

Algebra 1, Semester A

Course Overview

Algebra 1, Semester A, is a single-semester course designed to cultivate and periodically assess your subject-matter knowledge while strengthening your mathematical skills. This course includes lessons that focus on the relationships of linear and nonlinear equations. You'll learn to create, graph, and solve linear and exponential equations and inequalities. You'll also use function notation to describe relationships between quantities and interpret function notation accurately to solve problems. Toward the end of this course, you'll study transformations of linear and exponential functions.

Course Goals

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

- Interpret and create graphs of linear and nonlinear relationships.
- Identify the parts of an expression and interpret what each part represents in context.
- Solve linear equations and inequalities for a variable.
- Create linear equations and inequalities in one variable.
- Solve systems of linear equations using algebraic and graphical methods.
- Solve linear and exponential equations using graphs.
- Create, graph, and solve exponential equations and inequalities in one or two variables to represent and solve problems.
- Use a function to represent a sequence and the terms of the sequence that the function defines.
- Calculate and interpret the average rate of change for a linear or exponential function over an interval.
- Compare representations of linear and exponential functions.
- Create and combine linear and exponential functions using arithmetic operations to build functions.
- Identify the effects of linear and exponential function transformations graphically and algebraically.

Math Skills

Middle school mathematics is a prerequisite for Algebra 1A. 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.
- Know the meaning of a line, and be able to make predictions from linear relationships.
- Collect, analyze, and display data to solve problems.

General Skills

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

- Understand the basics of spreadsheet software, such as Microsoft Excel or Google Spreadsheets, but having prior computing experience is not necessary.
- Communicate through email and participate in discussion boards.

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

Credit Value

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

Course Materials

- notebook
- computer with Internet connection and speakers or headphones

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: Quantities and Expressions

Summary

This unit begins with a Course Activity designed to introduce you to the concept of algebra. You'll then move on to study quantities and expressions. Quantities are expressed in many different ways: two of them are graphs and expressions. You'll begin by studying graphical representations of quantities and the relationships between them. Then you'll learn about expressions and how to interpret their parts. Finally, you'll examine the connection between radical symbols and fractional exponents.

Day	Activity/Objective	Type
1 day: 1	Syllabus and Student Orientation <i>Review the Student Orientation and Course Syllabus at the beginning of this course.</i>	Course Orientation
3 days: 2–4	Introduction to Algebra <i>Improve your ability to study algebra by exploring its history and nature, as well as the ways in which it helps people solve problems.</i>	Course Activity
3 days: 5–7	Graphs of Linear Relationships <i>Use appropriate units and quantities to interpret and create graphs of linear relationships.</i>	Lesson
3 days: 8–10	Graphs of Nonlinear Relationships <i>Use appropriate units and quantities to interpret and create graphs of nonlinear relationships.</i>	Lesson
3 days: 11–13	Interpreting Expressions <i>Identify the parts of an expression and interpret what each part represents in context.</i>	Lesson

3 days: 14–16	Radicals and Properties of Exponents <i>Apply properties of integer exponents to rational exponents and translate between expressions with rational exponents and radical notation.</i>	Lesson
4 days: 17–20	Unit Activity and Discussion—Unit 1	Unit Activity/ Discussion
1 day: 21	Posttest—Unit 1	Assessment

Unit 2: Using Linear and Exponential Relationships to Model Problems

Summary

In this unit, you'll rearrange and then create linear and exponential equations and inequalities in one and two variables to solve problems. You'll learn how to combine multiple equations and inequalities to create systems of equations and inequalities and then determine the viability of their solutions.

