Intermediate Algebra and PreCalculus

This course covers the topics shown below.
Students navigate learning paths based on their level of readiness.
Institutional users may customize the scope and sequence to meet curricular needs.

Curriculum (783 topics + 503 additional topics)

- Real Numbers and Linear Equations (153 topics)
  - Plotting and Ordering (6 topics)
    - Fractional position on a number line
    - Plotting integers on a number line
    - Ordering integers
    - Square root of a perfect square
    - Using a calculator to approximate a square root
    - Absolute value of a number
  - Operations with Rational Numbers (31 topics)
    - Integer addition: Problem type 1
    - Integer addition: Problem type 2
    - Integer subtraction: Problem type 1
    - Integer subtraction: Problem type 2
    - Integer subtraction: Problem type 3
    - Addition and subtraction with 3 integers
    - Addition and subtraction with 4 or 5 integers
    - Word problem with addition or subtraction of integers
    - Integer multiplication and division
    - Multiplication of 3 or 4 integers
    - Division involving zero
    - Identifying numbers as integers or non–integers
    - Identifying numbers as rational or irrational
    - Least common multiple of 2 numbers
    - Least common multiple of 3 numbers
    - Signed fraction addition or subtraction: Basic
    - Signed fraction subtraction involving double negation
    - Signed fraction addition or subtraction: Advanced
    - Addition and subtraction of 3 fractions involving signs
    - Signed fraction multiplication: Basic
    - Signed fraction multiplication: Advanced
    - Signed fraction division
    - Signed decimal addition and subtraction
    - Signed decimal addition and subtraction with 3 numbers
    - Operations with absolute value: Problem type 2
    - Computing the distance between two integers on a number line
    - Exponents and integers: Problem type 1
    - Exponents and integers: Problem type 2
    - Exponents and signed fractions
    - Order of operations with integers
    - Order of operations with integers and exponents
- Evaluating Expressions (3 topics)
  ◇ 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

- Properties of Real numbers (12 topics)
  ◇ Combining like terms: Whole number coefficients
  ◇ Combining like terms: Integer coefficients
  ◇ Introduction to properties of addition
  ◇ Properties of addition
  ◇ Multiplying a constant and a linear monomial
  ◇ Distributive property: Whole number coefficients
  ◇ Distributive property: Integer coefficients
  ◇ Introduction to properties of multiplication
  ◇ Properties of real numbers
  ◇ Using distribution and combining like terms to simplify: Univariate
  ◇ Using distribution with double negation and combining like terms to simplify: Multivariate
  ◇ Combining like terms in a quadratic expression

- Geometry (6 topics)
  ◇ Perimeter of a square or a rectangle
  ◇ Area of a square or a rectangle
  ◇ Area of a triangle
  ◇ Circumference of a circle
  ◇ Circumference and area of a circle
  ◇ Volume of a rectangular prism

- Linear Equations (24 topics)
  ◇ Additive property of equality with decimals
  ◇ Additive property of equality with integers
  ◇ Additive property of equality with signed fractions
  ◇ Multiplicative property of equality with whole numbers
  ◇ Multiplicative property of equality with fractions
  ◇ Multiplicative property of equality with decimals
  ◇ Multiplicative property of equality with integers
  ◇ Multiplicative property of equality with signed fractions
  ◇ Identifying solutions to a linear equation in one variable: Two-step equations
  ◇ Additive property of equality with a negative coefficient
  ◇ Solving a two-step equation with integers
  ◇ Solving a multi-step equation given in fractional form
  ◇ Solving a linear equation with several occurrences of the variable: Variables on the same side
  ◇ Solving a linear equation with several occurrences of the variable: Variables on both sides
  ◇ 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: Fractions with monomial numerators
  ◇ Solving a two-step equation with signed fractions
  ◇ 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: Fractions with binomial numerators
  ◇ Solving equations with zero, one, or infinitely many solutions
Solving a proportion of the form \( x/a = b/c \)
Solving a proportion of the form \( (x+a)/b = c/d \)

**Solving Formulas for a Variable (8 topics)**
- 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 in terms of other variables in a linear equation with fractions
- Converting between temperatures in Fahrenheit and Celsius

**Applications (18 topics)**
- Writing a one-step expression for a real-world situation
- Translating a phrase into a one-step expression
- Translating a phrase into a two-step expression
- Translating a sentence into a one-step equation
- Translating a sentence into a multi-step equation
- Solving a fraction word problem using a linear equation of the form \( Ax = B \)
- 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 word problem with three unknowns using a linear equation
- Solving a word problem involving consecutive integers
- Solving a value mixture problem using a linear equation
- Solving a one-step word problem using the formula \( d = rt \)
- Solving a word problem involving rates and time conversion
- Solving a distance, rate, time problem using a linear equation
- Finding side lengths of rectangles given one dimension and an area or a perimeter
- Finding a side length given the perimeter and side lengths with variables
- Finding the dimensions of a rectangle given its perimeter and a relationship between sides
- Finding the perimeter or area of a rectangle given one of these values

**Applications Involving Percents (9 topics)**
- Finding the final amount given the original amount and a percentage increase or decrease
- Finding the sale price given the original price and percent discount
- Finding the sale price without a calculator 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
- Finding the percentage increase or decrease: Basic
- Computing a percent mixture
- Solving a percent mixture problem using a linear equation
- Finding simple interest without a calculator

