

## Math Review for AP Physics

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 (411 topics + 219 additional topics)

- Arithmetic (69 topics)
  - Integers (22 topics)
    - Order of operations with whole numbers
    - Order of operations with whole numbers and grouping symbols
    - Rounding to tens or hundreds
    - Rounding to thousands, ten thousands, or hundred thousands
    - Estimating a sum of whole numbers: Problem type 2
    - Estimating a difference of whole numbers: Problem type 2
    - Estimating a product or quotient of whole numbers
    - Comparing signed numbers relating to a real-world situation
    - Integer addition: Problem type 2
    - Integer subtraction: Problem type 3
    - Integer multiplication and division
    - Exponents and integers: Problem type 1
    - Exponents and integers: Problem type 2
    - Square root of a perfect square
    - Order of operations with integers
    - Order of operations with integers and exponents
    - Absolute value of a number
    - Operations with absolute value: Problem type 1
    - Evaluating a linear expression: Integer multiplication with addition or subtraction
    - Evaluating a quadratic expression: Integers
    - Additive property of equality with integers
    - Multiplicative property of equality with whole numbers
  - Introduction to Perimeter and Area (3 topics)
    - Perimeter of a square or a rectangle
    - Area of a square or a rectangle
    - Word problem involving the area of a rectangle: Problem type 2
  - Fractions (13 topics)
    - Equivalent fractions
    - Simplifying a fraction
    - Addition or subtraction of fractions with the same denominator
    - Addition or subtraction of fractions with different denominators
    - Signed fraction addition or subtraction: Basic
    - Product of a fraction and a whole number: Problem type 1
    - Introduction to fraction multiplication
    - Fraction multiplication
    - Determining if a quantity is increased or decreased when multiplied by a fraction
    - Signed fraction multiplication: Basic
    - Exponents and fractions
    - Exponents and signed fractions
    - Fraction division
  - Decimals and Percents (16 topics)
    - Rounding decimals
    - Signed decimal addition and subtraction
    - Multiplication of a decimal by a power of ten
    - Multiplication of a decimal by a power of 0.1
    - Division of a decimal by a power of ten
    - Division of a decimal by a power of 0.1
    - Evaluating a linear expression: Signed decimal addition and subtraction
    - Evaluating a linear expression: Signed decimal multiplication with addition or subtraction
    - Converting between percentages and decimals
    - Converting between percentages and decimals in a real-world situation
    - Converting a fraction to a percentage: Denominator of 20, 25, or 50
    - Writing a ratio as a percentage
    - Finding a percentage of a total amount: Real-world situations
    - Finding the final amount given the original amount and 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

- Unit Conversion (9 topics)
  - Choosing metric measurement units
  - Metric distance conversion with decimal values
  - Metric conversion with decimal values: Two-step problem
  - Metric area unit conversion with decimal values
  - Converting between metric units of volume and capacity
  - Converting between metric and U.S. Customary unit systems
  - Converting between compound units: Basic
  - Converting between compound units: Advanced
  - Word problem on area involving conversions between systems
- Properties of Real Numbers (6 topics)
  - Combining like terms: Integer coefficients
  - Distributive property: Whole number coefficients
  - Distributive property: Integer coefficients
  - Using distribution and combining like terms to simplify: Univariate
  - Using distribution with double negation and combining like terms to simplify: Multivariate
  - Introduction to the power of a product rule of exponents
- Linear Equations (38 topics)
  - Linear Equations (15 topics)
    - Additive property of equality with signed fractions
    - Additive property of equality with decimals
    - Additive property of equality with a negative coefficient
    - Multiplicative property of equality with signed fractions
    - Multiplicative property of equality with decimals
    - Solving a two-step equation with integers
    - Solving an equation to find the value of an expression
    - Solving a two-step equation with signed decimals
    - Solving a linear equation with several occurrences of the variable: Variables on the same side and distribution
    - Solving a linear equation with several occurrences of the variable: Variables on both sides and distribution
