Prep for PreCalculus

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

Curriculum (246 topics + 58 additional topics)

- Real Numbers (30 topics)
  - Fractions (5 topics)
    - Simplifying a fraction
    - Using a common denominator to order fractions
    - Addition or subtraction of fractions with different denominators
    - Fraction multiplication
    - Fraction division

- Percents and Proportions (8 topics)
  - Converting between percentages and decimals
  - Applying the percent equation
  - Finding the sale price without a calculator given the original price and percent discount
  - Finding the original price given the sale price and percent discount
  - Finding simple interest without a calculator
  - Solving a proportion of the form \( \frac{x}{a} = \frac{b}{c} \)
  - Word problem on proportions: Problem type 1
  - Word problem on proportions: Problem type 2

- Signed Numbers (15 topics)
  - Integer addition: Problem type 2
  - Integer subtraction: Problem type 3
  - Signed fraction addition or subtraction: Basic
  - Signed fraction addition or subtraction: Advanced
  - Signed decimal addition and subtraction with 3 numbers
  - Integer multiplication and division
  - Signed fraction multiplication: Basic
  - Signed fraction multiplication: Advanced
  - Exponents and integers: Problem type 1
  - Exponents and signed fractions
  - Order of operations with integers and exponents
  - Evaluating a linear expression: Integer multiplication with addition or subtraction
  - Evaluating a quadratic expression: Integers
  - Absolute value of a number
  - Operations with absolute value: Problem type 2

- Properties of Real Numbers (2 topics)
  - Identifying numbers as integers or non-integers
  - Identifying numbers as rational or irrational

- Equations and Inequalities (32 topics)
  - Linear Equations (20 topics)
    - Additive property of equality with integers
    - Multiplicative property of equality with signed fractions
    - Solving a two-step equation with integers
◊ Solving a two–step equation with signed fractions
◊ 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 fractional coefficients
◊ 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 binomial numerators
◊ Solving equations with zero, one, or infinitely many solutions
◊ Algebraic symbol manipulation: Problem type 1
◊ Algebraic symbol manipulation: Problem type 2
◊ Writing a one–step expression for a real–world situation
◊ Translating a phrase into a two–step expression
◊ Translating a sentence into a one–step equation
◊ Solving a word problem with two unknowns using a linear equation
◊ Solving a decimal word problem using a linear equation of the form Ax + B = C
◊ Solving a value mixture problem using a linear equation
◊ Solving a percent mixture problem using a linear equation
◊ Solving a distance, rate, time problem using a linear equation

♦ Linear Inequalities (9 topics)
◊ Graphing a linear inequality on the number line
◊ Graphing a compound inequality on the number line
◊ Solving a linear inequality: Problem type 1
◊ Solving a linear inequality: Problem type 2
◊ Solving a linear inequality: Problem type 3
◊ Solving a linear inequality: Problem type 4
◊ 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 and Inequalities (3 topics)
◊ Solving an absolute value equation of the form a|x| = b or |x|+a = b
◊ Solving an absolute value equation of the form |ax+b| = c
◊ Solving an absolute value inequality: Basic

• Exponents and Polynomials (44 topics)
♦ Properties of Exponents (13 topics)
◊ 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 of exponents
◊ Product rule with positive exponents: Multivariate
◊ Product rule with negative exponents
◊ Quotient of expressions involving exponents
◊ Quotient rule with negative exponents: Problem type 1
◊ Introduction to the power rules of exponents
◊ Power rules with positive exponents
◊ Power of a power rule with negative exponents
◊ Power rules with negative exponents
◊ Power and product rules with positive exponents

♦ Scientific Notation (2 topics)
◊ Scientific notation with positive exponent
Scientific notation with negative exponent

Polynomial Expressions (9 topics)
- Degree and leading coefficient of a univariate polynomial
- Combining like terms: Advanced
- Simplifying a sum or difference of two univariate polynomials
- Multiplying a univariate polynomial by a monomial with a positive coefficient
- Multiplying a multivariate polynomial by a monomial
- Multiplying binomials with leading coefficients of 1
- Multiplying conjugate binomials: Univariate
- Squaring a binomial: Univariate
- Multiplication involving binomials and trinomials in two variables