**Writing and Graphing Linear Inequalities (9 topics)**
- Translating a sentence by using an inequality symbol
- Translating a sentence into a one-step inequality
- Writing an inequality for a real-world situation
- Graphing a linear inequality on the number line
- Translating a sentence into a compound inequality
- Graphing a compound inequality on the number line
- Set-builder notation
- Set-builder and interval notation
- Union and intersection of finite sets

**Linear Inequalities and Applications (16 topics)**
- Identifying solutions to a two-step linear inequality in one variable
- Additive property of inequality with whole numbers
Additive property of inequality with integers
Additive property of inequality with signed fractions
Additive property of inequality with signed decimals
Multiplicative property of inequality with integers
Multiplicative property of inequality with signed fractions
Solving a two-step linear inequality: Problem type 1
Solving a two-step linear inequality: Problem type 2
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 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

Absolute Value Equations (6 topics)
Introduction to solving an absolute value equation
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|

Absolute Value Inequalities (5 topics)
Solving an absolute value inequality: Problem type 1
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

Lines, Functions, and Systems (100 topics)

The Coordinate Plane, Distance, and Midpoint (9 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
Midpoint of a line segment in the plane
Identifying solutions to a linear equation in two variables
Finding a solution to a linear equation in two variables

Graphing and Intercepts (10 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
Finding x- and y-intercepts of a line given the equation: Advanced
Graphing a line given its x- and y-intercepts
Graphing a line by first finding its x- and y-intercepts

Slope (6 topics)
Classifying slopes given graphs of lines
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
Graphing a line given its slope and y−intercept
Graphing a line through a given point with a given slope

♦ Equations of Lines (15 topics)
  ◊ Rewriting a linear equation in the form Ax + By = C
  ◊ 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
  ◊ Graphing a line by first finding its slope and y−intercept
  ◊ 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
  ◊ Finding the slope and a point on 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 of a line given the y−intercept and another point
  ◊ Writing the equation of the line through two given points
  ◊ Writing the equations of vertical and horizontal lines through a given point
  ◊ 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

♦ Applications (7 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
  ◊ Interpreting a line graph
  ◊ Finding the initial amount and rate of change given a graph of a linear function
  ◊ 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

♦ Introduction to Functions (9 topics)
  ◊ Identifying functions from relations
  ◊ Vertical line test
  ◊ Domain and range from ordered pairs
  ◊ Table for a linear function
  ◊ Evaluating functions: Linear and quadratic or cubic
  ◊ Evaluating a piecewise−defined function
  ◊ 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 (22 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 discrete relation
  ◊ Domain and range from the graph of a continuous function
  ◊ Domain and range from the graph of a piecewise function
  ◊ Finding intercepts of a nonlinear function given its graph
  ◊ 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 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 function of the form \( f(x) = ax^2 \)
◊ Graphing a function of the form \( f(x) = ax^2 + c \)
◊ Graphing a cubic function of the form \( y = ax^3 \)
◊ Graphing a piecewise–defined function: Problem type 1
◊ Graphing a piecewise–defined function: Problem type 2
◊ Graphing a piecewise–defined function: Problem type 3

♦ Systems of Linear Equations in Two Variables (10 topics)
  ◊ Identifying solutions to a system of linear equations
  ◊ Classifying systems of linear equations from graphs
  ◊ Graphically solving a system of linear equations
  ◊ Solving a system of linear equations of the form \( y = mx + b \)
  ◊ Solving a system of linear equations using substitution
  ◊ Solving a system of linear equations using elimination with addition
  ◊ Solving a system of linear equations using elimination with multiplication and addition
  ◊ Solving a system of linear equations with fractional coefficients
  ◊ Solving a system of linear equations with decimal coefficients
  ◊ Solving a 2x2 system of linear equations that is inconsistent or consistent dependent

♦ Applications (7 topics)
  ◊ Interpreting the graphs of two functions
  ◊ Solving a word problem involving a sum and another basic relationship using a system of linear equations
  ◊ Solving a word problem using a system of linear equations of the form \( Ax + By = C \)
  ◊ Solving a value mixture problem using a system of linear equations
  ◊ Solving a percent mixture problem using a system of linear equations
  ◊ Solving a distance, rate, time problem using a system of linear equations
  ◊ Solving a tax rate or interest rate problem using a system of linear equations

♦ Graphing Linear Inequalities (4 topics)
  ◊ Identifying solutions to a linear inequality in two variables
  ◊ Graphing a linear inequality in the plane: Vertical or horizontal line
  ◊ Graphing a linear inequality in the plane: Slope–intercept form
  ◊ Graphing a linear inequality in the plane: Standard form

♦ Systems of Linear Inequalities (1 topics)
  ◊ Graphing a system of two linear inequalities: Basic

• Exponents, Polynomials, and Factoring (105 topics)
  ◊ Properties of Exponents (16 topics)
    ◊ Understanding the product rule of exponents
    ◊ Introduction to the product rule of exponents
    ◊ Product rule with positive exponents: Univariate
    ◊ Product rule with positive exponents: Multivariate
    ◊ Understanding the power rules of exponents
    ◊ 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
    ◊ Power and product rules with positive exponents
    ◊ Simplifying a ratio of multivariate monomials: Basic
    ◊ Introduction to the quotient rule of exponents
    ◊ Simplifying a ratio of univariate monomials
    ◊ Quotient of expressions involving exponents
    ◊ Simplifying a ratio of multivariate monomials: Advanced
Power and quotient rules with positive exponents

Negative Exponents (14 topics)
◊ 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 (7 topics)
◊ 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
◊ Dividing numbers written in scientific notation: Basic
◊ Dividing numbers written in scientific notation: Advanced