    - Solving a linear equation with several occurrences of the variable: Variables on both sides and two distributions
    - Solving a two-step equation with signed fractions
    - Solving a linear equation with several occurrences of the variable: Fractional forms with monomial numerators
    - Solving a linear equation with several occurrences of the variable: Variables on both sides and fractional coefficients
    - Solving a linear equation with several occurrences of the variable: Fractional forms with binomial numerators
  - Solving Formulas for a Variable (7 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
  - Rates, Proportions, and Applications of Linear Equations (15 topics)
    - Writing a one-step expression for a real-world situation
    - Translating a sentence into a one-step equation
    - Word problem on unit rates associated with ratios of whole numbers: Decimal answers
    - Solving a word problem involving rates and time conversion
    - Solving a proportion of the form  $x/a = b/c$
    - Solving a proportion of the form  $(x+a)/b = c/d$
    - Word problem on proportions: Problem type 1
    - Word problem on proportions: Problem type 2
    - Writing an equation of the form  $Ax + B = C$  to solve a word problem
    - Solving a decimal word problem using a linear equation of the form  $Ax + B = C$
    - Writing an equation of the form  $A(x + B) = C$  to solve a word problem
    - Solving a word problem with two unknowns using a linear equation
    - Writing an equation to represent a real-world problem: Variable on both sides
    - Writing and solving a real-world problem given an equation with the variable on both sides
    - Solving a distance, rate, time problem using a linear equation
  - Absolute Value Equations (1 topics)
    - Introduction to solving an absolute value equation
- Geometry (34 topics)
  - Angles (8 topics)
    - Acute, obtuse, and right angles
    - Measuring an angle with the protractor
    - Finding the complement or supplement of an angle given a figure
    - Finding angle measures given two intersecting lines

- Solving equations involving vertical angles and linear pairs
- Finding angle measures given two parallel lines cut by a transversal
- Solving equations involving angles and a pair of parallel lines
- Solving equations involving angles and two pairs of parallel lines
- Triangles (12 topics)
  - Acute, obtuse, and right triangles
  - Finding an angle measure of a triangle given two angles
  - Finding an angle measure for a triangle with an extended side
  - Finding side lengths and angle measures of isosceles and equilateral triangles
  - Finding an angle measure for a triangle sharing a side with another triangle
  - Finding angle measures of a triangle given angles with variables
  - Finding an angle measure given a triangle and parallel lines
  - Pythagorean Theorem
  - Word problem involving the Pythagorean Theorem
  - Finding a missing side length given two similar triangles
  - Similar right triangles
  - Indirect measurement
- Polygons and Circles (6 topics)
  - Area of a piecewise rectangular figure
  - Finding side lengths of rectangles given one dimension and an area or a perimeter
  - Area of a triangle
  - Circumference of a circle
  - Circumference ratios
  - Circumference and area of a circle
- Solids (8 topics)
  - Surface area of a cube or a rectangular prism
  - Surface area of a cylinder
  - Surface area of a sphere
  - Volume of a rectangular prism
  - Volume of a cylinder
  - Volume of a sphere
  - Word problem involving the rate of filling or emptying a cylinder
  - Ratio of volumes
- Lines and Systems of Linear Equations (49 topics)
  - The Coordinate Plane, Distance, and Midpoint (4 topics)
    - Reading a point in the coordinate plane
    - Plotting a point in the coordinate plane
    - Finding a solution to a linear equation in two variables
    - Distance between two points in the plane: Decimal answers
  - Graphing and Intercepts (8 topics)
    - Graphing a linear equation of the form  $y = mx$
    - Graphing a line given its equation in slope-intercept form: Integer slope
    - Graphing a line given its equation in slope-intercept form: Fractional slope
    - Graphing a line given its equation in standard form
    - Graphing a vertical or horizontal line
    - Finding x- and y-intercepts given the graph of a line on a grid
    - Finding x- and y-intercepts of a line given the equation: Basic
    - Graphing a line given its x- and y-intercepts
  - Slope (4 topics)
    - Finding slope given the graph of a line on a grid
    - Finding slope given two points on a line
    - Using right triangles to find the slope of a line
    - Graphing a line given its slope and y-intercept
  - Equations of Lines (7 topics)
