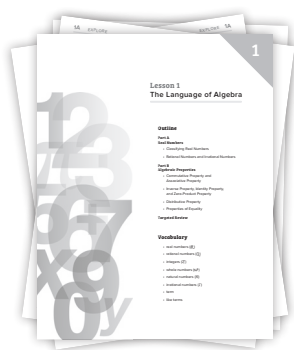


Welcome to Algebra 1!



Algebra 1: Principles of Secondary Mathematics challenges students to build in-depth knowledge in preparation for a more advanced study of math. Core algebraic topics and objectives are presented and addressed as students become fluent in the mathematical language, problem styles, and problem-solving and reasoning skills.

Each lesson presents a careful, intentional progression that allows students to activate and review concepts already mastered, have ample opportunities for practice, achieve and show mastery, and deepen their problem-solving abilities.

Unit 1: Foundations of Algebra

Lesson 1: The Language of Algebra

- Identify numbers as real, rational, integers, whole, natural, and/or irrational.
- Draw a scaled number line showing numbers and approximate numbers.
- Explain why:
 - a rational number + a rational number = a rational number
 - a rational number + an irrational number = an irrational number
 - an irrational number · an irrational number = an irrational number
- Identify algebraic properties within an equation or scenario.
- Use algebraic properties to explain the steps in an expression or equation.

Lesson 2: Solving Equations

- Solve a multi-step equation.
- Use substitution to prove your solutions are correct.
- When given a problem with defined variables, write a single-variable equation.
- When given an equation that has more than one variable, solve for a specific variable.
- Rewrite equations with rational coefficients to integer coefficients before solving.
- Determine that an equation has no solution or is an identity.

Lesson 3: Solving Absolute Value Equations

- Solve one- and two-step absolute value equations.
- Graph one- and two-step absolute value equation solutions on a number line.
- Explain why an absolute value equation can have two solutions.
- Write and solve an absolute value equation from a given problem.
- Solve multi-step absolute value equations.
- Graph multi-step absolute value equation solutions on a number line.
- Determine when an absolute value equation has no solution or is an identity.

Lesson 4: Solving Inequalities

- Solve inequalities that include rational coefficients.
- Graph solutions for an inequality on a number line.
- Explain why the inequality symbol changes when multiplying by a negative factor.
- Solve and graph solutions for single-variable compound inequalities.
- Solve and graph solutions for single-variable inequalities that contain absolute value.
- Identify inequalities containing absolute value as having no solution or as true for all real numbers.

Lesson 5: Ratios, Proportions, and Rates

- Determine equivalent ratios.
- Solve a proportion using cross-products.
- Convert units for a value using a single conversion.
- Convert units for a value using multiple conversions.
- Convert compound units for a value.

Lesson 6: Understanding Data

- Match a data set to a graph, including dot plots, histograms, and box plots.
- Calculate measures of spread, including range, interquartile range, and the five-number summary.
- Calculate the measures of center: mean, median, and mode.
- Use the 68-95-99.7 Rule and bell curves to analyze standard deviations.
- Use the outlier formula to determine if a data set contains outliers.
- Compare center and spread for multiple data sets, including their outliers.

Unit 2: Linear Equations and Functions

Lesson 7: Functions

- Find the domain and range of a relation from a graph, table, and mapping.
- Express the definition of a function using words and diagrams.
- Write equations with two variables in function notation.
- Identify variables as dependent or independent.
- Evaluate a function for the dependent variable given a set of values for the independent variable.
- Determine whether a specific point is a solution for a function presented as a graph, table, or equation.

Lesson 8: Using Graphs

- Identify intercepts of a line from a graph, table, or equation.
- Given a graph of a line, determine the slope using slope triangles or rise over run.
- Plot the graph of a line given a point and the slope.
- Express the linear parent function in all forms (table, graph, and equation).
- Demonstrate translations by a factor of b to a linear function.
- Explain how b translates a linear function up or down.