Day	Activity/Objective	Type
3 days: 22–24	Rearranging and Solving Linear Equations and Inequalities <i>Rearrange and solve linear equations and inequalities for a variable and identify the property of equality that justifies each step of the solution.</i>	Lesson
2 days: 25–26	Creating One-Variable Linear Equations and Inequalities <i>Create linear equations and inequalities in one variable and use them to solve problems.</i>	Lesson
3 days: 27–29	Creating One-Variable Exponential Equations and Inequalities <i>Create exponential equations and inequalities in one variable and use them to solve problems.</i>	Lesson
3 days: 30–32	Creating Two-Variable Linear and Exponential Equations <i>Create two-variable linear and exponential equations and graph them to display the relationship.</i>	Lesson

Day	Activity/Objective	Type
2 days: 33–34	Creating Systems of Equations and Inequalities <i>Create systems of equations and inequalities that represent boundaries from a context and determine the viability of solutions.</i>	Lesson
4 days: 35–38	Unit Activity and Discussion—Unit 2	Unit Activity/ Discussion
1 day: 39	Posttest—Unit 2	Assessment

Unit 3: Methods of Solving Linear and Exponential Equations, Inequalities, and Systems

Summary

In the third unit, you'll use algebraic and graphical methods to solve linear and exponential equations. You will also solve linear inequalities and systems of linear inequalities in two variables on a coordinate plane using graphical methods.

Day	Activity/Objective	Type
2 days: 40–41	Solving Systems of Equations <i>Solve systems of linear equations using algebraic and graphical methods.</i>	Lesson
2 days: 42–43	Solving Equations by Graphing <i>Use graphing, tables, and successive approximation to solve linear and exponential equations.</i>	Lesson
2 days: 44–45	Graphing Linear Inequalities <i>Graph solutions to linear inequalities and systems of linear inequalities in two variables on a coordinate plane.</i>	Lesson
4 days: 46–49	Unit Activity and Discussion—Unit 3	Unit Activity/ Discussion
1 day: 50	Posttest—Unit 3	Assessment

Unit 4: Function Representations

Summary

In this unit, you'll use function notation and function concepts to describe the relationships between quantities and to solve problems. You'll also use functions to represent a sequence. These functions will be linear or exponential, and you'll learn to interpret key features of their graphs in various contexts. In addition to graphical key features, you'll calculate the average rate of change for a linear or exponential function over an interval and compare linear and exponential functions.

Day	Activity/Objective	Type
2 days: 51–52	Function Notation and Function Concepts <i>Use function notation to describe relationships between quantities and interpret function notation accurately to solve problems.</i>	Lesson
2 days: 53–54	Sequences as Functions <i>Use a function to represent a sequence and the terms of the sequence that the function defines.</i>	Lesson
3 days: 55–57	Interpreting Linear and Exponential Functions and Their Graphs <i>Show a linear or exponential relationship between two quantities by sketching a graph that reveals key features and use a table or graph to interpret key features in context.</i>	Lesson
3 days: 58–60	Average Rate of Change with Linear and Exponential Functions <i>Calculate and interpret the average rate of change for a linear or exponential function over an interval.</i>	Lesson
3 days: 61–63	Graphing Linear and Exponential Functions and Their Key Features <i>Graph linear and exponential functions to show intercepts and end behavior.</i>	Lesson
3 days: 64–66	Comparing Linear and Exponential Functions <i>Compare representations of linear and exponential functions.</i>	Lesson

4 days: 67–70	Unit Activity and Discussion—Unit 4	Unit Activity/ Discussion
1 day: 71	Posttest—Unit 4	Assessment

Unit 5: Building Linear and Exponential Functions

Summary

In this unit, you'll determine functions used to model arithmetic and geometric sequences and then combine linear and exponential functions to build functions. You'll identify the effects of linear and exponential function transformations graphically and algebraically. Finally, you will construct functions that model situations and interpret what the parameters of these functions represent.