    - Finding the slope and y-intercept of a line given its equation in the form  $y = mx + b$
    - Finding the slope and y-intercept of a line given its equation in the form  $Ax + By = C$
    - Writing an equation and graphing a line given its slope and y-intercept
    - Finding the slope, y-intercept, and equation for a linear function given a table of values
    - Writing an equation in slope-intercept 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
  - Applications (7 topics)
    - Interpreting a line graph
    - Finding the intercepts and rate of change given a graph of a linear function
    - 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
- Sketching the least-squares regression line
- Scatter plots and correlation
- Approximating the equation of a line of best fit and making predictions
- Systems of Linear Equations (10 topics)
  - Identifying solutions to a system of linear equations
  - Graphically solving a system of linear equations
  - Solving a system of linear equations of the form  $y = mx + b$
  - Solving a system of linear equations using substitution
  - Solving a system of linear equations using elimination with addition
  - Solving a system of linear equations using elimination with multiplication and addition
  - Solving a system of linear equations with decimal coefficients
  - Interpreting the graphs of two functions
  - Solving a percent mixture problem using a system of linear equations
  - Solving a distance, rate, time problem using a system of linear equations
- Introduction to Functions (9 topics)
  - Evaluating functions: Linear and quadratic or cubic
  - Finding where a function is increasing, decreasing, or constant given the graph
  - Choosing a graph to fit a narrative: Basic
  - Understanding distance and speed graphs
  - Graphing a function of the form  $f(x) = ax + b$ : Fractional slope
  - 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  $f(x) = ax^2 + c$
- Exponents, Polynomials, and Factoring (57 topics)
  - Integer Exponents (23 topics)
    - Introduction to the product rule of exponents
    - Product rule with positive exponents: Univariate
    - Product rule with positive exponents: Multivariate
    - Ordering numbers with positive exponents
    - Introduction to the power of a power rule of exponents
    - Power rules with positive exponents: Multivariate products
    - Power rules with positive exponents: Multivariate quotients
    - 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
    - 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
    - Ordering numbers 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, product, and quotient rules with negative exponents
  - Scientific Notation (14 topics)
    - Power of 10: Positive exponent
    - Scientific notation with a positive exponent
    - Scientific notation with a negative exponent
    - Converting between scientific notation and standard form in a real-world situation
    - Estimating numbers using scientific notation
    - Choosing metric units and converting to the base unit in scientific notation
    - Expressing calculator notation as scientific notation
    - Multiplying numbers written in scientific notation: Advanced
    - Multiplying numbers written in decimal form or scientific notation in a real-world situation
    - Dividing numbers written in scientific notation: Advanced
    - Adding or subtracting numbers written in scientific notation: Same exponents, basic
    - Adding or subtracting numbers written in scientific notation: Different exponents
    - Finding powers of numbers written in scientific notation
    - Order of magnitude estimation
  - Polynomial Expressions (9 topics)
    - Simplifying a sum or difference of two 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 binomials with leading coefficients of 1
- Multiplying binomials with leading coefficients greater than 1
- Multiplying binomials in two variables
- Squaring a binomial: Univariate
- Multiplying binomials with negative coefficients
- Factoring (7 topics)
  - Introduction to the GCF of two monomials
  - Factoring out a monomial from a polynomial: Univariate
  - Factoring a quadratic with leading coefficient 1
  - Factoring a quadratic with leading coefficient greater than 1: Problem type 1
  - Factoring a quadratic with leading coefficient greater than 1: Problem type 2
  - Factoring a perfect square trinomial with leading coefficient 1
  - Factoring a difference of squares in one variable: Basic
- Solving Quadratic Equations by Factoring (4 topics)
  - 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
- Rational Expressions (28 topics)
  - Rational Expressions (10 topics)
    - Restriction on a variable in a denominator: Linear
    - Multiplying rational expressions involving multivariate monomials