Lesson 9: Slope and Linear Functions

- Use the slope formula, $m = \frac{\Delta y}{\Delta x}$, to calculate the slope of a line when given two points on the line.
- Describe a graph as a scenario using mathematical vocabulary and sketch a graph from a written scenario.
- Write linear equations in point-slope form from a given graph or a point and the slope.
- Write linear equations in slope-intercept form from a graph or given the slope and the y -intercept.
- Graph equations on the coordinate plane in point-slope or slope-intercept form.

Lesson 10: Writing Linear Equations

- Write an equation in slope-intercept form given the slope and one point.
- Write an equation in slope-intercept form given two points.
- Write an equation in slope-intercept form given any type of scenario.
- Explain what a given point, the slope, and the x - and y -intercept represent within the context of a word problem.

Lesson 11: More Forms of Lines

- Solve for the x - and y -intercepts from standard form and use the intercepts to create a graph of the line.
- Convert the equation of a line to standard form. Determine the slope and intercept formulas found in a linear equation in standard form.
- Graph horizontal and vertical lines.
- Find the domain, range, slope, and y -intercept for horizontal and vertical lines.
- Determine the equation of horizontal and vertical lines that pass through a given point.

Lesson 12: Parallel and Perpendicular Lines

- Identify parallel lines.
- Write the equation of a line that is parallel to another known line and passes through a given point.
- Identify perpendicular lines.
- Write the equation of a line that is perpendicular to another known line and passes through a given point.

Lesson 13: Scatter Plots

- Identify a correlation of a scatter plot as strong or weak, positive or negative, or no correlation.
- Explain the meanings of correlations in real-life examples.
- Create a scatter plot with accurate scale, labels, and ordered pairs.
- Estimate and draw the line of best fit for a set of data.
- Write the equation for the line of best fit in the requested form.
- Use the line of best fit to interpolate, extrapolate, and explain the context of the data.

Lesson 14: Types of Functions and Arithmetic Sequences

- Decide if a function is discrete or continuous and explain the difference.
- Use interval notation to define the domain and range of functions.
- Choose the most appropriate form of the equation of a line for a given scenario.
- Describe the arithmetic sequence of a given set.
- Use a sequence to find additional terms.

Unit 3: Systems of Equations and Inequalities

Lesson 15: Graphing Systems

- Identify and describe the types of possible solutions for a system of equations.
- Graph a system of equations given in slope-intercept form. Then find and explain the solution to the system.
- Graph a system of equations not given in slope-intercept form. Then find and explain the solution to the system.
- Describe what the shaded region on a graph of a linear inequality or a system of linear inequalities represents.
- Graph a linear inequality.
- Graph a system of linear inequalities.

Lesson 16: Solving Systems Algebraically

- Use substitution to solve a system of equations when both equations have an isolated variable.
- Use substitution to solve a system of equations when one equation has an isolated variable.
- Use substitution to solve a system of equations when none of the equations have an isolated variable.
- Use elimination to solve a system of equations when one variable has a set of opposite coefficients.
- Use elimination to solve a system of equations by distributing -1 across an equation.
- Use elimination to solve a system of equations using linear combinations.

Lesson 17: Applications of Linear Systems

- Choose the best method to solve a system of linear equations and justify your choice.
- Write systems of equations for how much and how many, coin, and wind and water word problems and solve them.
- Explain the solutions to how much and how many, coin, and wind and water problems and determine if the solutions are reasonable.

Lesson 18: More Applications of Linear Systems

- Write systems of equations for break-even, formula, and digit word problems and solve them.
- Explain the solutions to break-even, formula, and digit problems and determine if the solutions are reasonable.
- Identify and apply the following key words to write an inequality from a verbal model:
 - is more than
 - is at most
 - is less than
 - has a minimum of
 - is no more than
 - has a maximum of
 - is at least
- Write a system of inequalities from a scenario and solve for the solution.
- Explain what the solution to a system of inequalities means within a given context.