Factoring (9 topics)
- Introduction to the GCF of two 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 a quadratic with leading coefficient 1
- Factoring a quadratic with leading coefficient greater than 1
- Factoring a product of a quadratic trinomial and a monomial
- Factoring a difference of squares
- Factoring a polynomial by grouping: Problem type 1

Quadratic Equations (11 topics)
- Solving an equation written in factored form
- 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 quadratic equation using the square root property: Exact answers, basic
- Completing the square
- Applying the quadratic formula: Exact answers
- Discriminant of a quadratic equation
- Solving a word problem using a quadratic equation with rational roots
- Solving a word problem using a quadratic equation with irrational roots
- Solving a quadratic inequality written in factored form

Lines and Systems (33 topics)
- Ordered Pairs (3 topics)
  - Plotting a point in the coordinate plane
  - Finding a solution to a linear equation in two variables
  - Determining whether given points lie on one, both, or neither of 2 lines given equations
- Graphing Lines (5 topics)
  - Graphing a line given its x- and y-intercepts
  - Graphing a line given its equation in slope-intercept form
  - Graphing a line given its equation in standard form
  - Graphing a line through a given point with a given slope
  - Graphing a vertical or horizontal line
- Equations of Lines (13 topics)
  - Finding the y-intercept of a line given its equation
  - Finding x- and y-intercepts of a line given the equation: Advanced
  - Finding slope given the graph of a line on a grid
  - Finding slope given two points on the line
  - Finding the slope of a line given its equation
  - Writing an equation of a line given the y-intercept and another point
  - Writing the equation of a line given the slope and a point on the line
  - Writing the equation of the line through two given points
Finding slopes of lines parallel and perpendicular to a line given in the form $Ax + By = C$
Finding writing equations of lines parallel and perpendicular to a given line through a point
Finding an equation and drawing its graph to model a real-world situation: Advanced
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

- **Graphing Linear Inequalities (3 topics)**
  - Graphing a linear inequality in the plane: Standard form
  - Graphing a linear inequality in the plane: Vertical or horizontal line
  - Graphing a linear inequality in the plane: Slope-intercept form

- **Systems of Linear Equations (9 topics)**
  - Graphically solving a system of linear equations
  - Solving a system of linear equations using substitution
  - Solving a system of linear equations using elimination with multiplication and addition
  - Solving a word problem involving a sum and another basic relationship using a system of linear equations
  - Solving a value mixture problem using a system of linear equations
  - Solving a distance, rate, time problem using a system of linear equations
  - Solving a percent mixture problem using a system of linear equations
  - Interpreting the graphs of two functions
  - Graphing a system of two linear inequalities: Basic

