

ALGEBRA I Course Overview

[Unit Descriptions](#)

[Unit Assessments](#)

[Pacing Guide](#)

Algebra I Overview: The Story of Functions

Algebra I has two big ideas that are threads throughout the course. The first big idea is that we can construct representations of relationships between two sets of quantities and that these representations, which we call functions, have common traits. The second big idea is that we can use these relationships between the quantities, which we call variables, to use our knowledge of the value of one variable to predict or determine explicitly the value of the other variable. In our formulation of the course, the first big idea is intended to inform students' ability to use the second big idea. It should be noted that there is a critical important prerequisite idea which is our abstraction from the idea of a specific set of quantities into a variable reference to these quantities. While this is an expected outcome of the middle school Common Core standards, this big idea is one that many high school students still do not completely understand.

Unit Descriptions

Unit 0: Introduction to Algebra I

This introductory unit is designed to provide students with an opportunity to engage in worthwhile mathematical investigations. Through these investigations, students will draw heavily on the eight Mathematical Practices and establish their importance to this entire course. Through working with the mathematical practices, students will come to understanding the importance of seeing, doing, re-constructing, and supposing, in learning mathematics.

Unit 1: Modeling with Functions

Using functions to describe relationships between quantities is a core idea in high school algebra and mathematical thinking in general. Students began working with linear functions in grade 8, and in this unit they expand that work to address a variety of types of situations that can be modeled using functions, including exponential and quadratic relationships. Detailed analysis of specific types of functions will be addressed in subsequent units of study. The work here is more focused on appropriate modeling, understanding domain and range, using function notation, and interpreting functions in multiple representations. There is a particular emphasis on the differences between linear and exponential models, and specifically the types of growth these functions produce.

Unit 2: Linear Functions

This unit continues the work from unit 1, but with a particular focus on linear functions. Students continue to understand functions as mathematical relationships as they investigate rates of change and the key features of graphic representations and relate them to the specific relationship being modeled. Students write functions that describe such relationships using arithmetic and geometric sequences. The emphasis in this unit is not so much on the algebraic expression of linear functions, but on the conceptual understanding of linear functions as mathematical relationships and the specific character of such relationships as compared to other types of functions.

Unit 3: Linear Equations & Inequalities in 1 variable

This unit focuses on the algebra of equations and inequalities in one variable. Students deepen their understanding of the properties of equality and how the basic mathematical operations can be used to transform expressions, equations, and inequalities. These understandings form a basis for students to solve equations and inequalities in one variable and to rearrange formulas to isolate a specific quantity. By looking deeply into the meaning of equations and what it means to solve them, students use algebraic tools and concepts to investigate and interpret equations in a useful way. Students cannot effectively learn how to solve equations and inequalities by using a purely algorithmic or stepwise approach. It is imperative that they grapple with the mathematical principles that make the solving process work. Inequalities in one variable are presented as unique mathematical objects with infinite solution sets that can be expressed using a number line.

Unit 4: Linear Equations & Inequalities in 2 variables

Students build on algebraic skills highlighted in unit 3 to create, interpret, and graph equations and inequalities in two unknowns. Particular attention is placed on the idea that the graph of a linear equation in two unknowns represents the set of all its solutions plotted on the coordinate plane. Inequalities in two variables are presented as unique mathematical objects that have a solution set, which can be described by a half-plane when graphed. Students apply their understanding of equations and inequalities in two unknowns and their graphical representations to work with systems of equations and inequalities. In studying simultaneous linear equations both graphically and algebraically, and they build on that work here by focusing on justification of the methods used and on a deeper analysis of systems with no solution or infinite solutions. They also solve systems of inequalities by identifying the intersection of the two solution sets, shown graphically as half-planes.

Unit 5: Quadratic Functions

Students build on their experience with linear and exponential relationships as they investigate quadratic functions. They compare quadratic functions to linear and exponential functions and identify relationships in which the quadratic function is the most appropriate model. Continuing their work with domain and range, students graph quadratic functions and identify key features of the graphs. This includes understanding how different algebraic forms of quadratic functions can be used to identify key features of the graph, such as the roots, the vertex, and whether the function has a maximum or a minimum.

Unit 6: Quadratic Equations

In this unit, students use algebra to transform quadratic expressions and equations and to solve quadratic equations in one variable. This includes factoring quadratic expressions as well as using the quadratic formula and completing the square to solve quadratic equations. Students extend their number sense by investigating complex numbers within the context of quadratic equations with complex solutions. Finally, they build on their earlier work with linear systems by using algebra and graphing to solve systems consisting of a linear equation and a quadratic equation in two variables.

Unit 7: Statistics

This statistics unit contains two main ideas: interpreting data and modeling data. When working with data, there is always the temptation to stop at calculating measures of center and spread. A key focus of these standards is interpreting these measures in the context of the data sets. Comparisons between graphs of multiple data sets should also be emphasized. These comparisons should be based on descriptions of shape, center, spread, and extreme values. Students need to examine data using multiple representations, including various graphs, lists, and tables. The other focus of this unit is modeling data. Linear models are emphasized, but quadratic and exponential models are mentioned. While regression is not formally discussed in this unit, foundational understandings are developed to facilitate future study. Not only should linear models be approximated for appropriate data sets, but they should also be interpreted in context of the data set. Effort should be spent developing a conceptual understanding of correlation and causation. Students should be aware that correlation does not imply causation.

Unit Assessments

#	Unit Title	Assessments		
		Initial Task	FAL	Final Task
0	Introduction to Algebra I	None specified		
1	Modeling Functions	200 Freestyle	Functions & Situations	Bike Ride
2	Linear Functions	Patchwork Quilt	Lines & Linear Equations	Conference Tables
3	Linear Equations & Inequalities in 1 variable	Mystery Letters	Steps to Solving Equations	How Old Are They?
4	Linear Equations & Inequalities in 2 variables	Picking Apples or Soup & Beans	Solving Linear Equations in 2 Variables	The Cycle Shop
5	Quadratic Functions	Functions	Forming Quadratics	Quadratic Graphs
6	Quadratic Equations	Squares	Cutting Corners	Quadratic

7	<u>Statistics</u>	<u>Interpre</u> <u>ting</u> <u>Statistic</u> <u>s</u> <u>Heartbe</u> or <u>at</u> <u>Repres</u> <u>enting</u> <u>Data 1</u>
---	-------------------	--

Unit 8: The Regents Review unit focuses on reading comprehension and triggers. The students know how to do a problem most of the time, but if they don't understand what the problem is asking or don't know which procedure to use to solve it they will not try the problem. This unit is about enforcing everything we learned through the entire year. Perseverance, never giving up. They know now to read a problem at least 3 times. They will take out key words and recognize triggers to help them start a problem.