Unit 4: Polynomial Expressions and Equations

Lesson 19: Product and Power Rules for Exponents

- Use the product of powers rule for exponents ($a^x \cdot a^y = a^{x+y}$) to simplify expressions.
- Use the power of powers rule for exponents ($(a^x)^y = a^{x \cdot y}$) and the power of a product rule for exponents ($(ab)^x = a^x b^x$) to simplify expressions.
- Simplify exponential expressions using both the product and power rules for exponents.
- Apply the product and power rules for exponents to formulas.

Lesson 20: Polynomial Expressions

- Classify polynomials by degree and number of terms.
- Write polynomials in standard form.
- Calculate the sum or difference of polynomial expressions.
- Multiply a monomial by a polynomial using the Distributive Property and exponent rules.
- Find the product of a binomial and a binomial using the Distributive Property.
- Find the product of a binomial and a trinomial, as well as a trinomial and a trinomial.

Lesson 21: Introduction to Factoring Polynomials

- Determine the greatest common monomial factor of a polynomial expression using the inverse of the Distributive Property.
- Write a polynomial expression as the product of its greatest common monomial factor and another factor.
- Factor polynomials by grouping.

Lesson 22: Patterns in Factoring

- Find the factors of a product that have a given sum or difference.
- Analyze the sign patterns of trinomials.
- Factor special products including the difference of two squares (DOTS) and trinomial squares (TriSq).

Lesson 23: Factoring Polynomials

- Demonstrate different methods of factoring trinomials.
- Factor trinomials in standard form when the leading coefficient is equal to 1.
- Factor trinomials in standard form when the leading coefficient is not equal to 1.

Lesson 24: More Factoring

- Factor polynomials completely, or state when a polynomial is not factorable.
- Explain what the zeros of a quadratic equation represent.
- Solve quadratic equations equal to zero by factoring.

Lesson 25: Applications of Quadratics

- Solve quadratic equations not equal to zero by factoring.
- Translate a quadratic word problem into symbolic notation.
- Solve a quadratic word problem.

Unit 5: Quadratics, Exponentials, Radicals

Lesson 26: Graphing Quadratics

- Find the direction, axis of symmetry, vertex, and y -intercept of a quadratic function.
- Graph a quadratic function.
- Find exact and approximate solutions to quadratic equations, using technology as needed.
- Determine the domain and range for quadratic equations.

Lesson 27: More Quadratic Graphing

- Graph quadratic inequalities.
- Recognize vertex form and identify and graph a , h , and k .
- Translate a parent graph vertically and horizontally and describe the transformation.
- Reflect and dilate a parent graph and describe the transformation.
- Transform a parent graph using more than one transformation (translation, reflection, dilation) and describe the transformation.

Lesson 28: More Exponent Rules

- Write expressions with exponents so that all terms are in the numerator.
- Simplify expressions containing negative and zero exponents using only positive exponents.
- Simplify monomial expressions using the quotient rules for exponents.

Lesson 29: Radical Expressions and Equations

- Simplify radical expressions with variables.
- Write radical expressions using rational exponents.
- Add and subtract radical expressions.
- Solve equations with rational exponents.
- Solve second degree polynomial equations by taking the square root.
- Solve radical equations by taking the inverse of the square root.

Lesson 30: Exponential Functions

- Graph an exponential function from a table.
- Determine the domain and range of an exponential function.
- Find the common ratio for exponential functions from a table.
- Determine a , r , t and whether the function represents growth or decay.
- Calculate exponential growth and decay using the formula.

Extension Lessons

Extension: Completing the Square

- Determine the value of c to make a perfect-square trinomial for $x^2 + bx + c$.
- Solve quadratic equations by completing the square.

Extension: The Quadratic Formula and the Discriminant

- Determine the number of real solutions to a quadratic equation using the discriminant.
- Use the quadratic formula to find solutions to a quadratic equation.
- Derive the quadratic formula by completing the square for $ax^2 + bx + c$.

Extension: Graphing Linear and Quadratic Systems

- Graph a system consisting of a linear and quadratic equation.
- Determine the solution(s) of the linear/quadratic system of equations.
- Graph a system consisting of a linear and quadratic inequality.