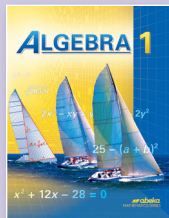# MATHEMATICS: *Algebra 1*

Algebra is an extension of arithmetic, and the concepts and procedures of arithmetic are used as the foundation upon which the study of algebra is built. Algebra supplies the language and patterns of reasoning used in the sciences and other branches of knowledge. Algebraic axioms are used to form and solve equations.

Algebra 1 uses mathematical ideas in solving problems ranging from everyday applications to applications in the physical and biological sciences.

For this grade level, see also *Algebra II* on p. 158.

Features
- Flexible pacing options in curriculum
- Review exercises for every section (107)
- Informational boxes including mathematical history and applications of algebra (13)
- Mid-chapter reviews (13)
- Chapter reviews (12)
- Nine-weeks reviews (2)
- Semester review
- Final review

Evaluation
- Quizzes (36)
- Tests (8)
- 9-weeks exam (2)
- Semester exam
- Final exam

➤ **RED** *indicates first introduction of content.*

Real Numbers and the Language of Algebra
- Using letters, notation
- Terms, coefficients, factors, variables
- Evaluating algebraic expressions with given value
- Translating word phrases into algebra
- Commutative property
  - Addition
  - Multiplication
- Order of operations
- Distributive property
- Simple interest formula
- ➤ Distance formula: Cartesian Plane
- Numbers
  - Integers
  - Natural numbers
  - Whole numbers
  - Real numbers
  - Rational numbers
  - Irrational numbers
- Signed numbers
  - Addition, subtraction, multiplication, division
- Least common denominator (LCD)—numerical
- ➤ Least common denominator (LCD)—algebraic
- Absolute value
- Simplifying algebraic expressions
- Writing formulas from descriptions
- Associative property
  - Addition, multiplication
- Identity property
  - Addition, multiplication
- Inverse property
  - Addition, multiplication

Linear Equations in One Variable
- Solving equations
- Addition property of equality
- Multiplication property of equality
- Linear equations:
  - Identity, contradiction, conditional
- Clearing equations of fractions, decimals
- Absolute value
  - Absolute value definition

- ➤ Linear absolute value equations
- ➤ Graphing absolute value equations on a number line
- ➤ Literal equations
  - Dependent variable, independent variable
- Solving word problems
  - Mixture problems

Linear Equations in Two Variables
- Cartesian plane
  - Ordered pair
  - ➤ Abscissa
  - ➤ Ordinate
  - Origin
  - Quadrants
  - ➤ Collinear points
  - Plotting points on the Cartesian plane
- Develop a table of values for a linear equation
- Graph a linear equation
- Slope:
  - Formula
  - Horizontal, vertical, zero, undefined
- X and Y intercepts
- ➤ Standard form of an equation
- Slope-intercept form
  - Convert equation to slope-intercept form
  - Graph equation using slope-intercept form
- ➤ Find equation using point-slope form
- Parallel and perpendicular lines
  - ➤ Find slope using another slope
  - ➤ Find equation using another equation

Linear Inequalities
- Law of trichotomy
- Inequality notation
- Graphing inequalities on a number line
- Addition property of inequality
- Multiplication property of inequality
- Solve linear inequalities
- Graph linear inequalities on a number line
- Write inequalities from word problems
- Compound inequalities
  - ➤ Interval notation
  - Solve compound inequalities
  - Graph compound inequalities on a number line

MATHEMATICS: *Algebra 1* cont.

Linear Inequalities *cont.*
➤ Absolute value inequalities
  ➤ Solve absolute value inequalities
  ➤ Graph absolute value inequalities on a number line
➤ Linear inequalities in two variables
  ➤ Solve linear inequalities in two variables
  ➤ Graph linear inequalities in two variables

Systems of Equations
- System of linear equations
  - Consistent and inconsistent systems
  - Dependent and independent equations
  - Point of intersection
- Solve a system of linear equations:
  - Graphing
  - Substitution
  - Elimination
➤ Solve word problems with systems of equations

Polynomial Arithmetic
- Monomial, binomial, trinomial, polynomial
➤ Degree of polynomial
- Addition of polynomials
  - Combining like terms
- Subtraction of polynomials
- Multiplication of polynomials
  - Multiplying monomials
  - Product rule for exponents
  - Power rule for exponents
  - Multiply polynomials by monomials
  - Multiply a binomial by a binomial
  - FOIL
  ➤ Square a binomial
  ➤ Multiply binomial conjugates
  - Multiply a polynomial by a polynomial
- Division of polynomials
  - Divide monomials
  - Quotient rule for exponents
  - Zero exponent rule
  - Negative exponent rule
  - Divide a polynomial by a monomial
  ➤ Divide a polynomial by a binomial
- Scientific notation
- Addition, Subtraction
- Solve equations involving simplification
➤ Write a quadratic equation for a polygon
  ➤ Plane geometric figures
  ➤ Three-dimensional geometric figures

