

## Algebra 1, Semester B

### Course Overview

Algebra 1, Semester B, is a single-semester course designed to build, develop, and periodically assess your subject-matter knowledge while strengthening your mathematical skills. The major topics of this semester are quadratic and exponential relationships. You'll learn to perform operations on polynomials and factor them. You will examine quadratic relationships in detail by writing and graphing quadratic equations. You'll also model real-world situations with quadratic functions and solve quadratic equations using a variety of methods. You will investigate exponential relationships and use exponential models to describe and make predictions about real-world situations. You'll solve linear-quadratic and linear-exponential functions. At the end of the semester, you'll compare different function types graphically and algebraically.

### Course Goals

By the end of this course, you will be able to do the following:

- Determine the sums, differences, and products of polynomials.
- Use factoring techniques and distribution to rewrite quadratic expressions.
- Graph and transform quadratic functions on the coordinate plane.
- Identify and use a quadratic data model to make predictions and solve problems.
- Solve quadratic equations in one variable by inspection, taking square roots, factoring, completing the square, and using the quadratic formula.
- Graph exponential functions, and identify their key features.
- Write and use exponential functions to model situations in the real world.
- Identify and analyze key features of piecewise and absolute value functions.
- Solve systems of linear and quadratic equations graphically and algebraically.
- Solve systems of linear and exponential equations graphically, tabularly, and by using successive approximation.

### Math Skills

Before beginning this course, you should be able to do the following:

- Solve problems involving operations with real numbers.
- Understand linear relationships through past work with ratios, proportions, and rates.
- Collect, analyze, and display data to solve problems.

## General Skills

To participate in this course, you should be able to do the following:

- Communicate through email.

*For a complete list of general skills that are required for participation in online courses, refer to the Prerequisites section of the Student Orientation, found at the beginning of this course.*

## Credit Value

Algebra 1, Semester B, is a 0.5-credit course.

## Course Materials

- notebook
- computer with internet connection and speakers or headphones
- graphing calculator

## Course Pacing Guide

This course description and pacing guide is intended to help you keep on schedule with your work. Note that your course instructor may modify the schedule to meet the specific needs of your class.

## Unit 1: Polynomials

### Summary

This unit is designed to provide you with the tools you need to solve and model complex problems using polynomials. Using the laws of exponents, you'll simplify algebraic expressions, including expressions with radicals and rational exponents. You'll rewrite monomial expressions and add, subtract, and multiply polynomials. Finally, you'll use factoring techniques, including the distributive property, to rewrite polynomial expressions of degree 2.

Day	Activity/Objective	Type
1 day: 1	<b>Syllabus and Student Orientation</b> <i>Review the Student Orientation and Course Syllabus at the beginning of this course.</i>	Course Orientation
3 days: 2–4	<b>Properties of Exponents</b> <i>Use the laws of exponents to rewrite monomial expressions and ratios of monomial expressions.</i>	Lesson

Day	Activity/Objective	Type
3 days: 5–7	<b>Radicals and Exponents</b> <i>Use the laws of exponents to rewrite expressions with radicals and rational exponents.</i>	Lesson
3 days: 8–10	<b>Adding and Subtracting Polynomials</b> <i>Determine sums and differences of polynomials.</i>	Lesson
3 days: 11–13	<b>Multiplying Polynomials</b> <i>Determine products of polynomials.</i>	Lesson
3 days: 14–16	<b>Factoring Polynomials, Part 1</b> <i>Use factoring techniques and distribution to rewrite quadratic expressions.</i>	Lesson
3 days: 17–19	<b>Factoring Polynomials, Part 2</b> <i>Use factoring techniques and distribution to rewrite quadratic expressions.</i>	Lesson
1 day: 20	<b>Unit Discussion—Unit 1</b>	Discussion
1 day: 21	<b>Posttest—Unit 1</b>	Assessment

## Unit 2: Quadratic Relationships

### Summary

In this unit, you'll examine quadratic relationships in detail. You will use the graphs of quadratic relationships to identify their key attributes, and then you'll determine the effects on the graph of the function  $f(x) = x^2$  when  $f(x)$  undergoes a variety of transformations. You will describe the relationship between the linear factors of quadratic expressions and the zeros of their associated quadratic functions. You will identify and use quadratic equations in vertex, standard, and factored form. At the end of the unit, you'll use quadratic functions to model real-world situations.