- **Functions and Graphs (29 topics)**
  - Sets, Relations, and Functions (9 topics)
    - Union and intersection of finite sets
    - Set builder and interval notation
    - Identifying functions from relations
    - Vertical line test
    - Evaluating functions: Linear and quadratic or cubic
    - Evaluating functions: Absolute value, rational, radical
    - Evaluating a piecewise-defined function
    - Variable expressions as inputs of functions: Problem type 1
    - Domain and range from ordered pairs
  - Graphs and Transformations (16 topics)
    - Finding intercepts of a nonlinear function given its graph
    - Finding local maxima and minima of a function given the graph
    - Finding zeros of a polynomial function written in factored form
    - Domain and range from the graph of a continuous function
    - Writing an equation for a function after a vertical translation
    - Writing an equation for a function after a vertical and horizontal 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
    - Finding the x-intercept(s) and the vertex of a parabola
    - Graphing a parabola of the form $y = ax^2$
    - Graphing a parabola of the form $y = (x-h)^2 + k$
    - Graphing a parabola of the form $y = ax^2 + bx + c$: Integer coefficients
    - Graphing a cubic function of the form $y = ax^3$
    - Graphing an absolute value equation in the plane: Advanced
  - Combining Functions; Composite Functions; Inverse Functions (4 topics)
    - Sum, difference, and product of two functions
    - Quotient of two functions: Basic
    - Composition of two functions: Basic
    - Inverse functions: Linear, discrete
• Rational Expressions (27 topics)
  ◆ Rational Expressions (19 topics)
  ◊ Domain of a rational function: Excluded values
  ◊ Simplifying a ratio of polynomials: Problem type 1
  ◊ Simplifying a ratio of polynomials: Problem type 2
  ◊ Simplifying a ratio of multivariate polynomials
  ◊ Multiplying rational expressions involving multivariate monomials
  ◊ Multiplying rational expressions involving quadratics with leading coefficients of 1
  ◊ Dividing rational expressions involving multivariate monomials
  ◊ Introduction to the LCM of two monomials
  ◊ Adding rational expressions with common denominators and binomial numerators
  ◊ Adding rational expressions with different denominators: ax, bx
  ◊ Adding rational expressions with different denominators: x+a, x+b
  ◊ Complex fraction without variables: Problem type 1
  ◊ Complex fraction without variables: Problem type 2
  ◊ Complex fraction involving multivariate monomials
  ◊ Complex fraction: GCF and quadratic factoring
  ◊ Complex fraction made of sums involving rational expressions
  ◊ Dividing a polynomial by a monomial: Univariate
  ◊ Polynomial long division: Problem type 1
  ◊ Polynomial long division: Problem type 2
  ◆ Rational Equations (6 topics)
  ◊ 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: Unlike binomial denominators
  ◊ Solving a rational equation that simplifies to linear: Denominators a, x, or ax
  ◊ Solving a rational equation that simplifies to quadratic: Binomial denominators, constant numerators
  ◊ Solving a rational equation that simplifies to quadratic: Binomial denominators and numerators
  ◆ Variation (2 topics)
  ◊ Word problem on direct variation
  ◊ Word problem on inverse variation
• Radical Expressions (26 topics)
  ◆ Radical Functions (2 topics)
  ◊ Domain of a square root function: Advanced
  ◊ Graphing a square root function
  ◆ Radical Expressions (16 topics)
  ◊ Square root of a rational perfect square
  ◊ Cube root of an integer
  ◊ Simplifying the square root of a whole number less than 100
  ◊ Square root of a perfect square monomial
  ◊ Simplifying a radical expression with an even exponent
  ◊ Simplifying a radical expression with two variables
  ◊ Simplifying a higher root of a whole number
  ◊ Simplifying a higher radical expression: Multivariate
  ◊ Square root addition or subtraction
  ◊ Simplifying a sum or difference of radical expressions: Multivariate
  ◊ Square root multiplication: Advanced
  ◊ Simplifying a product of radical expressions: Multivariate
  ◊ Simplifying a product involving square roots using the distributive property: Advanced
  ◊ Special products of radical expressions: Conjugates and squaring
  ◊ Rationalizing the denominator of a radical expression
  ◊ Rationalizing the denominator of a radical expression using conjugates
  ◆ Rational Exponents (5 topics)
Converting between radical form and exponent form
◊ Rational exponents: Non-unit fraction exponent with a whole number base
◊ Rational exponents: Negative exponents and fractional bases
◊ Rational exponents: Products and quotients with negative exponents
◊ Rational exponents: Powers of powers with negative exponents
♦ Radical Equations (3 topics)
◊ Solving a radical equation that simplifies to a linear equation: One radical, basic
◊ Solving a radical equation that simplifies to a linear equation: Two radicals
◊ Solving a radical equation that simplifies to a quadratic equation: One radical