    - Dividing rational expressions involving multivariate monomials
    - Introduction to the LCM of two monomials
    - Adding rational expressions with common denominators and monomial numerators
    - Adding rational expressions with common denominators and binomial numerators
    - Adding rational expressions with denominators  $ax$  and  $bx$ : Basic
    - Adding rational expressions with denominators  $ax$  and  $bx$ : Advanced
    - Adding rational expressions with linear denominators without common factors: Basic
    - Adding rational expressions with linear denominators without common factors: Advanced
  - Complex Fractions (2 topics)
    - Complex fraction without variables: Problem type 1
    - Complex fraction involving univariate monomials
  - Rational Equations (9 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: Denominators  $a$ ,  $x$ , or  $ax$
    - Solving a rational equation that simplifies to linear: Denominators  $ax$  and  $bx$
    - 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 involving multiple rates
    - Solving a work problem using a rational equation
  - Direct and Inverse Variation (7 topics)
    - Identifying direct variation equations
    - Word problem on direct variation
    - Identifying direct and inverse variation 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
- Radicals (38 topics)
  - Radical Expressions (19 topics)
    - Simplifying the square root of a whole number less than 100
    - Introduction to simplifying a radical expression with an even exponent
    - Square root of a perfect square monomial
    - 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
- Square root multiplication: Basic
- Square root multiplication: Advanced
- Introduction to simplifying a product of radical expressions: Univariate
- Simplifying a product of radical expressions: Univariate
- Simplifying a product of radical expressions: Multivariate
- Introduction to simplifying a product of higher roots
- Simplifying a product of higher radical expressions
- Simplifying a quotient of square roots
- Rational Exponents (11 topics)
  - Converting between radical form and exponent form
  - Rational exponents: Unit fraction exponents and whole number bases
  - 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 products or quotients of higher radicals with different indices: Univariate
  - Simplifying products or quotients of higher radicals with different indices: Multivariate
- Radical Equations (8 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, basic
  - 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
  - Solving an equation with a root index greater than 2: Problem type 1
  - Solving an equation with exponent  $1/a$ : Problem type 1
- Quadratic Functions (13 topics)
  - Quadratic Equations (5 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
    - Applying the quadratic formula: Exact answers
    - Applying the quadratic formula: Decimal answers
    - Solving a word problem using a quadratic equation with irrational roots
  - Quadratic Functions (5 topics)
    - Graphing a parabola of the form  $y = (x-h)^2 + k$
    - Graphing a parabola of the form  $y = a(x-h)^2 + k$
    - 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 zeros of a quadratic function given its equation
  - Conic Sections (3 topics)
    - Graphing a parabola of the form  $y^2 = ax$  or  $x^2 = ay$
    - Graphing a parabola of the form  $x = a(y-k)^2 + h$  or  $y = a(x-h)^2 + k$
    - Graphing a parabola of the form  $ay^2 + by + cx + d = 0$  or  $ax^2 + bx + cy + d = 0$
- Function Operations (4 topics)
  - Transformations of Graphs (3 topics)
    - Translating the graph of a parabola: One step
    - Translating the graph of a parabola: Two steps
    - Translating the graph of a function: One step
  - Function Operations (1 topics)
    - Introduction to the composition of two functions
- Exponential and Logarithmic Functions (21 topics)
  - Exponential Functions (6 topics)
    - Table for an exponential function
    - Graphing an exponential function and its asymptote:  $f(x)=b^x$
    - Graphing an exponential function and its asymptote:  $f(x) = a(b)^x$



- Graphing an exponential function and its asymptote:  $f(x) = b^{-x}$  or  $f(x) = -b^x$  or  $f(x) = -b^{-x}$
- Evaluating an exponential function with base  $e$  that models a real-world situation
- Finding a final amount in a word problem on exponential growth or decay
- Logarithmic Functions (8 topics)
  - Converting between logarithmic and exponential equations
  - Converting between natural logarithmic and exponential equations
  - Evaluating logarithmic expressions
  - Solving an equation of the form  $\log_b a = c$
  - Basic properties of logarithms
  - Using properties of logarithms to evaluate expressions