Day	Activity/Objective	Type
3 days: 22–24	<b>Quadratic Relationships</b> <i>Explore quadratic relationships and use their graphs to identify key attributes.</i>	Lesson
3 days: 25–27	<b>Graphs of Quadratic Relationships</b> <i>Graph and transform quadratic functions on the coordinate plane.</i>	Lesson

Day	Activity/Objective	Type
3 days: 28–30	<b>Forms of Quadratic Equations</b> <i>Identify and use the three forms of quadratic equations.</i>	Lesson
3 days: 31–33	<b>Writing Quadratic Functions and Equations</b> <i>Write quadratic equations in two variables.</i>	Lesson
4 days: 34–37	<b>Unit Activity and Discussion—Unit 2</b>	Unit Activity/ Discussion
1 day: 38	<b>Posttest—Unit 2</b>	Assessment

## Unit 3: Solving Quadratic Equations

### Summary

In this unit, you'll practice a variety of techniques for solving quadratic equations, including inspection, taking square roots, factoring, completing the square, and applying the quadratic formula. At the end of this unit, you'll solve quadratic equations using the method appropriate to the initial form of the equation.

Day	Activity/Objective	Type
3 days: 39–41	<b>Solving Quadratic Equations with Square Roots</b> <i>Solve quadratic equations in one variable by inspection and by taking square roots.</i>	Lesson
3 days: 42–44	<b>Solving Quadratic Equations by Factoring</b> <i>Solve quadratic equations in one variable by factoring.</i>	Lesson
3 days: 45–47	<b>Solving Quadratic Equations by Completing the Square</b> <i>Solve quadratic equations in one variable by completing the square.</i>	Lesson
3 days: 48–50	<b>The Quadratic Formula</b> <i>Solve quadratic equations in one variable and categorize the solutions using the quadratic formula.</i>	Lesson
3 days: 51–53	<b>Unit Activity and Discussion—Unit 3</b>	Unit Activity/ Discussion
1 day: 54	<b>Posttest—Unit 3</b>	Assessment

## Unit 4: Exponential Relationships

### Summary

This unit will introduce you to exponential relationships and the ways you can use them to model real-world situations. You'll examine the key features of exponential functions and their graphs. Then you'll describe transformations of exponential functions and practice writing exponential functions. You will write and graph exponential functions that model growth and decay. Finally, you'll use different representations to compare exponential functions.

Day	Activity/Objective	Type
3 days: 55–57	<b>Graphs of Exponential Relationships</b> <i>Graph exponential functions and identify their key features.</i>	Lesson
3 days: 58–60	<b>Transforming Exponential Functions</b> <i>Describe transformations of the graph of <math>f(x) = ab^x</math>.</i>	Lesson
3 days: 61–63	<b>Writing Exponential Functions</b> <i>Write exponential functions in mathematical and real-world contexts.</i>	Course Activity
3 days: 64–66	<b>Modeling with Exponential Functions</b> <i>Use exponential functions to model situations in the real world.</i>	Lesson
3 days: 67–69	<b>Comparing Exponential Functions</b> <i>Compare exponential functions that are represented in different ways.</i>	Lesson
1 day: 70	<b>Unit Discussion—Unit 4</b>	Discussion
1 day: 71	<b>Posttest—Unit 4</b>	Assessment

## Unit 5: Mixed Functions

### Summary

This unit will help you compare different function types and use them to solve mathematical and real-world problems. You'll graph piecewise-defined functions, including absolute value and step functions, and identify transformations of their graphs. You will solve simple systems consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. You'll use various methods to solve linear and exponential equations, observing that a quantity increasing exponentially eventually

exceeds a quantity increasing linearly. You will see that sequences are functions whose domain is a subset of the integers. Finally, you'll compare and translate representations of linear, exponential, and quadratic functions.

<b>Day</b>	<b>Activity/Objective</b>	<b>Type</b>
3 days: 72–74	<b>Piecewise and Absolute Value Functions</b> <i>Analyze key features of piecewise and absolute value functions algebraically and graphically.</i>	Lesson
3 days: 75–77	<b>Solving Systems of Linear and Quadratic Equations</b> <i>Solve systems of linear and quadratic equations using algebraic and graphical methods.</i>	Lesson
3 days: 78–80	<b>Solving Linear and Exponential Equations</b> <i>Use graphing, tables, and successive approximation to solve linear and exponential equations.</i>	Lesson
3 days: 81–83	<b>Sequences as Functions</b> <i>Use a function to represent a sequence and the terms of the sequence that the function defines.</i>	Lesson
3 days: 84–86	<b>Comparing Functions</b> <i>Compare and translate representations of linear, exponential, and quadratic functions.</i>	Lesson
1 day: 87	<b>Unit Discussion—Unit 5</b>	Discussion
1 day: 88	<b>Posttest—Unit 5</b>	Assessment
1 day: 89	<b>End-of-Semester Review</b>	
1 day: 90	<b>End-of-Semester Test</b>	Assessment