

## Intermediate Algebra

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 (495 topics + 307 additional topics)

- Real Numbers (54 topics)
  - Plotting and Ordering (5 topics)
    - 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 (24 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
    - 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
  - Exponents and Order of Operations (5 topics)
    - 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 (2 topics)
    - Evaluating a linear expression: Integer multiplication with addition or subtraction
    - Evaluating a quadratic expression: Integers
  - 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 and Inequalities (93 topics)
  - One-Step Linear Equations (8 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
  - Multi-Step Linear Equations (16 topics)
    - 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: Variables on both sides and two distributions
    - Solving a linear equation with several occurrences of the variable: Fractional forms 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: Fractional forms 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 inside parentheses in terms of other variables
    - Solving for a variable in terms of other variables in a linear equation with fractions
    - Converting between temperatures in Fahrenheit and Celsius
  - Writing Expressions and Equations (5 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
  - Applications (11 topics)
    - 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 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 the side length of a rectangle given its perimeter or area
    - Finding a side length given the perimeter and side lengths with variables
    - 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 and Functions (61 topics)
  - Ordered Pairs (5 topics)
    - Reading a point in the coordinate plane
    - Plotting a point in the coordinate plane
    - Table for a linear equation
    - 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 a line
    - Finding the slopes 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 (14 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
  - Writing the equation of a line in point-slope form given the slope and a point
  - Writing the equation of a line given the y-intercept and another point
  - Writing the equation of a 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 (5 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 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 Functions, Domain, and Range (3 topics)
  - Identifying functions from relations
  - Vertical line test
  - Domain and range from ordered pairs
- Function Evaluation and Applications (6 topics)
  - Table for a linear function
  - Evaluating functions: Linear and quadratic or cubic
  - Variable expressions as inputs of functions: Problem type 1
  - 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 (12 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
  - Finding intercepts of a nonlinear function given its graph
  - 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  $f(x) = ax^2 + c$
- Systems of Linear Equations (21 topics)
  - Systems of Linear Equations (9 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 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  $2 \times 2$  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 and Polynomials (58 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 a positive exponent
    - Scientific notation with a 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 (4 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
- Factoring Polynomials (44 topics)
  - 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 (7 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
  - 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 involving 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  $x$
  - Solving a rational equation that simplifies to linear: Denominator  $x+a$
  - 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 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
- 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 (73 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  $n^{\text{th}}$  roots of perfect  $n^{\text{th}}$  powers with signs
  - 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
- Radical Functions (4 topics)
  - Table for a square root function
  - Domain of a square root function: Basic
  - Domain of a square root function: Advanced
  - Graphing a square root function: Problem type 1
- 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 (12 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 with two radicals that simplifies to  $\sqrt{x} = a$
  - 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 that simplifies to a quadratic equation: Two radicals
  - Solving for a variable in terms of other variables in an equation involving radicals
  - Word problem involving radical equations: Basic
  - Word problem involving radical equations: Advanced
- 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 and Functions (20 topics)
    - Quadratic Equations (11 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
      - Solving an equation that can be written in quadratic form: Problem type 1
    - Quadratic Functions (9 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  $y = ax^2 + bx + c$ : Integer coefficients
      - 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 the vertex of its graph
      - Finding the maximum or minimum of a quadratic function
      - Word problem involving the maximum or minimum of a quadratic function
- Other Topics Available(\*) (307 additional topics)
    - Real Numbers (31 topics)
      - Fractional position on a number line
      - 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 fraction multiplication with addition or subtraction
      - Evaluating a linear expression: Signed decimal addition and subtraction
      - Evaluating a linear expression: Signed decimal multiplication with addition or subtraction
      - 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
      - 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 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 sphere
- Linear Equations and Inequalities (26 topics)
  - 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
  - Solving a word problem with three unknowns using a linear equation
  - 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
  - Finding angle measures of a triangle given angles with variables
  - Finding angle measures of a right or isosceles triangle given angles with variables
  - Finding the value for a new score that will yield a given mean
  - Computing a percentage from a table of values
  - Finding the multiplier to give a final amount after a percentage increase or decrease
  - Finding the original amount given the result of a percentage increase or decrease
  - Finding the percentage increase or decrease: Advanced
  - Finding a percentage of a total amount in a circle graph
  - Computations from a circle graph
  - Translating a sentence into a multi-step inequality
  - Writing an inequality given a graph on the number line
  - Writing a compound inequality given a graph on the number line
  - Union and intersection of intervals
  - Solving inequalities with no solution or all real numbers as solutions
  - Solving a decimal word problem using a linear inequality with the variable on both sides
  - Writing an absolute value inequality given a graph on the number line
- Lines and Functions (23 topics)
  - Finding the coordinate that yields a given slope
  - Identifying linear equations: Advanced
  - Identifying linear functions given ordered pairs
  - Writing an equation and graphing a line given its slope and y-intercept
  - Graphing a line given its equation in point-slope form
  - Combining functions to write a new function that models a real-world situation
  - Comparing properties of linear functions given in different forms
  - Identifying independent and dependent variables from equations or real-world situations
  - Solving a linear equation by graphing
  - Sketching the line of best fit
  - Scatter plots and correlation
  - Predictions from the line of best fit
  - Approximating the equation of a line of best fit and making predictions
  - Evaluating a piecewise-defined function
  - Domain and range of a linear function that models a real-world situation
  - Domain and range from the graph of a piecewise function
  - 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
  - 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 cubic function of the form  $y = ax^3$
  - Graphing a piecewise-defined function: Problem type 1
- Systems of Linear Equations (20 topics)
  - Creating an inconsistent system of linear equations
  - Identifying the operations used to create equivalent systems of equations
  - Solving a 3x3 system of linear equations: Problem type 1
  - Solving a word problem using a system of linear equations of the form  $y = mx + b$
  - Solving a word problem using a 3x3 system of linear equations: Problem type 1
  - Graphing a system of two linear inequalities: Advanced
  - Graphing a system of three linear inequalities
  - Writing a multi-step inequality for a real-world situation
  - Solving a word problem using a system of linear inequalities: Problem type 1
  - Linear programming
  - Solving a word problem using linear programming
  - Scalar multiplication of a matrix
  - Addition or subtraction of matrices
  - Linear combination of matrices

