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 x/a = 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 $Ax + By = C$
Writing equations of lines parallel and perpendicular to a given line through a point
Writing 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
Diamond Write a multi-step inequality for a real-world situation
Diamond Solving a decimal word problem using a linear inequality with the variable on both sides

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

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

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

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

- Radical Expressions (8 topics)
  - Diamond Rationalizing a denominator: Quotient involving higher radicals and monomials
  - Diamond Using $i$ to rewrite square roots of negative numbers
  - Diamond Simplifying a product and quotient involving square roots of negative numbers
  - Diamond Adding or subtracting complex numbers
  - Diamond Multiplying complex numbers
  - Diamond Dividing complex numbers
  - Diamond Simplifying a power of $i$
  - Diamond Solving a quadratic equation with complex roots

- Geometry (8 topics)
  - Diamond Areas of rectangles with the same perimeter
  - Diamond Finding the radius or the diameter of a circle given its circumference
  - Diamond Circumference ratios
  - Diamond Area involving rectangles and circles
  - Diamond Word problem involving the area between two concentric circles
  - Diamond Word problem involving the rate of filling or emptying a cylinder
  - Diamond 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.*