  - Expanding a logarithmic expression: Problem type 2
  - Change of base for logarithms: Problem type 1
- Exponential and Logarithmic Equations and Applications (7 topics)
  - Solving a multi-step equation involving natural logarithms
  - Solving an exponential equation by using natural logarithms: Decimal answers
  - Finding the time given an exponential function with base  $e$  that models a real-world situation
  - Finding the final amount in a word problem on continuous compound interest
  - Finding the final amount in a word problem on continuous exponential growth or decay
  - Finding the rate or time in a word problem on continuous exponential growth or decay
  - Finding half-life or doubling time
- Trigonometric Functions (40 topics)
  - Radians and Unit Circle Trigonometry (11 topics)
    - Converting between degree and radian measure: Problem type 1
    - Converting between degree and radian measure: Problem type 2
    - Sketching an angle with absolute value less than  $2\pi$  radians in standard position
    - Arc length and central angle measure
    - Angular and linear speed
    - Common angles and trigonometric functions
    - Trigonometric functions and special angles: Problem type 1
    - Trigonometric functions and special angles: Problem type 2
    - Evaluating expressions involving sine or cosine
    - Using a calculator to approximate sine, cosine, and tangent values
    - Evaluating a sinusoidal function that models a real-world situation
  - Right Triangle Trigonometry (10 topics)
    - Sine, cosine, and tangent ratios: Numbers for side lengths
    - Using the Pythagorean Theorem to find a sine, cosine, or tangent ratio in a right triangle
    - Understanding trigonometric ratios through similar right triangles
    - Relationship between the sines and cosines of complementary angles
    - Using a trigonometric ratio to find a side length in a right triangle
    - Using trigonometry to find a length in a word problem with one right triangle
    - Using a trigonometric ratio to find an angle measure in a right triangle
    - Using trigonometry to find angles of elevation or depression in a word problem
    - Solving a right triangle
    - Using trigonometry to find a length in a word problem with two right triangles
  - Trigonometric Functions of Angles (1 topics)
    - Finding values of trigonometric functions given information about an angle: Problem type 2
  - Graphs of Sine and Cosine Functions (12 topics)
    - Sketching the graph of  $y = a \sin(x)$  or  $y = a \cos(x)$
    - Sketching the graph of  $y = \sin(bx)$  or  $y = \cos(bx)$
    - Sketching the graph of  $y = \sin(x) + d$  or  $y = \cos(x) + d$
    - Sketching the graph of  $y = \sin(x+c)$  or  $y = \cos(x+c)$
    - Sketching the graph of  $y = a \sin(x+c)$  or  $y = a \cos(x+c)$
    - Sketching the graph of  $y = a \sin(bx)$  or  $y = a \cos(bx)$
    - Sketching the graph of  $y = a \sin(bx+c)$  or  $y = a \cos(bx+c)$
    - Sketching the graph of  $y = a \sin(bx) + d$  or  $y = a \cos(bx) + d$
    - Amplitude and period of a sine or cosine function
    - Amplitude, period, and phase shift of a sine or cosine function
    - Writing the equation of a sine or cosine function given its graph: Problem type 1
    - Writing the equation of a sine or cosine function given its graph: Problem type 2
  - Inverse Trigonometric Functions (6 topics)
    - Values of inverse trigonometric functions
    - Composition of a trigonometric function with the inverse of another trigonometric function: Problem type 1
    - Composition of a trigonometric function with the inverse of another trigonometric function: Problem type 2
    - Composition of a trigonometric function with the inverse of another trigonometric function: Problem type 3
    - Composition of trigonometric functions with variable expressions as inputs: Problem type 1
    - Using a calculator to approximate inverse trigonometric values

- Trigonometric Equations and Vectors (20 topics)
  - Vectors (18 topics)
    - Writing a position vector in  $ai+bj$  form given its graph
    - Writing a vector in  $ai+bj$  form given its initial and terminal points
    - Writing a vector in component form given its initial and terminal points
    - Magnitude of a vector given in  $ai+bj$  form
    - Magnitude of a vector given in component form
    - Vector addition and scalar multiplication:  $ai+bj$  form
    - Linear combination of vectors:  $ai+bj$  form
    - Multiplication of a vector by a scalar: Geometric approach
    - Vector addition: Geometric approach
    - Vector subtraction: Geometric approach
    - Finding the magnitude and direction of a vector given its graph
    - Finding the components of a vector given its graph
