth or decay given doubling time or half-life
- ◇ Writing and evaluating a function modeling continuous exponential growth or decay given two outputs

**\*Other Topics Available** *By default, these topics are NOT included in the course, but can be added using the content editor in the Teacher Module.*