• Geometry (25 topics)
  ◦ Perimeter, Area, and Volume (17 topics)
    ◊ Perimeter of a square or a rectangle
    ◊ Area of a square or a rectangle
    ◊ Area of a piecewise rectangular figure
    ◊ Finding a side length given the perimeter and side lengths with variables
    ◊ Finding the side length of a rectangle given its perimeter or area
    ◊ Finding the perimeter or area of a rectangle given one of these values
    ◊ Area of a parallelogram
    ◊ Area of a triangle
    ◊ Circumference and area of a circle
    ◊ Perimeter involving rectangles and circles
    ◊ Area involving inscribed figures
    ◊ Volume of a rectangular prism
    ◊ Volume of a cylinder
    ◊ Surface area of a cube or a rectangular prism
    ◊ Surface area of a cylinder: Exact answers in terms of pi
    ◊ Similar polygons
    ◊ Indirect measurement
  ◦ Angles (3 topics)
    ◊ Solving equations involving vertical angles
    ◊ Finding an angle measure of a triangle given two angles
    ◊ Finding an angle measure for a triangle with an extended side
  ◦ Coordinate Geometry (5 topics)
    ◊ Pythagorean Theorem
    ◊ Distance between two points in the plane: Exact answers
    ◊ Graphing a circle given its equation in standard form
    ◊ Graphing a circle given its equation in general form
    ◊ Writing an equation of a circle given its center and a point on the circle

• Other Topics Available(*) (58 additional topics)
  ◦ Real Numbers (6 topics)
    ◊ Fractional part of a circle
    ◊ Finding the percentage increase or decrease: Advanced
    ◊ Word problem on unit rates associated with ratios of whole numbers: Decimal answers
    ◊ Exponents and integers: Problem type 2
    ◊ Properties of addition
    ◊ Properties of real numbers
  ◦ Equations and Inequalities (6 topics)
    ◊ Solving an equation to find the value of an expression
    ◊ 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 inequality for a real-world situation
Solving a decimal word problem using a linear inequality with the variable on both sides

Exponents and Polynomials (13 topics)
- Evaluating expressions with exponents of zero
- Ordering numbers with positive exponents
- Ordering numbers with negative exponents
- Power, product, and quotient rules with negative exponents
- Multiplying and dividing numbers written in scientific notation
- Degree of a multivariate polynomial
- Simplifying a sum or difference of three univariate polynomials
- Factoring with repeated use of the difference of squares formula
- Factoring a sum or difference of two cubes
- Solving an equation that can be written in quadratic form: Problem type 1
- Solving a quadratic equation using the square root property: Exact answers, advanced
- Solving a quadratic equation by completing the square: Exact answers
- Solving a quadratic inequality

Lines and Systems (5 topics)
- Writing the equations of vertical and horizontal lines through a given point
- Solving a 3x3 system of linear equations: Problem type 1
- Solving a 2x2 system of linear equations that is inconsistent or consistent dependent
- Solving a tax rate or interest rate problem using a system of linear equations
- Solving a word problem using a 3x3 system of linear equations: Problem type 1

Functions and Graphs (6 topics)
- Set builder notation
- Finding inputs and outputs of a function from its graph
- Finding where a function is increasing, decreasing, or constant given the graph: Interval notation
- Classifying the graph of a function
- Horizontal line test
- Determining whether two functions are inverses of each other

Rational Expressions (6 topics)
- Ordering fractions with variables
- Dividing rational expressions involving quadratics with leading coefficients of 1
- Least common multiple of two monomials
- Adding rational expressions with multivariate monomial denominators: Advanced
- Writing an equation that models variation
- Word problem on combined variation

Radical Expressions (8 topics)
- Rationalizing a denominator: Quotient involving higher radicals and monomials
- 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 $i$
- Solving a quadratic equation with complex roots

Geometry (8 topics)
- Areas of rectangles with the same perimeter
- Finding the radius or the diameter of a circle given its circumference
- Circumference ratios
- Area involving rectangles and circles
- Word problem involving the area between two concentric circles
- Word problem involving the rate of filling or emptying a cylinder
- Midpoint of a line segment in the plane
Writing an equation of a circle given the endpoints of a diameter

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.