

ALGEBRA I, SEMESTER B

COURSE OVERVIEW AND GOALS

Algebra I builds students' command of linear, quadratic, and exponential relationships. Students learn through discovery and application, developing the skills they need to break down complex challenges and demonstrate their knowledge in new situations.

Course topics include problem solving with basic equations and formulas; an introduction to functions and problem solving; linear equations and systems of linear equations; exponents and exponential functions; sequences and functions; descriptive statistics; polynomials and factoring; quadratic equations and functions; and function transformations and inverses. This course supports students as they develop computational fluency, deepen conceptual understanding, and apply mathematical knowledge. Students discover new concepts through guided instruction and confirm their understanding in an interactive, feedback-rich environment.

A range of activities allow students to think mathematically in a variety of scenarios and tasks. In discussion activities, students exchange and explain their mathematical ideas. Modeling activities ask them to analyze real-world scenarios and mathematical concepts. Journaling activities have students reason abstractly and quantitatively, construct arguments, critique reasoning, and communicate precisely. And in performance tasks, students synthesize their knowledge in novel, real-world scenarios, make sense of multifaceted problems, and persevere in solving them. This course is built to state standards. Throughout the course, students are evaluated by a variety of assessments designed to prepare them for the content, form, and depth of state exams.

There are no required or optional materials.

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

- ❖ Determine the sums, differences, and products of polynomials.
- ❖ Apply factoring techniques and distribution to rewrite quadratic expressions.
- ❖ Solve quadratic equations in one variable by factoring, completing the square, and using the quadratic formula.
- ❖ Graph quadratic functions and analyze their key features.
- ❖ Identify and transform linear, quadratic, and exponential parent functions.
- ❖ Represent data with dot plots, box plots, and histograms.

- ❖ Analyze, interpret, and justify conclusions from a set of data.
- ❖ Represent bivariate data in scatterplots, and model real-world situations with linear and nonlinear functions.

COURSE COMPONENTS AND GRADING RUBRIC

The table gives a breakdown of the weight for each component in the course. Weight represents the percentage of the total score coming from each activity.

Course Components	Count	Weight
Pretest. <i>A pretest is an optional assessment, typically designed for credit recovery. If a student shows mastery of a lesson objective, the student may be automatically exempted from the upcoming activities associated with the mastered objective. Each passing pretest grade is entered into the gradebook.</i>	6	0%
Practice. <i>A practice activity provides instruction similar to that found in a study so that students can practice or review skills necessary to complete their assignment with mastery.</i>	6	10%
Discussion. <i>A discussion activity is an opportunity for students to collaborate with their peers. This activity gives students the opportunity to practice speaking and listening in a clear and logical manner and to receive feedback from peers.</i>	6	5%
Journal. <i>A journal is a short reflective writing exercise that encourages students to connect historical events and ideas to their own lives and circumstances.</i>	6	5%
Project. <i>A project is a hands-on investigation that extends over several weeks.</i>	1	5%
Mastery Test. <i>A mastery test is a computer-scored lesson-level summative assessment.</i>	27	30%
Posttest. <i>A posttest appears at the end of each unit.</i>	6	15%
End-Of-Semester Test. <i>An end-of-semester test (EOS) appears at the end of each course.</i>	1	10%
Teacher-Graded Posttest. <i>A posttest that prompts students for written responses appears at the end of each unit.</i>	6	20%
Total	65	100%

**Teachers may manually adjust these weights if desired, per district grading requirements.*

UNIT 1: POLYNOMIALS

In this unit, you will add, subtract, and multiply polynomials.

Lesson and Duration	Activities	Objectives
What Is a Polynomial? 1 hour, 40 minutes	<i>Overview: What Is a Polynomial?</i> <i>Study: What Is a Polynomial?</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: What Is a Polynomial?</i>	- Determine what makes up a polynomial. - Identify terms and constants, as well as coefficients and degrees. - Distinguish between polynomials and non-polynomials. - Classify monomials, binomials, and trinomials. Indicate the degree of a polynomial. - Interpret parts of a polynomial expression in a real-world context. - Rewrite polynomials in descending order. - Define a polynomial as the sum or difference of monomials. - Recognize that polynomials are closed under the operations of addition, subtraction, and multiplication.
Adding and Subtracting Polynomials 1 hour, 40 minutes	<i>Overview: Adding and Subtracting Polynomials</i> <i>Study: Adding and Subtracting Polynomials</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Adding and Subtracting Polynomials</i>	- Arrange polynomials either horizontally or vertically to combine like terms. - Distribute the minus sign to every term when subtracting a polynomial.