    - Finding the direction angle of a vector given in  $ai+bj$  form
    - Writing a vector given its magnitude and direction angle
    - Writing a vector to represent a force pushing or pulling an object
    - Finding the magnitude and direction angle of the resultant force of two vectors
    - Finding magnitudes of forces related to a sum of three vectors
    - Finding magnitudes of forces related to an object suspended by cables
  - The Dot Product (2 topics)
    - Dot product of vectors given in  $ai+bj$  form
    - Finding the component of a vector along another vector
- Other Topics Available(\*) (219 additional topics)
  - Arithmetic (26 topics)
    - Plotting integers on a number line
    - Ordering integers
    - Operations with absolute value: Problem type 2
    - Additive property of equality with whole numbers
    - Perimeter of a polygon
    - Constructing a bar graph for non-numerical data
    - Interpreting a bar graph
    - Constructing a histogram for numerical data
    - Signed fraction addition or subtraction: Advanced
    - Signed fraction multiplication: Advanced
    - Signed fraction division
    - Writing an improper fraction as a mixed number
    - Writing a mixed number as an improper fraction
    - Decimal place value: Hundreds to ten thousandths
    - Converting a fraction to a terminating decimal: Basic
    - Converting a fraction to a repeating decimal: Basic
    - Converting a mixed number to a terminating decimal: Basic
    - Converting a decimal to a proper fraction in simplest form: Advanced
    - Finding a percentage of a whole number without a calculator: Basic
    - Finding the multiplier to give a final amount after a percentage increase or decrease
    - Finding the percentage increase or decrease: Basic
    - Finding the absolute error and percent error of a measurement
    - Computing a percent mixture
    - Mean of a data set
    - Weighted mean: Tabular data
    - Converting between temperatures in Fahrenheit and Celsius
  - Linear Equations (11 topics)
    - Solving a proportion of the form  $a/(x+b) = c/x$
    - Writing a multi-step equation for a real-world situation
    - Solving a decimal word problem using a linear equation with the variable on both sides
    - Solving a fraction word problem using a linear equation with the variable on both sides
    - Solving a word problem with three unknowns using a linear equation
    - Solving a word problem involving consecutive integers
    - 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  $|ax+bl| = |cx+dl|$
  - Geometry (27 topics)
    - Drawing an angle with the protractor
    - Finding supplementary and complementary angles
    - Finding angle measures of an isosceles triangle given angles with variables



- Finding an angle measure given extended triangles
  - Using the Pythagorean Theorem repeatedly
  - Triangles and parallel lines
  - Identifying similar right triangles that overlap
  - Special right triangles: Decimal answers
  - Finding the dimensions of a rectangle given its perimeter and a relationship between sides
  - Finding the perimeter or area of a rectangle given one of these values
  - Area between two rectangles
  - Word problem involving the area between two rectangles
  - Finding lengths using scale models
  - Using a scale drawing to find actual area
  - Area of a parallelogram
  - Finding measures involving diagonals of parallelograms
  - Finding measures involving diagonals of rectangles
  - Perimeter involving rectangles and circles
  - Area involving rectangles and circles
  - Area between two concentric circles
  - Word problem involving the area between two concentric circles
  - Arc length
  - Area of a sector of a circle: Exact answer in terms of pi
  - Arc length and area of a sector of a circle
  - Identifying solids generated by rotations of two-dimensional regions
  - Volume of an oblique rectangular prism
  - Computing ratios of side lengths, surface areas, and volumes for similar solids
- Lines and Systems of Linear Equations (38 topics)
    - Distance between two points in the plane: Exact answers
    - Midpoint of a line segment in the plane
    - Finding x- and y-intercepts of a line given the equation: Advanced
    - X- and y-intercepts of a line given the equation in standard form
    - Graphing a linear inequality in the plane: Standard form
    - Graphing a linear inequality in the plane: Vertical or horizontal line
    - Finding the slopes of horizontal and vertical lines
    - Finding the coordinate that yields a given slope
    - Graphing a line through a given point with a given slope
    - Writing an equation of a line given its slope and y-intercept
    - Finding the slope and a point on a line given its equation in point-slope form