Polynomial Addition, Subtraction, and Multiplication (17 topics)
◊ Degree and leading coefficient of a univariate polynomial
◊ Simplifying a sum or difference of two univariate polynomials
◊ Simplifying a sum or difference of three univariate polynomials
◊ Simplifying a sum or difference of multivariate polynomials
◊ Multiplying a univariate polynomial by a monomial with a positive coefficient
◊ Multiplying a univariate polynomial by a monomial with a negative coefficient
◊ Multiplying a multivariate polynomial by a monomial
◊ Multiplying binomials with leading coefficients of 1
◊ Multiplying binomials with leading coefficients greater than 1
◊ Multiplying binomials in two variables
◊ Multiplying conjugate binomials: Univariate
◊ Multiplying conjugate binomials: Multivariate
◊ Squaring a binomial: Univariate
◊ Squaring a binomial: Multivariate
◊ Multiplying binomials with negative coefficients
◊ Multiplication involving binomials and trinomials in one variable
◊ Multiplication involving binomials and trinomials in two variables

Polynomial Division (6 topics)
◊ Dividing a polynomial by a monomial: Univariate
◊ Dividing a polynomial by a monomial: Multivariate
◊ Polynomial long division: Problem type 1
◊ Polynomial long division: Problem type 2
◊ Polynomial long division: Problem type 3
◊ Synthetic division

Factoring Using the GCF (9 topics)
◊ Prime numbers
◊ Prime factorization
◊ Greatest common factor of 2 numbers
Factoring a linear binomial
◊ Introduction to the GCF of two monomials
◊ Greatest common factor of three univariate monomials
◊ Greatest common factor of two multivariate monomials
◊ Factoring out a monomial from a polynomial: Univariate
◊ Factoring out a monomial from a polynomial: Multivariate

♦ Factoring by Grouping (5 topics)
◊ 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 Quadratic Trinomials (9 topics)
◊ Factoring a quadratic with leading coefficient 1
◊ Factoring a quadratic in two variables 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 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 Special Products (10 topics)
◊ Factoring a perfect square trinomial with leading coefficient 1
◊ 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 one variable: Basic
◊ Factoring a difference of squares in one variable: Advanced
◊ Factoring a difference of squares in two variables
◊ Factoring a polynomial involving a GCF and a difference of squares: Univariate
◊ 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

♦ Solving Quadratic Equations by Factoring (8 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 a quadratic equation needing simplification
◊ Solving a word problem using a quadratic equation with rational roots
◊ Roots of a product of polynomials
◊ Writing a quadratic equation given the roots and the leading coefficient

♦ Pythagorean Theorem (4 topics)
◊ Introduction to the Pythagorean Theorem
◊ Pythagorean Theorem
◊ Word problem involving the Pythagorean Theorem
◊ Using the Pythagorean Theorem and a quadratic equation to find side lengths of a right triangle

• Rational Expressions (71 topics)
♦ Simplifying Expressions (11 topics)
◊ Restriction on a variable in a denominator: Linear
◊ Restriction on a variable in a denominator: Quadratic
◊ Evaluating a rational function: Problem type 1
◊ Evaluating a rational function: Problem type 2
◊ Domain of a rational function: Excluded values
◊ Simplifying a ratio of factored polynomials: Linear factors
◊ Simplifying a ratio of polynomials using GCF factoring
◊ Simplifying a ratio of linear polynomials: 1, −1, and no simplification
◊ Simplifying a ratio of polynomials by factoring a quadratic with leading coefficient 1
◊ Simplifying a ratio of polynomials: Problem type 1
◊ Simplifying a ratio of polynomials: Problem type 2

♦ Multiplication and Division (6 topics)
◊ Multiplying rational expressions involving multivariate monomials
◊ Multiplying rational expressions made up of linear expressions
◊ Multiplying rational expressions involving quadratics with leading coefficients of 1
◊ Dividing rational expressions involving multivariate monomials
◊ Dividing rational expressions involving linear expressions
◊ Dividing rational expressions involving quadratics with leading coefficients of 1

♦ Addition and Subtraction (23 topics)
◊ Introduction to the LCM of two monomials
◊ Least common multiple of two monomials
◊ Finding the LCD of rational expressions with linear denominators: Relatively prime
◊ 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 with polynomial denominators
◊ Writing equivalent rational expressions involving opposite factors
◊ 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 denominators ax^n and bx^m
◊ Adding rational expressions with linear denominators without common factors: Basic
◊ 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

♦ Complex Fractions (11 topics)
◊ Complex fraction without variables: Problem type 1
◊ Complex fraction without variables: Problem type 2
◊ Complex fraction involving univariate monomials
◊ Complex fraction involving multivariate monomials
◊ Complex fraction: GCF factoring
◊ Complex fraction: Quadratic factoring
◊ Complex fraction made of sums involving rational expressions: Problem type 1
◊ 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 6

