

The Algebra Progression in *MathLinks*: Grade 8

Algebra topics primarily appear in the CCSS-M Expressions and Equations and Functions domains. They are also in the Statistics and Probability domain. These areas are the focus of six units in *MathLinks* Grade 8.

Unit 1 (**Plane and Solid Figures**) and Unit 2 (**Real Numbers and the Pythagorean Theorem**) apply 7th grade algebra to new 8th grade topics.

- In Unit 3, **The Algebra of Exponents and Roots**, students observe patterns in numerical expressions with exponents and generalize them to obtain the product, power, and quotient rules for exponents. They also use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number.
- In Unit 4, **Introduction to Functions**, students continue the work started in 6th and 7th grades with multiple representations by connecting real-life or visual contexts to tables, graphs, and algebraic equations. Functions are formally defined and students represent them in tables, graphs, and mapping diagrams. They interpret different characteristics of functions (e.g., increasing or decreasing, linear or nonlinear).
- In Unit 5 (this unit), **Linear Functions**, slope is formally defined as students find slopes of lines by counting on a grid, and by using the slope formula, which leads into using the slope-intercept form of a line, and applying this knowledge to solving various problems.
- In Unit 6, **Bivariate Data**, students graph bivariate numerical data as scatter plots, describe patterns of association (if they exist), estimate lines of best fit to points showing linear associations, write equations of these estimated lines from which predictions are made, and draw conclusions from the data.
- In Unit 7, **Linear Equations and Systems 1**, students solve linear systems of equations by graphing, noting that these systems have exactly one solution, no solutions, or infinitely many solutions. Estimating solutions creates the need for a more precise solution method. The process of substitution is introduced as a way to take a system of two equations in slope-intercept form and creating one equation in one variable. This creates a need to learn to solve equations with variables on both sides.

Students then revisit the “cups and counters” model (introduced in Grade 7) for solving equations. The model aids the transition to formal procedures. Students see a parallel to the work done with systems, as linear equations in one variable may have one, infinitely many, or no solutions.

- In Unit 8, **Linear Equations and Systems 2**, students revisit the use of procedures to solve equations in one variable, though made harder by the introduction of non-integer values. With newly acquired equation-solving skills, students use the substitution method to solve systems algebraically. The elimination method is introduced as an alternative algebraic method, but is not rigorously pursued, being left to high school mathematics. The unit culminates with applications that utilize skills learned in Units 7 and 8.

The concept of a function is revisited in Unit 9 (**Congruence**) and Unit 10 (**Similarity**) as a mapping diagram, and transformations are defined as functions that map points in the plane to points in the plane. Algebraic rules are used to describe translations on coordinate planes.