- Finding the determinant of a 2x2 matrix
- Finding the determinant of a 3x3 matrix
- Using Cramer's rule to solve a 2x2 system of linear equations
- Using Cramer's rule to solve a 3x3 system of linear equations
- Gauss-Jordan elimination with a 2x2 matrix
- Solving a system of linear equations given its augmented matrix
  
- Exponents and Polynomials (7 topics)
  - Ordering numbers with positive exponents
  - Ordering numbers with negative exponents
  - Degree of a multivariate polynomial
  - Polynomial long division: Problem type 3
  - Synthetic division
  - Using the remainder theorem to evaluate a polynomial
  - Closure properties of integers and polynomials
  
- Factoring Polynomials (2 topics)
  - Factoring a polynomial involving a GCF and a difference of squares: Multivariate
  - Writing a quadratic equation given the roots and the leading coefficient
  
- Rational Expressions (39 topics)
  - Simplifying a ratio of factored polynomials: Factors with exponents
  - Simplifying a ratio of polynomials: Problem type 3
  - Simplifying a ratio of multivariate polynomials
  - Multiplying rational expressions involving quadratics with leading coefficients greater than 1
  - Multiplying rational expressions involving multivariate quadratics
  - Dividing rational expressions involving quadratics with leading coefficients greater than 1
  - Dividing rational expressions involving multivariate quadratics
  - Multiplication and division of 3 rational expressions
  - Adding rational expressions with multivariate monomial denominators: Basic
  - Adding rational expressions with multivariate monomial denominators: Advanced
  - Adding 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 variation involving the completion of a task
  - Writing an equation that models variation
  - Word problem on combined variation
  - Finding the asymptotes of a rational function: Constant over linear
  - Finding the asymptotes of a rational function: Linear over linear
  - Graphing a rational function: Constant over linear
  - Graphing a rational function: Linear over linear
  