♦ Rational Equations (13 topics)
◊ Solving a proportion of the form a/(x+b) = c/x
◊ Solving a rational equation that simplifies to linear: Denominator x
<table>
<thead>
<tr>
<th>Topic</th>
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<tbody>
<tr>
<td>Solving a rational equation that simplifies to linear: Denominator x+a</td>
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<td>Solving a rational equation that simplifies to linear: Denominators a, x, or ax</td>
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<td>Solving a rational equation that simplifies to linear: Like binomial denominators</td>
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<tr>
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<tr>
<td>Solving a rational equation that simplifies to linear: Factorable quadratic denominator</td>
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<tr>
<td>Solving a rational equation that simplifies to quadratic: Proportional form, basic</td>
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<tr>
<td>Solving a rational equation that simplifies to quadratic: Denominator x</td>
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<tr>
<td>Solving a rational equation that simplifies to quadratic: Binomial denominators, constant numerators</td>
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<tr>
<td>Solving a rational equation that simplifies to quadratic: Binomial denominators and numerators</td>
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<td>Solving a rational equation that simplifies to quadratic: Factorable quadratic denominator</td>
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Applications (7 topics)
- 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
- Solving for a variable in terms of other variables in a rational equation: Problem type 3
- Word problem on proportions: Problem type 1
- Word problem involving multiple rates
- Solving a work problem using a rational equation
- Solving a distance, rate, time problem using a rational equation

Radicals and Quadratic Functions (110 topics)
- Roots of Perfect Powers (9 topics)
  - Finding all square roots of a number
  - Square root of a rational perfect square
  - Square roots of perfect squares with signs
  - Introduction to simplifying a radical expression with an even exponent
  - Square root of a perfect square monomial
  - Cube root of an integer
  - Finding n<sup>th</sup> roots of perfect n<sup>th</sup> powers with signs
  - Finding the n<sup>th</sup> root of a perfect n<sup>th</sup> power fraction
  - Finding the n<sup>th</sup> root of a perfect n<sup>th</sup> power monomial
- Radical Functions (7 topics)
  - Table for a square root function
  - Evaluating a cube root function
  - Domain of a square root function: Basic
  - Domain of a square root function: Advanced
  - Graphing a square root function: Problem type 1
  - Graphing a square root function: Problem type 2
  - Matching parent graphs with their equations
- Rational Exponents (10 topics)
  - Converting between radical form and exponent form
  - Rational exponents: Unit fraction exponents and whole number bases
  - Rational exponents: Unit fraction exponents and bases involving signs
  - Rational exponents: Non–unit fraction exponent with a whole number base
  - 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 Expressions (10 topics)
  - Simplifying the square root of a whole number less than 100
  - 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
◊ Simplifying a higher root of a whole number
◊ Introduction to simplifying a higher radical expression
◊ Simplifying a higher radical expression: Univariate
◊ Simplifying a higher radical expression: Multivariate

♦ Addition and Subtraction (5 topics)
◊ Introduction to square root addition or subtraction
◊ Square root addition or subtraction
◊ 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

♦ Multiplication (9 topics)
◊ Introduction to square root multiplication
◊ Square root multiplication: Basic
◊ Square root multiplication: Advanced
◊ Introduction to simplifying a product of radical expressions: Univariate
◊ Simplifying a product of radical expressions: Univariate
◊ 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
◊ Special products of radical expressions: Conjugates and squaring

♦ Division and Rationalization (8 topics)
◊ 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: Quotient involving a monomial
◊ Rationalizing a denominator using conjugates: Integer numerator
◊ Rationalizing a denominator using conjugates: Square root in numerator
◊ Rationalizing a denominator using conjugates: Variable in denominator

♦ Radical Equations (14 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
◊ 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
◊ Algebraic symbol manipulation with radicals
◊ Word problem involving radical equations: Basic
◊ Word problem involving radical equations: Advanced
◊ 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

♦ Complex Numbers (6 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
 ♥ Simplifying a power of $i$

 ♥ Quadratic Equations (10 topics)
 ♥ 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
 ♥ Solving a quadratic equation by completing the square: Exact answers
 ♥ Applying the quadratic formula: Exact answers
 ♥ Applying the quadratic formula: Decimal answers
 ♥ Solving a quadratic equation with complex roots
 ♥ Discriminant of a quadratic equation
 ♥ Solving a word problem using a quadratic equation with irrational roots

 ♥ Quadratic Inequalities and Higher Degree Equations (5 topics)
 ♥ Solving a quadratic inequality written in factored form
 ♥ Solving a quadratic inequality
 ♥ Solving an equation using the odd–root property: Problem type 1
 ♥ Solving an equation using the odd–root property: Problem type 2
 ♥ Solving an equation that can be written in quadratic form: Problem type 1

 ♥ Quadratic Functions (17 topics)
 ♥ Finding the vertex, intercepts, and axis of symmetry from the graph of a parabola
 ♥ Graphing a parabola of the form $y = (x-h)^2 + k$
 ♥ 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 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 to find its vertex and sketch its graph
 ♥ Finding the maximum or minimum of a quadratic function
 ♥ Word problem involving the maximum or minimum of a quadratic function
 ♥ 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

 • Function Operations and Inverses (49 topics)
 ♥ More on Function Evaluation and Properties (13 topics)
 ♥ Evaluating functions: Absolute value, rational, radical
 ♥ 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 of a rational function: Interval notation
 ♥ Finding the domain of a fractional function involving radicals
 ♥ Finding a difference quotient for a linear or quadratic function
 ♥ Finding a difference quotient for a rational function
 ♥ 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

 ♥ Transformations and Graphs of Functions (15 topics)
 ♥ Translating the graph of a parabola: One step
Translating the graph of a parabola: Two steps
How the leading coefficient affects the shape of a parabola
Translating the graph of an absolute value function: One step
Translating the graph of an absolute value function: Two steps
Graphing an absolute value equation in the plane: Basic
Graphing an absolute value equation in the plane: Advanced
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