Day	Activity/Objective	Type
3 days: 72–74	Explicit and Recursive Functions <i>Determine explicit and recursive functions that model arithmetic or geometric sequences.</i>	Lesson
3 days: 75–77	Combining Functions <i>Create and combine linear and exponential functions using arithmetic operations to build functions.</i>	Lesson
4days: 78–81	Linear and Exponential Function Transformations <i>Identify the effects of linear and exponential function transformations—specifically vertical exponential translations and all linear transformations—both graphically and algebraically.</i>	Lesson
3 days: 82–84	Modeling and Interpreting with Linear and Exponential Functions <i>Show how linear and exponential functions grow or decay, construct functions that model situations given in different forms, and interpret what the parameters of these functions represent.</i>	Lesson
3 days: 85–87	Unit Activity and Discussion—Unit 5	Unit Activity/ Discussion

1 day: 88	Posttest—Unit 5	Assessment
1 day: 89	Semester Review	
1 day: 90	End-of-Semester Exam	Assessment

Algebra 1, Semester B

Course Overview

Algebra 1, Semester B, is a single-semester course designed to cultivate and periodically assess your subject-matter knowledge while strengthening your mathematical skills. This course includes lessons that focus on the relationship of linear, exponential, and quadratic functions. You will create, graph, and solve quadratic equations and inequalities in one or two variables. You will also add, subtract, and multiply linear and quadratic polynomials. At the end of this course, you'll interpret, analyze, and build functions.

Course Goals

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

- Compare data sets using statistics, and interpret differences in shape, center, and spread.
- Represent data with scatter plots, fit and analyze functions that model the plots, and use the models to solve problems.
- Add, subtract, and multiply linear and quadratic polynomials.
- Create quadratic equations and inequalities in one and two variables, and use them to solve problems.
- Solve systems of linear and quadratic equations using algebraic and graphical methods.
- Graph quadratic, absolute value, piecewise, and step functions, and illustrate key features of their graphs.
- Compare and translate representations of linear, exponential, and quadratic functions.

Math Skills

Middle school mathematics is a prerequisite for Algebra 1B. 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.
- Know the meaning of a line and make predictions from linear relationships.
- Collect, analyze, and display data to solve problems.

General Skills

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

- Understand the basics of spreadsheet software, such as Microsoft Excel or Google Spreadsheets, but having prior computing experience is not necessary.
- Communicate through email and participate in discussion boards.

For a complete list of general skills that are required for participation in online courses, refer to the Prerequisites section of the Student Orientation document, 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
- Microsoft Excel or equivalent

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: Descriptive Statistics

Summary

In this unit, you will represent data with dot plots, box plots, histograms, and scatter plots, and solve problems. You'll use these representations to depict data sets, derive statistics from the datasets, and interpret those statistics. You'll create functions using scatterplots as a guide. Finally, you'll interpret linear models derived from scatterplots and describe the difference between correlation and causation.

Day	Activity/Objective	Type
1 day: 1	Syllabus and Student Orientation <i>Review the Student Orientation and Course Syllabus at the beginning of this course.</i>	Course Orientation
3 days: 2–4	Visual Representations of Data <i>Represent data with dot plots, box plots, and histograms.</i>	Lesson
3 days: 5–7	Comparing Data Sets <i>Compare multiple data sets using statistics and interpret differences in shape, center, and spread.</i>	Lesson
3 days: 8–10	Two-Way Frequency Tables <i>Construct two-way frequency tables for categorical data and interpret measures and associations within the data, including relative frequencies.</i>	Lesson
4 days: 11–14	Representing Data with Scatter Plots and Functions <i>Represent data with scatter plots, fit and analyze functions that model the plots, and use the models to solve problems.</i>	Lesson
3 days: 15–17	Interpreting Linear Models <i>Interpret the characteristics of a linear model in the context of the data and explain the difference between correlation and causation.</i>	Lesson

Day	Activity/Objective	Type
3 days: 18–20	Unit Activity and Discussion—Unit 1	Unit Activity/ Discussion
1 day: 21	Posttest—Unit 1	Assessment

Unit 2: Manipulating and Interpreting Expressions

Summary

In this unit, you will study ways to rewrite quadratic expressions and examine the properties of arithmetic operations on rational and irrational numbers as well as quadratic polynomials. You'll use the structure and various forms of quadratic and exponential expressions to interpret their meaning in context.