    - Graphing a line given its equation in point-slope form
    - Writing the equation of a line in point-slope form given the slope and a point
    - Writing the equation of a line in standard form given the slope and a point
    - 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
    - Comparing properties of linear functions given in different forms
    - Finding the coordinates of a point to make a parallelogram
    - Solving a linear equation by graphing
    - Identifying proportional relationships in tables by calculating unit rates: Whole numbers
    - Identifying proportional relationships in graphs: Basic
    - Identifying proportional relationships in graphs: Advanced
    - Comparing proportional relationships given in different forms
    - Constructing a scatter plot
    - Predictions from the line of best fit
    - Classifying linear and nonlinear relationships from scatter plots
    - Linear relationship and the sample correlation coefficient
    - Solving a word problem using a system of linear equations of the form  $Ax + By = C$
    - Solving a word problem using a system of linear equations of the form  $y = mx + b$
    - Introduction to solving a  $3 \times 3$  system of linear equations
    - Solving a  $3 \times 3$  system of linear equations: Problem type 1
    - Solving a  $3 \times 3$  system of linear equations: Problem type 2
    - Graphing a system of two linear inequalities: Basic
    - Finding an output of a function from its graph
    - Finding where a function is increasing, decreasing, or constant given the graph: Interval notation
    - Finding local maxima and minima of a function given the graph
    - Finding the absolute maximum and minimum of a function given the graph
    - Finding values and intervals where the graph of a function is zero, positive, or negative
  - Exponents, Polynomials, and Factoring (18 topics)
    - Power and product rules with positive exponents
    - Power and quotient rules with negative exponents: Problem type 1
    - Power and quotient rules with negative exponents: Problem type 2
    - Power of 10: Negative exponent
    - Finding the scale factor between numbers given in scientific notation in a real-world situation
    - Adding or subtracting numbers written in scientific notation: Same exponents, advanced
    - Simplifying a sum or difference of three univariate polynomials
    - Multiplying a multivariate polynomial by a monomial

- Squaring a binomial: Multivariate
  - Multiplication involving binomials and trinomials in one variable
  - Multiplication involving binomials and trinomials in two variables
  - Greatest common factor of two multivariate monomials
  - Factoring a univariate polynomial by grouping: Problem type 1
  - Factoring a univariate polynomial by grouping: Problem type 2
  - Factoring out a constant before factoring a quadratic
  - Factoring a quadratic with a negative leading coefficient
  - Factoring a difference of squares in one variable: Advanced
  - Using the Pythagorean Theorem and a quadratic equation to find side lengths of a right triangle
- Rational Expressions (19 topics)
    - Restriction on a variable in a denominator: Quadratic
    - Simplifying a ratio of polynomials: Problem type 1
    - Least common multiple of two monomials
    - Adding rational expressions with multivariate monomial denominators: Advanced
    - Complex fraction without variables: Problem type 2
    - 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 that contains a complex fraction
    - Solving a rational equation that simplifies to linear: Unlike binomial denominators
    - 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 and numerators
    - Solving a distance, rate, time problem using a rational equation
    - Writing a direct variation equation
    - Writing an inverse variation equation
- Radicals (14 topics)
    - Introduction to square root addition or subtraction
    - Introduction to simplifying a sum or difference of radical expressions: Univariate
    - Simplifying a sum or difference of radical expressions: Univariate
    - Simplifying a sum or difference of radical expressions: Multivariate
    - Simplifying a product of radical expressions: Multivariate, fractional expressions
    - Introduction to simplifying a product involving square roots using the distributive property
    - Simplifying a product involving square roots using the distributive property: Advanced
    - Rationalizing a denominator: Quotient involving square roots
    - Rationalizing a denominator: Square root of a fraction
    - Solving a radical equation that simplifies to a linear equation: One radical, advanced
    - 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 an equation with a root index greater than 2: Problem type 2