Function Operations (13 topics)
Sum, difference, and product of two functions
Quotient of two functions: Basic
Quotient of two functions: Advanced
Combining functions: Advanced
Introduction to the composition of two functions
Composition of two functions: Basic
Composition of a function with itself
Expressing a function as a composition of two functions
Composition of two functions: Advanced
Composition of two rational functions
Word problem involving composition of two functions
Determining whether an equation defines a function: Basic
Determining whether an equation defines a function: Advanced

Inverse Functions (8 topics)
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

Exponential and Logarithmic Functions (50 topics)
Graphing Exponential Functions (8 topics)
Table for an exponential function
Graphing an exponential function and its asymptote: $f(x)=b^x$
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
The graph, domain, and range of an exponential function
Transforming the graph of a natural exponential function
Graphing an exponential function and its asymptote: $f(x) = a(e)^{x-b} + c$

Applications of Exponential Functions (7 topics)
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
◊ Finding a final amount in a word problem on exponential growth or decay
◊ Finding the final amount in a word problem on compound interest

♦ Logarithmic Functions (9 topics)
  ◊ 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

♦ Properties of Logarithms (6 topics)
  ◊ 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
  ◊ Writing an expression as a single logarithm
  ◊ Change of base for logarithms: Problem type 1

♦ Logarithmic and Exponential Equations (10 topics)
  ◊ 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 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

♦ Applications (10 topics)
  ◊ 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 initial 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 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

♦ Conic Sections and Nonlinear Systems (8 topics)
  ◊ Circles (6 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
    ◊ 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 given its center and radius or diameter
    ◊ 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
  ◊ Intercepts and Symmetries of Nonlinear Equations (2 topics)
    ◊ 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

- **Polynomial and Rational Functions (42 topics)**
  - **Polynomial Functions (10 topics)**
    - Finding zeros of a polynomial function written in factored form
    - Finding zeros and their multiplicities given a polynomial function written in factored form
    - Finding a polynomial of a given degree with given zeros: Real zeros
    - Finding x- and y-intercepts given a polynomial function
    - Determining the end behavior of the graph of a polynomial function
    - Determining end behavior and intercepts to graph a polynomial function
    - Matching graphs with polynomial functions
    - Inferring properties of a polynomial function from its graph
    - Using a graphing calculator to find local extrema of a polynomial function
    - Using a graphing calculator to solve a word problem involving a local extremum of a polynomial function
  - **Remainder and Factor Theorems (2 topics)**
    - Using the remainder theorem to evaluate a polynomial
    - The Factor Theorem
  - **Real Zeros of Polynomial Functions (7 topics)**
    - Using a given zero to write a polynomial as a product of linear factors: Real zeros
    - Finding all possible rational zeros using the rational zeros theorem: Problem type 1
    - Finding all possible rational zeros using the rational zeros theorem: Problem type 2
    - Using the rational zeros theorem to find all zeros of a polynomial: Rational zeros
    - Using the rational zeros theorem to find all zeros of a polynomial: Irrational zeros
    - Using a graphing calculator to find zeros of a polynomial function
    - Using a graphing calculator to solve a word problem involving a polynomial of degree 3
  - **Complex Zeros of Polynomial Functions (4 topics)**
    - Multiplying expressions involving complex conjugates
    - Finding a polynomial of a given degree with given zeros: Complex zeros
    - Using a given zero to write a polynomial as a product of linear factors: Complex zeros
    - Using the rational zeros theorem to find all zeros of a polynomial: Complex zeros
  - **Rational Functions (13 topics)**
    - Finding the intercepts, asymptotes, domain, and range from the graph of a rational function
    - Finding the asymptotes of a rational function: Constant over linear
    - Finding the asymptotes of a rational function: Linear over linear
    - Finding horizontal and vertical asymptotes of a rational function: Quadratic numerator or denominator
    - Finding the asymptotes of a rational function: Quadratic over linear
    - Graphing a rational function: Constant over linear
    - Graphing a rational function: Linear over linear
    - Transforming the graph of a rational function
    - Graphing a rational function: Quadratic over linear
    - Graphing rational functions with holes
    - Matching graphs with rational functions: Two vertical asymptotes
    - Graphing a rational function with more than one vertical asymptote
    - Using a graphing calculator to solve a word problem involving a local extremum of a rational function
  - **Polynomial and Rational Inequalities (6 topics)**
    - Solving a polynomial inequality: Problem type 1
    - Solving a polynomial inequality: Problem type 2
    - Solving a polynomial inequality: Problem type 3
    - Solving a polynomial inequality: Problem type 4
    - Solving a rational inequality: Problem type 1
    - Solving a rational inequality: Problem type 2
Trigonometric Functions (58 topics)
- Angles and Their Measure (5 topics)
  ◊ 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
- The Unit Circle and Evaluating Trigonometric Functions (9 topics)
  ◊ Finding coordinates on the unit circle for special angles
  ◊ 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 (9 topics)
  ◊ 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
- 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

**Inverse Trigonometric Functions (8 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
- Using a calculator to approximate inverse trigonometric values

**Trigonometric Identities and Equations (37 topics)**
- Verifying Trigonometric Identities (6 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
- 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, Product–to–Sum, and Power Reducing 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 (12 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
† Finding solutions in an interval for a trigonometric equation with an angle multiplied by a constant

◊ **Laws of Sines and Cosines (5 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