Day	Activity/Objective	Type
3 days: 22–24	Rewriting Expressions <i>Use factoring techniques and distribution to rewrite quadratic expressions.</i>	Lesson
3 days: 25–27	Relationships Between Real Numbers <i>Explain the result of adding or multiplying rational and irrational numbers.</i>	Course Activity
3 days: 28–30	Arithmetic with Polynomials <i>Add, subtract, and multiply linear and quadratic polynomials.</i>	Lesson
3 days: 31–33	Interpreting and Using Quadratic Expressions <i>Use the structure and various forms of quadratic expressions to interpret what the expression represents in context.</i>	Lesson
3 days: 34–36	Interpreting and Using Exponential Expressions <i>Use the structure and various forms of exponential expressions to interpret what an expression represents in context.</i>	Lesson

4 days: 37–40	Unit Activity and Discussion—Unit 2	Unit Activity/ Discussion
1 day: 41	Posttest—Unit 2	Assessment

Unit 3: Quadratic Equations and Inequalities

Summary

In this unit, you will create one- and two-variable quadratic equations and inequalities and use them to solve problems. You'll solve quadratic equations by inspection, taking square roots, and factoring, and you'll approximate solutions by graphing. In addition, you will complete the square and use the quadratic formula to solve the equations. At the end of this unit, you'll explore how to solve systems of linear and quadratic equations using algebraic and graphical methods.

Day	Activity/Objective	Type
3 days: 42–44	Creating One-Variable Quadratic Equations and Inequalities <i>Create quadratic equations and inequalities in one variable and use them to solve problems.</i>	Lesson
3 days: 45–47	Creating Two-Variable Quadratic Equations <i>Create quadratic equations in two variables and graph them to display the relationship.</i>	Lesson
4 days: 48–51	Solving Quadratic Equations, Part 1 <i>Solve quadratic equations in one variable by inspection, taking square roots, factoring, and graphing.</i>	Lesson
4 days: 52–55	Solving Quadratic Equations, Part 2 <i>Use completing the square and the quadratic formula to solve quadratic equations and investigate the types of solutions that exist.</i>	Lesson

4 days: 56–59	Solving Systems of Linear and Quadratic Equations <i>Solve systems of linear and quadratic equations using algebraic and graphical methods.</i>	Lesson
4 days: 60–63	Unit Activity and Discussion—Unit 3	Unit Activity/ Discussion
1 day: 64	Posttest—Unit 3	Assessment

Unit 4: Interpreting, Analyzing, and Building Functions

Summary

In unit 4, you'll learn to interpret quadratic functions and graphs. You will then interpret function characteristics and build quadratic functions. Finally, you'll determine inverse of functions and simplify the expressions of linear, exponential, and quadratic functions.

Day	Activity/Objective	Type
3 days: 65–67	Interpreting Quadratic Functions and Graphs <i>Calculate and interpret key features of a quadratic relationship between two quantities and use them to sketch a graph.</i>	Lesson
4 days: 68–71	Graphing Nonlinear Functions and Their Key Features <i>Graph quadratic, absolute value, piecewise, and step functions and illustrate key features of the graphs.</i>	Lesson
4 days: 72–75	Rewriting and Interpreting Functions <i>Use quadratic and exponential functions written in various forms to identify and interpret function characteristics in context.</i>	Lesson
3 days: 76–78	Quadratic Relationships Between Quantities <i>Build quadratic functions to model relationships in context.</i>	Lesson
3 days: 79–81	Inverse Functions and Function Transformations <i>Identify the effects of transformations on graphs of quadratic and absolute value functions and determine inverses of functions.</i>	Lesson

Day	Activity/Objective	Type
3 days: 82–84	Comparing Functions <i>Compare and translate representations of linear, exponential, and quadratic functions.</i>	Lesson
3 days: 85–87	Unit Activity and Discussion—Unit 4	Unit Activity/ Discussion
1 day: 88	Posttest—Unit 4	Assessment
1 day: 89	Semester Review	
1 day: 90	End-of-Semester Exam	Assessment