- Radicals (24 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
  - Evaluating a cube root function
  - Domains of higher root functions
  - Graphing a square root function: Problem type 2
  - 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 a root index greater than 2: Problem type 1
  - Solving an equation with a root index greater than 2: Problem type 2
  - Solving an equation with exponent  $1/a$ : Problem type 1
  - Solving an equation with exponent  $1/a$ : Problem type 2
- Quadratic Equations and Functions (19 topics)
    - Discriminant of a quadratic equation with a parameter
    - 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 2
    - Solving an equation with a positive rational exponent
    - Solving an equation with a negative rational exponent
    - Graphing a parabola of the form  $y = ax^2 + bx + c$ : Rational coefficients
    - Finding the domain and range from the graph of a parabola
    - Range of a quadratic function
    - Writing the equation of a quadratic function given its graph
    - Solving a quadratic equation by graphing
    - Comparing properties of quadratic functions given in different forms
    - Classifying the graph of a function
    - How the leading coefficient affects the shape of a parabola
    - Solving a quadratic inequality written in factored form
    - Solving a quadratic inequality
    - Solving a polynomial inequality
    - Solving a rational inequality: Problem type 1
    - Solving a rational inequality: Problem type 2
- Function Operations and Inverses (22 topics)
    - Translating the graph of a parabola: One step
    - 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
    - How the leading coefficient affects the graph of an absolute value function
    - Writing an equation for a function after a vertical translation
    - Writing an equation for a function after a vertical and horizontal translation
    - Sum, difference, and product of two functions
    - Quotient of two functions: Basic
    - Combining functions: Advanced
    - Composition of two functions: Basic
    - Expressing a function as a composition of two functions
    - Composition of two functions: Domain and range
    - Composition of two functions: Advanced
    - Determining whether an equation defines a function: Basic
    - Determining whether an equation defines a function: Advanced
    - Horizontal line test
    - Determining whether two functions are inverses of each other
    - Inverse functions: Linear, discrete
    - Inverse functions: Rational
    - Inverse functions: Quadratic, cubic, radical
- Exponential and Logarithmic Functions (43 topics)
    - Table for an exponential function
    - Graphing an exponential function:  $f(x) = b^x$
    - Graphing an exponential function:  $f(x) = a(b)^x$
    - Graphing an exponential function and its asymptote:  $f(x) = b^x$  or  $f(x) = -b^x$  or  $f(x) = b^{-x}$
    - Translating the graph of an exponential function
    - Graphing an exponential function and finding its domain and range
    - Graphing an exponential function and its asymptote:  $f(x) = a(e)^{x-b} + c$
    - Evaluating an exponential function that models a real-world situation
    - 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
    - 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
  - Converting between logarithmic and exponential equations
  - Converting between natural logarithmic and exponential equations
  - Evaluating a logarithmic expression
  - Solving an equation of the form  $\log_b a = c$
  - Translating the graph of a logarithmic function
  - Graphing a logarithmic function: Basic
  - Graphing a logarithmic function and finding its domain and range
  - Graphing a logarithmic function: Advanced
  - Basic properties of logarithms
  - 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
  - Change of base for logarithms: Problem type 2
  - Solving a multi-step equation involving a single logarithm
  - 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: Exact answers in logarithmic form
  - 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 initial or final amount in a word problem on exponential growth or decay
  - Finding the rate or time in a word problem on continuous exponential growth or decay
- Conic Sections and Sequences (51 topics)
    - Midpoint of a line segment in the plane
    - Finding an endpoint of a line segment given the other endpoint and the midpoint
    - Distance between two points in the plane: Exact answers
    - 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
    - Finding the focus of a parabola of the form  $ay^2 + by + cx + d = 0$  or  $ax^2 + bx + cy + d = 0$
    - Graphing a circle given its equation in standard form
    - Graphing a circle given its equation in general form: Basic
    - Graphing a circle given its equation in general form: Advanced
    - 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
    - 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
    - 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
    - Classifying conics given their equations
    - Graphically solving a system of linear and quadratic equations
    - Using a graphing calculator to solve a nonlinear system of equations: Advanced
    - Solving a system of linear and quadratic equations
    - Solving a system of nonlinear equations: Problem type 1
    - Graphing a quadratic inequality: Problem type 1
    - Graphing a quadratic inequality: Problem type 2
    - Graphing a system of nonlinear inequalities: Problem type 1
    - Graphing a system of nonlinear inequalities: Problem type 2
    - 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
- Factorial expressions
- Binomial formula

**\*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.