• **Other Topics Available(*) (503 additional topics)**
  ◊ **Real Numbers and Linear Equations (55 topics)**
    ◊ Reading decimal position on a number line: Tenths
    ◊ Reading decimal position on a number line: Hundredths
    ◊ Plotting rational numbers on a number line
    ◊ Estimating a square root
    ◊ Ordering real numbers
    ◊ Signed decimal multiplication
    ◊ Signed decimal division
    ◊ Evaluating a linear expression: Signed decimal addition and subtraction
    ◊ Evaluating a linear expression: Signed decimal multiplication with addition or subtraction
    ◊ Identifying properties used to simplify an algebraic expression
    ◊ Sides of polygons having the same perimeter
    ◊ Area of a rectangle involving fractions
    ◊ 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 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
    ◊ Solving an equation to find the value of an expression
    ◊ Identifying properties used to solve a linear equation
    ◊ Solving a two–step equation with signed decimals
    ◊ 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
    ◊ Writing a multi–step equation for a real–world situation
    ◊ Word problem on unit rates associated with ratios of whole numbers: Decimal answers
    ◊ Circumference ratios
    ◊ Solving equations involving vertical angles
Diamond Finding angle measures of a triangle given angles with variables
Diamond Finding angle measures of an isosceles triangle given angles with variables
Diamond Converting a repeating decimal to a fraction
Diamond Finding the multiplier to give a final amount after a percentage increase or decrease
Diamond Finding the original amount given the result of a percentage increase or decrease
Diamond Finding the percentage increase or decrease: Advanced
Diamond Writing an inequality given a graph on the number line
Diamond Writing a compound inequality given a graph on the number line
Diamond Union and intersection of intervals
Diamond Solving inequalities with no solution or all real numbers as solutions
Diamond Translating a sentence into a multi−step inequality
Diamond Solving a decimal word problem using a linear inequality with the variable on both sides
Diamond Writing an absolute value inequality given a graph on the number line

- Lines, Functions, and Systems (77 topics)
  Diamond Finding the area of a triangle or parallelogram in the coordinate plane
  Diamond Distance between two points in the plane: Decimal answers
  Diamond Identifying scalene, isosceles, and equilateral triangles given coordinates of their vertices
  Diamond Finding an endpoint of a line segment given the other endpoint and the midpoint
  Diamond Finding the coordinate that yields a given slope
  Diamond Identifying linear equations: Advanced
  Diamond Identifying linear functions given ordered pairs
  Diamond Writing an equation and graphing a line given its slope and y−intercept
  Diamond Finding the slope, y−intercept, and equation for a linear function given a table of values
  Diamond Graphing a line given its equation in point−slope form
  Diamond Writing an equation in standard form given the slope and a point
  Diamond Comparing linear functions to the parent function y=x
  Diamond Identifying parallel and perpendicular lines from coordinates
  Diamond Identifying coordinates that give right triangles
  Diamond Graphing ordered pairs and writing an equation from a table of values in context
  Diamond Finding the initial amount and rate of change given a table for a linear function
  Diamond Combining functions to write a new function that models a real−world situation
  Diamond Comparing properties of linear functions given in different forms
  Diamond Identifying independent and dependent variables from equations or real−world situations
  Diamond Solving a linear equation by graphing
  Diamond Constructing a scatter plot
  Diamond Sketching the line of best fit
  Diamond Scatter plots and correlation
  Diamond Predictions from the line of best fit
  Diamond Approximating the equation of a line of best fit and making predictions
  Diamond Computing residuals
  Diamond Interpreting residual plots
  Diamond Classifying linear and nonlinear relationships from scatter plots
  Diamond Linear relationship and the correlation coefficient
  Diamond Identifying outliers and clustering in scatter plots
  Diamond Domain and range of a linear function that models a real−world situation
  Diamond Finding domain and range from a linear graph in context
  Diamond Choosing a graph to fit a narrative: Basic
  Diamond Choosing a graph to fit a narrative: Advanced
  Diamond Graphing an integer function and finding its range for a given domain
  Diamond Using a graphing calculator to solve a system of linear equations: Basic
  Diamond Using a graphing calculator to solve a system of linear equations: Advanced
  Diamond Writing a system of linear equations given its graph
  Diamond Creating an inconsistent system of linear equations
Multiplying rational expressions involving multivariate quadratics
Multiplying rational expressions involving quadratics with leading coefficients greater than 1
Multiplying rational expressions involving multivariate quadratics
Multiplying and division of 3 rational expressions
Dividing rational expressions involving quadratics with leading coefficients greater than 1
Dividing rational expressions involving multivariate quadratics
Dividing 3 rational expressions with different quadratic denominators
Complex fraction made of sums involving rational expressions: Problem type 5
Complex fraction made of sums involving rational expressions: Multivariate
Complex fraction with negative exponents: Problem type 1
Complex fraction with negative exponents: Problem type 2
Complex fraction that contains a complex fraction
Solving a rational equation that simplifies to quadratic: Proportional form, advanced
Word problem on proportions: Problem type 2
Similar polygons
Similar right triangles
Indirect measurement
Ratio of volumes
Ordering fractions with variables
Identifying direct variation equations
Identifying direct variation from ordered pairs and writing equations
Writing a direct variation equation
Word problem on direct variation
Interpreting direct variation from a graph
Writing an inverse variation equation
Identifying direct and inverse variation equations
Identifying direct and inverse variation from ordered pairs and writing equations
Word problem on inverse variation
Word problem on inverse proportions
Writing an equation that models variation
Word problem on combined variation
Introduction to partial fraction decomposition with distinct linear factors
Partial fraction decomposition with distinct linear factors
Partial fraction decomposition with repeated linear factors
Partial fraction decomposition with an irreducible quadratic factor
Partial fraction decomposition with repeated, irreducible quadratic factors