Polynomial Factoring
- Greatest common factors
  - Prime, composite
- Fundamental theorem of arithmetic
- Factoring:
  - Factor a common factor from a polynomial
  ➤ Perfect square trinomials
  ➤ Difference between two squares
  ➤ Factoring general trinomials
  ➤ Trinomials with a second variable
  - By grouping

➤ Zero factor property
  ➤ Extraneous solutions
➤ Solving equations after factoring
➤ Applying polynomial factoring

Radical Expressions and Equations
- Radical, radicand, index
- Principal root
➤ Quotient rule for radicals
- Product rule for radicals
- Simplifying radicals
- Adding and subtracting radicals
  - Like radicals
➤ Multiplying radical expressions
➤ Rationalizing the denominator of a radical
  ➤ Rationalizing two term denominators:
  ➤ Conjugate
- Rational exponent property
- Expressions with rational exponents:
  - Simplify, multiply, divide
➤ Solving radical equations
- Pythagorean theorem:
  - Hypotenuse, legs
➤ Distance formula
  ➤ Find distance between two points from formula

Quadratic Equations
➤ Quadratic equations in standard form
➤ Solve quadratic equations by:
  ➤ Factoring
  ➤ Extracting the root
  ➤ Completing the square
  ➤ Quadratic formula
- Pure quadratic
➤ Discriminant
➤ Applying quadratic equations in word problems

Statistics and Probability
- Statistics
  ➤ Descriptive
  ➤ Inferential
  - Graphs features:
  - Chart title, scale, gridlines, zero line, category label, axis title, major and minor gridlines, data label, legend
- Bar graph
  - Interpreting bar graphs
  - Creating bar graphs
  - Frequency
  - Trend
  - Segmented bar graph
  - Interpreting segmented bar graphs
  ➤ Clustered bar graph
  ➤ Interpreting clustered bar graphs
- Percent of change
- Circle graphs
  - Creating circle graphs
  - Interpreting circle graphs

MATHEMATICS: *Algebra 1* cont.

Statistics and Probability *cont.*

- ➤ Types of information
  - ➤ Qualitative
  - ➤ Quantitative
  - ▪ Classes categorization
- ▪ Stem-and-Leaf plots
  - ▪ Stem
  - ▪ Leaf
  - ▪ Creating stem-and-leaf plots
  - ▪ Interpreting stem-and-leaf plots
- ▪ Histograms
  - ▪ Creating histograms
  - ▪ Interpreting histograms
  - ➤ Frequency distribution
  - ➤ Symmetric or asymmetric distribution
- ▪ Measure of center
  - ▪ Arithmetic mean
  - ▪ Median
  - ▪ Outlier
  - ▪ Mode
- ▪ Box-and-Whisker plot
  - ▪ Creating box-and-whisker plot
  - ▪ Interpreting box-and-whisker plot
  - ▪ Dispersion
  - ▪ Five-number summary
  - ▪ Minimum
  - ▪ Maximum
  - ▪ Quartiles
  - ➤ Skewness
- ▪ Scatterplots
  - ➤ Univariate data
  - ➤ Bivariate data
  - ➤ Explanatory and response variable
  - ▪ Positive and negative association
  - ➤ Causation
- ▪ Line of fit
  - ➤ Exponential growth
  - ▪ Interpolation
  - ▪ Extrapolation
- ▪ Probability
  - ▪ Outcome
  - ▪ Mutually exclusive or not mutually exclusive
  - ▪ Calculate probability of single event
  - ▪ Probability notation
  - ▪ Independent events
  - ▪ Dependent events
  - ▪ Probability of multiple events
  - ➤ Conditional probability
  - ▪ Tree diagram

Rational Expressions and Equations

- ➤ Rational expression
  - ➤ Undefined
  - ➤ Domain
- ➤ Simplifying rational expressions
- ➤ Multiply rational expressions
- ➤ Divide rational expressions
- ➤ Add and subtract rational expressions
  - ➤ Least common denominator of rational expressions
- ➤ Complex fractions
- ➤ Solving rational equations
  - ▪ Proportion
- ▪ Word problems
  - ▪ Ratios and proportions
  - ➤ Word problems involving work

Functions

- ▪ Direct variation
  - ▪ Constant of variation
  - ▪ Dependent variable and independent variable
- ▪ Functions
  - ▪ Relation
  - ▪ Function notation
  - ▪ Determine if an equation is a function
- ➤ Domain of functions
- ➤ Zero of a function
- ▪ Parabola
  - ➤ Vertex
  - ➤ Parabola vertex formula
- ▪ Graph parabolas
  - ➤ Rigid transformations
  - ➤ Non-rigid transformations
  - ➤ Parent function
  - ➤ Vertical translation
  - ➤ Horizontal translation
  - ➤ Standard graphing form of a parabola