

MCPS Curriculum 2.0 Algebra I*

Unit 1: Relationships between Quantities and Reasoning with Equations

By the end of 8th grade, students have mastered the process of solving linear equations in one variable. Unit 1 of Algebra I builds on that experience by asking students to analyze and explain this process and to reason quantitatively and use units to solve problems. Students develop fluency and master writing, interpreting, and translating between various forms of linear equations and inequalities in one variable, and using them to solve problems. They also solve simple exponential equations that rely only on the application of the laws of exponents. All of this work is grounded in understanding quantities and the relationships between them.

- **Topic 1: Linear Equations in One Variable**
 - **A.CED.1** Create equations and inequalities in one variable and use them to solve problems. (Include equations arising from linear and quadratic functions, and simple rational and exponential functions.)
 - **A.REI.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- **Topic 2: Linear Inequalities in One Variable**
 - Same standards as Topic 1 with a focus on inequalities
- **Topic 3: Exponential Equations in One Variable**
 - Same standards as Topic 1 with a focus on exponential equations

Unit 2: Linear and Exponential Relationships

Unit two focuses on linear and exponential relationships in two variables, beginning with developing a solid understanding of functions. In earlier grades, students have defined, evaluated, and compared functions, and used them to model relationships between quantities. In this unit, students learn function notation and develop the concepts of domain and range. They move beyond viewing functions as processes that take inputs and yield outputs and start viewing functions as objects in their own right. They explore many examples of functions, including sequences. Students interpret arithmetic sequences as linear functions and geometric sequences as exponential functions. Students interpret functions given graphically, numerically, symbolically, and verbally, translate between representations, and understand the limitations of various representations. Work includes functions that can be described or approximated by formulas as well as those that cannot. When functions describe relationships between quantities arising from a context, students reason with the units in which those quantities are measured. Embedded in this study of functions, students achieve fluency writing, interpreting, and translating between various forms of linear equations and inequalities in two variables, and use them to solve problems. Overarching the entire unit is the comparison of linear and exponential functions, distinguishing between additive and multiplicative change.

- **Topic 1: Functions**
 - **F.IF.4** For a function that models a relationship between two quantities, interpret key features of the graph and the table in terms of the quantities, and sketch the graph showing key features given a verbal description of the relationship. ★
 - **F.IF.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
 - Includes understanding functions, domain, range, intercepts, rate of change, graphing linear and exponential functions, and properties with rational exponents.
- **Topic 2: Equations in Two Variables**
 - **CED.2** Create linear and exponential equations in two variables to represent relationships between quantities, graph equations on coordinate axes with labels and scales.
 - **REI.6** Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables.
- **Topic 3: Writing Functions**
 - **F.BF.1** Combine standard function types using arithmetic operations.
 - **F.LE.2** Construct linear and exponential functions, including arithmetic and geometric sequences.
 - **F.LE.1** Distinguish between situations that can be modeled with linear functions and with exponential functions.

Unit 3: Descriptive Statistics

This unit builds upon students' prior experiences with center, variability, scatterplots, and linear trends in data, by providing more formal means of assessing how a model fits data. Students use regression techniques to describe approximately linear relationships between quantities and look at residuals to analyze the goodness of fit.

- **Topic 1: Analyzing Data Representations**
 - **S.ID.5** Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
 - **S.ID.6** Represent data on two quantitative variables on a scatter-plot, and describe how the variables are related.

Unit 4: Quadratic Relationships

In this unit, students extend their knowledge of linear and exponential functions to quadratic functions. They compare the key characteristics of quadratic functions to those of linear and exponential functions and select from among these functions to model phenomena. Students relate the graph of a quadratic function to various forms of quadratic expressions. Students learn that when quadratic equations do not have real solutions the number system must be extended so that solutions exist. Formal work with complex numbers comes in Algebra II. Through their work with quadratic relationships students explore distinctions between rational and irrational numbers and apply this new understanding to see structure in and create and/or solve quadratic and exponential expressions, equations, and/or inequalities.

- **Topic 1: Quadratic Function**
 - **F.IF.4** For a function that models a relationship between two quantities, interpret key features of the graph and the table in terms of the quantities, and sketch the graph showing key features given a verbal description of the relationship. ★
 - **F.IF.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
 - Includes transformations, comparing to linear and exponential function graphs.
- **Topic 2: Equations in Two Variables**
 - **F.IF.8a** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
 - Includes factoring, completing square, and other transformations of expressions.
 - **A.APR.1** Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. (contributes to mindful manipulation fluency expectation)
- **Topic 3: Solving Quadratic Equations**
 - **A.REI.4** Solve quadratic equations in one variable.
 - Includes using factoring, completing the square, quadratic formula, and by inspection.
 - **A.REI.7** Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.* **Note:** Include systems that lead to work with fractions.

Unit 5: Generalizing Function Properties

Students expand their experience with linear, quadratic, and exponential functions to include more specialized functions—absolute value, step, and those that are piecewise-defined. They select from among these models to model phenomena and solve problems.

- **Topic 1: Function Families**
 - **F.IF.7b** Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. (note: square root and cube root may be in Algebra II)