Radicals and Quadratic Functions (30 topics)
Square roots of integers raised to even exponents
Using absolute value to simplify square roots of perfect square monomials
Using absolute value to simplify higher radical expressions
Domains of higher root functions
Graphing a square root function: Problem type 3
Graphing a cube root function
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
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
Classifying sums and products as rational or irrational
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
Solving an equation with exponent 1/a: Problem type 1
Solving an equation with exponent 1/a: Problem type 2
Discriminant of a quadratic equation with parameter
Solving an equation that can be written in quadratic form: Problem type 2
Solving an equation with positive rational exponent
Solving an equation with negative rational exponent
Graphing a parabola of the form \( y = ax^2 + bx + c \): Rational coefficients
Rewriting a quadratic function in standard form
Solving a quadratic equation by graphing
Comparing properties of quadratic functions given in different forms
Classifying the graph of a function
Choosing a quadratic model and using it to make a prediction

Function Operations and Inverses (4 topics)
- Rewriting a multivariate function as a univariate function given a relationship between its variables
- Writing the equation of a secant line
- How the leading coefficient affects the graph of an absolute value function
- Composition of two functions: Domain and range

Exponential and Logarithmic Functions (12 topics)
- Finding domain and range from the graph of an exponential function
- Calculating and comparing simple interest and 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
- Choosing an exponential model and using it to make a prediction
- Comparing linear, polynomial, and exponential functions
- Graphing a logarithmic function: Advanced
- Expanding a logarithmic expression: Problem type 3
- Change of base for logarithms: Problem type 2
- Solving an exponential equation by finding common bases: Linear and quadratic exponents
- Solving an exponential equation by using substitution and quadratic factoring

Conic Sections and Nonlinear Systems (44 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 \( y = a(x-h)^2+k \)
- 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 focus of a parabola of the form \( ay^2 + by + cx + d = 0 \) or \( ax^2 + bx + cy + d = 0 \)
- Finding the vertex, focus, directrix, and axis of symmetry of a parabola
- Writing an equation of a parabola given its graph
- Word problem involving a parabola
- Identifying the center and radius to graph a circle given its equation in general form: Advanced
- Writing an equation of a circle and identifying points that lie on the circle
- Deriving the equation of a circle using the Pythagorean Theorem
- Graphing an ellipse given its equation in standard form
- 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
◊ Testing an equation for symmetry about the axes and origin
◊ Graphically solving a system of linear and quadratic equations
◊ Using a graphing calculator to solve a system of linear and quadratic equations: Basic
◊ Using a graphing calculator to solve a system of equations
◊ Using a graphing calculator to solve an exponential or logarithmic equation
◊ Solving a system of linear and quadratic equations
◊ Solving a system of nonlinear equations: Problem type 1
◊ Solving a system of nonlinear equations: Problem type 2
◊ Solving a word problem involving geometry using a system of nonlinear equations
◊ Graphing a quadratic inequality: Problem type 1
◊ Graphing a quadratic inequality: Problem type 2
◊ Graphing an inequality involving a circle
◊ Graphing a system of nonlinear inequalities: Problem type 1
◊ Graphing a system of nonlinear inequalities: Problem type 2
♦ Sequences, Series, and Probability (113 topics)
◊ Finding the first terms of an arithmetic sequence using an explicit rule
◊ Finding the first terms of a geometric sequence using an explicit rule
◊ Finding the first terms of a sequence using an explicit rule with multiple occurrences of \( n \)
◊ Finding the next terms of an arithmetic sequence with integers
◊ Finding the first terms of a sequence using a recursive rule
◊ Identifying arithmetic sequences and finding the common difference
◊ Finding a specified term of an arithmetic sequence given the first terms
◊ Finding a specified term of an arithmetic sequence given the common difference and first term
◊ Finding a specified term of an arithmetic sequence given two terms of the sequence
◊ Writing an explicit rule for an arithmetic sequence
◊ Writing a recursive rule for an arithmetic sequence
◊ Sum of the first \( n \) terms of an arithmetic sequence
◊ Finding the next terms of a geometric sequence with signed numbers
◊ Identifying arithmetic and geometric sequences
◊ Identifying geometric sequences and finding the common ratio
◊ Finding a specified term of a geometric sequence given the first terms
◊ Finding a specified term of a geometric sequence given the common ratio and first term
◊ Finding a specified term of a geometric sequence given two terms of the sequence
◊ Arithmetic and geometric sequences: Identifying and writing an explicit rule
◊ Writing recursive rules for arithmetic and geometric sequences
◊ Sum of the first \( n \) terms of a geometric sequence
◊ Sum of an infinite geometric series
◊ Identifying linear, quadratic, and exponential functions given ordered pairs
◊ Interpreting a tree diagram
◊ Introduction to the counting principle
◊ Counting principle
◊ Factorial expressions
◊ Computing permutations and combinations
◊ Introduction to permutations and combinations
◊ Permutations and combinations: Problem type 1
◊ Permutations and combinations: Problem type 2
◊ Permutations and combinations: Problem type 3
◊ Binomial formula
◊ Interpreting a tally table
◊ Constructing a two−way frequency table: Basic
◊ Constructing a two−way frequency table: Advanced
◊ Computing a percentage from a table of values
◊ Making an inference using a two−way frequency table
◊ Calculating relative frequencies in a contingency table
◊ Making a reasonable inference based on proportion statistics
◊ Finding if a question can be answered by the data
◊ Interpreting a Venn diagram of 2 sets
◊ Interpreting a Venn diagram of 3 sets
◊ Venn diagrams: Two events
◊ Shading a Venn diagram with 3 sets to represent a group
◊ Constructing a line plot
◊ Constructing a bar graph for non−numerical data
◊ Constructing a histogram for numerical data
◊ Interpreting a bar graph
◊ Interpreting a double bar graph
◊ Interpreting a pictograph table
◊ Interpreting a stem−and−leaf plot
◊ Finding a percentage of a total amount in a circle graph
◊ Computation from a circle graph
◊ Interpreting a circle graph or pie chart
◊ Angle measure in a circle graph
◊ Determining a sample space and outcomes for a simple event
◊ Determining a sample space and outcomes for a compound event
◊ Introduction to the probability of an event
◊ Probability of an event
◊ Understanding likelihood
◊ Odds of an event
◊ Outcomes and event probability
◊ Probabilities of a permutation and a combination
◊ Area as probability
◊ Experimental and theoretical probability
◊ Introduction to expectation
◊ Probability of independent events: Decimal answers
◊ Probability of dependent events
◊ Probabilities of draws with replacement
◊ Probabilities of draws without replacement
◊ Probabilities involving two rolls of a die
◊ Determining outcomes for compound events and complements of events
◊ Using a Venn diagram to understand the addition rule for probability
◊ Outcomes and event probability: Addition rule
◊ Word problem involving the probability of a union or an intersection
◊ Identifying independent events given values of probabilities
◊ Probability of the union and intersection of independent events
◊ Probability of the union of mutually exclusive events and independent events
◊ Using a Venn diagram to understand the multiplication rule for probability
Outcomes and event probability: Conditional probability
Computing conditional probability using a two-way frequency table
Computing conditional probability to make an inference using a two-way frequency table
Conditional probability: Basic
Intersection and conditional probability
Binomial problems: Basic
Binomial problems: Advanced
Using a random number table to make a fair decision
Identifying outcomes in a random number table used to simulate a compound event
Using a random number table to simulate a compound event
Mode of a data set
Finding the mode and range of a data set
Finding the mode and range from a line plot
Mean of a data set
Using a model to find the mean
Understanding the mean graphically: Two bars
Understanding the mean graphically: Four or more bars
Computations involving the mean, sample size, and sum of a data set
Finding the value for a new score that will yield a given mean
Rejecting unreasonable claims based on average statistics
Weighted mean
Mean and median of a data set
How changing a value affects the mean and median
Finding outliers in a data set
Choosing the best measure to describe data
Using back-to-back stem-and-leaf plots to compare data sets
Percentiles
Five-number summary and interquartile range
Constructing a box-and-whisker plot
Using box-and-whisker plots to compare data sets
Computing mean absolute deviation from a list of numerical values
Population standard deviation
Word problem involving calculations from a normal distribution