    - Solving an equation with exponent  $1/a$ : Problem type 2
- Quadratic Functions (13 topics)
    - Discriminant of a quadratic equation
    - Solving an equation using the odd-root property: Problem type 1
    - Finding the x-intercept(s) and the vertex of a parabola
    - Rewriting a quadratic function to find its vertex and sketch its graph
    - Finding the maximum or minimum of a quadratic function
    - Word problem involving the maximum or minimum of a quadratic function
    - Word problem involving optimizing area by using a quadratic function
    - Writing the equation of a quadratic function given its graph
    - Solving a quadratic equation by graphing
    - Graphing an ellipse given its equation in standard form
    - Graphing an ellipse centered at the origin:  $Ax^2 + By^2 = C$
    - Graphing a hyperbola given its equation in standard form
    - Graphing a hyperbola centered at the origin:  $Ax^2 + By^2 = C$
- Function Operations (9 topics)
    - Evaluating functions: Absolute value, rational, radical
    - Variable expressions as inputs of functions: Problem type 1
    - Variable expressions as inputs of functions: Problem type 2
    - Translating the graph of a function: Two steps
    - Transforming the graph of a function by reflecting over an axis
    - Transforming the graph of a function by shrinking or stretching
    - Transforming the graph of a quadratic, cubic, square root, or absolute value function
    - Sum, difference, and product of two functions
    - Quotient of two functions: Basic

- Exponential and Logarithmic Functions (12 topics)
  - Graphing an exponential function and its asymptote:  $f(x) = a(e)^{x-b} + c$
  - Finding the initial amount and rate of change given an exponential function
  - Graphing a logarithmic function: Basic
  - Graphing a logarithmic function: Advanced
  - Change of base for logarithms: Problem type 2
  - Solving a multi-step equation involving a single logarithm: Problem type 1
  - Solving a multi-step equation involving a single logarithm: Problem type 2
  - Solving an exponential equation by using logarithms: Decimal answers, basic
  - Solving an exponential equation by using logarithms: Decimal answers, advanced
  - Finding the time to reach a limit in a word problem on exponential growth or decay
  - Writing and evaluating a function modeling continuous exponential growth or decay given doubling time or half-life
  - Writing and evaluating a function modeling continuous exponential growth or decay given two outputs
  
- Trigonometric Functions (9 topics)
  - Area of a sector of a circle
  - Sine, cosine, and tangent ratios: Variables for side lengths
  - Using similar right triangles to find trigonometric ratios
  - Reference angles: Problem type 1
  - Word problem involving a sine or cosine function: Problem type 1
  - Sketching a graph of a damped sine or cosine function
  - Composition of a trigonometric function with its inverse trigonometric function: Problem type 1
  - Composition of a trigonometric function with its inverse trigonometric function: Problem type 2
  - Composition of trigonometric functions with variable expressions as inputs: Problem type 2
  
- Trigonometric Equations and Vectors (23 topics)
  - Finding solutions in an interval for a basic trigonometric equation involving sine or cosine
  - Finding solutions in an interval for a basic trigonometric equation involving tangent, cotangent, secant, or cosecant
  - Finding solutions in an interval for a basic trigonometric equation using a calculator
  - Solving a trigonometric equation modeling a real-world situation
  - Solving a triangle with the law of sines: Problem type 1
  - Solving a triangle with the law of sines: Problem type 2
  - Solving a word problem using the law of sines
  - Solving a triangle with the law of cosines
  - Solving a word problem using the law of cosines
  - Using trigonometry to find the area of a right triangle
  - Using trigonometry to find the area of a triangle
  - Expressing the area of a triangle in terms of the sine of one of its angles
  - Translation of a vector
  - Vector addition and scalar multiplication: Component form
  - Linear combination of vectors: Component form
  - Unit vectors
  - Dot product of vectors given in component form
  - Finding the angle between two vectors given in component form
  - Classifying vector relationships by finding the angle between two vectors given in  $ai + bj$  form
  - Using the dot product to find perpendicular vectors
  - Decomposing a vector into two orthogonal vectors
  - Finding the amount of work done given a force vector and a distance
  - Finding magnitudes of forces related to an object on a ramp

**\*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.