Polynomial and Rational Functions (6 topics)
Identifying polynomial functions
Remainder theorem: Advanced
Descartes' Rule of Signs
Using the conjugate zeros theorem to find all zeros of a polynomial
Linear factors theorem and conjugate zeros theorem
Writing the equation of a rational function given its graph

Trigonometric Functions (13 topics)
Converting degrees-minutes-seconds to decimal degrees
Converting a decimal degree to degrees-minutes-seconds
Area of a sector of a circle
Angular and linear speed
Finding a point on the unit circle given one coordinate
Using a calculator to approximate cosecant, secant, and cotangent values
Special right triangles: Exact answers
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
Sketching a graph of a damped sine or cosine function
Composition of trigonometric functions with variable expressions as inputs: Problem type 2

Trigonometric Identities and Equations (100 topics)

- Proving trigonometric identities: Problem type 4
- Proving trigonometric identities using odd and even properties
- 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 equation
- Using a graphing calculator to solve a trigonometric inequality
- 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 more than one function
- Finding solutions in an interval for an equation with sine and cosine using sum and difference identities
- 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
- Proving the law of sines
- Proving the law of cosines
- Using trigonometry to find the area of a right triangle
- Finding the area of a triangle using trigonometry
- Expressing the area of a triangle in terms of the sine of one of its angles
- Heron's formula
- Writing a position vector in ai+bj form given its graph
- Writing a vector in ai+bj 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 ai+bj form
- Magnitude of a vector given in component form
- Vector addition and scalar multiplication: ai+bj form
- Linear combination of vectors: ai+bj 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 ai+bj 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
- Finding magnitudes of forces related to a sum of three vectors
- Finding magnitudes of forces related to an object suspended by cables
- Dot product of vectors given in ai+bj 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 ai + bj form
- Using the dot product to find perpendicular vectors
- Finding the component of a vector along another vector
- 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
Plotting points in polar coordinates
Multiple representations of polar coordinates
Converting rectangular coordinates to polar coordinates: Special angles
Converting rectangular coordinates to polar coordinates: Decimal answers
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
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
Identifying symmetries of graphs given their polar equations
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 nth roots of a number: Problem type 1
Finding the nth roots of a number: Problem type 2
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
Estimating a limit numerically
Finding limits from a graph
Finding a limit by using the limit laws: Problem type 1
Finding limits for a piecewise–defined function
Finding a limit by using the limit laws: Problem type 2
Finding a limit by using the limit laws: Problem type 3
Squeeze Theorem
Determining points of discontinuity from a graph
Determining a parameter to make a function continuous
Infinite limits and graphs
Limits at infinity and graphs
Limits at infinity and rational functions
Infinite limits and rational functions
Finding a limit of a trigonometric function by using continuity
Finding a limit by using special trigonometric limits
*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.