Lesson and Duration	Activities	Objectives
Multiplying Binomials 2 hours, 25 minutes	<i>Overview: Multiplying Binomials</i> <i>Study: Multiplying Binomials</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Multiplying Binomials</i> <i>Practice: Modeling: Multiplying Binomials</i>	- Find the product of two binomials using the distributive property. - Multiply two binomials using the FOIL method. - Identify special cases of binomial multiplication and problem-solving shortcuts. - Apply mathematical models to make sense of and solve real-world problems. - Represent the multiplication of linear polynomials using tiles.
Multiplying Polynomials 2 hours, 25 minutes	<i>Overview: Multiplying Polynomials</i> <i>Study: Multiplying Polynomials</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Multiplying Polynomials</i> <i>Journal: Multiplying Polynomials</i>	- Compute the product of two polynomials in a table. - Combine like terms to find solutions. - Multiply polynomials vertically and horizontally. - Identify similarities between multiplying polynomials and multiplying numbers. - Rewrite polynomial products by using the distributive property. - Interpret products of polynomials in a real-world context.
Wrap-Up: Polynomials 2 hours, 45 minutes	<i>Review: Polynomials</i> <i>Discussion: FOILed Again</i> <i>Posttest: Polynomials</i> <i>Teacher-Graded Posttest: Polynomials</i>	- Review key ideas presented in the unit. - Apply concepts and skills from the unit by completing a teacher-scored assignment. - Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment.

Lesson and Duration	Activities	Objectives
		Demonstrate mastery of concepts and skills from the unit by completing a teacher-scored assessment.

UNIT 2: FACTORING POLYNOMIALS

In this unit, you will factor and graph trinomial expressions, including special cases.

Lesson and Duration	Activities	Objectives
GCF and Factoring by Grouping 1 hour, 40 minutes	<i>Overview: GCF and Factoring by Grouping</i> <i>Study: GCF and Factoring by Grouping</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: GCF and Factoring by Grouping</i>	- Identify the similarities between factoring numbers and factoring polynomials. - Identify the greatest common factor (GCF) in a polynomial. - Factor one or more GCFs out of a polynomial using the grouping method.
Factoring Trinomials, Part 1 1 hour, 40 minutes	<i>Overview: Factoring Trinomials, Part 1</i> <i>Study: Factoring Trinomials, Part 1</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Factoring Trinomials, Part 1</i>	- Identify a quadratic trinomial and its leading coefficient. - Examine how to factor a trinomial by factoring its constant. - Determine the signs for the factors by the sign of the x-term.
Factoring Trinomials, Part 2 2 hours, 25 minutes	<i>Overview: Factoring Trinomials, Part 2</i> <i>Study: Factoring Trinomials, Part 2</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Factoring Trinomials, Part 2</i> <i>Practice: Modeling: Factoring Trinomials, Part 2</i>	- Identify a common factor in the terms of a trinomial. - Factor a trinomial without a common factor by using tiles. - Find the factors for a trinomial by factoring its leading coefficient and constant.

Lesson and Duration	Activities	Objectives
Special Cases 1 hour, 40 minutes	<i>Overview: Special Cases</i> <i>Study: Special Cases</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Special Cases</i>	- Recognize a difference of two squares and how it is factored. - Analyze a geometric representation of a difference of two squares. - Factor a perfect square trinomial.
Factoring and Graphing 2 hours, 25 minutes	<i>Overview: Factoring and Graphing</i> <i>Study: Factoring and Graphing</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Factoring and Graphing</i> <i>Journal: Factoring and Graphing</i>	- Identify the zeros of a function from a graph. - Identify the factors of a polynomial expression from a graph. - Factor a polynomial expression to reveal the zeros of the related function. - Find and interpret the zeros of a polynomial function in terms of a context.
Wrap-Up: Factoring Polynomials 2 hours, 45 minutes	<i>Review: Factoring Polynomials</i> <i>Discussion: Just the Factors</i> <i>Posttest: Factoring Polynomials</i> <i>Teacher-Graded Posttest: Factoring Polynomials</i>	- Review key ideas presented in the unit. - Apply concepts and skills from the unit by completing a teacher-scored assignment. - Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment. - Demonstrate mastery of concepts and skills from the unit by completing a teacher-scored assessment.

UNIT 3: QUADRATIC EQUATIONS AND FUNCTIONS

In this unit, you will solve quadratic equations using multiple methods. You will also graph quadratic functions and compare their key features to those of linear and exponential functions.

Lesson and Duration	Activities	Objectives
Solving Quadratic Equations 1 hour, 40 minutes	<i>Overview: Solving Quadratic Equations</i> <i>Study: Solving Quadratic Equations</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Solving Quadratic Equations</i>	- Distinguish quadratic equations from nonquadratic equations. - Solve quadratic equations by taking the square root. - Apply the zero product rule to factored equations. - Solve quadratic equations by factoring. - Rewrite quadratic equations into standard form, and then factor and solve. - Factor quadratic equations to solve real-world problems.
Completing the Square 2 hours, 25 minutes	<i>Overview: Completing the Square</i> <i>Study: Completing the Square</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Completing the Square</i> <i>Journal: Completing the Square</i>	- Write any quadratic equation in the form $(x - p)^2 = q$ by completing the square. - Solve quadratic equations by completing the square. - Complete the square to find the maximum or minimum of a quadratic function. - Apply the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
The Quadratic Formula 1 hour, 40 minutes	<i>Overview: The Quadratic Formula</i> <i>Study: The Quadratic Formula</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: The Quadratic Formula</i>	- Determine how and when to apply the quadratic formula. - Apply the quadratic formula to find the factors and roots of quadratic equations. - Calculate the discriminant of a quadratic equation and use it to determine the number of real roots.

Lesson and Duration	Activities	Objectives
		Derive the quadratic formula.
Graphs of Quadratic Functions 1 hour, 40 minutes	<i>Overview: Graphs of Quadratic Functions</i> <i>Study: Graphs of Quadratic Functions</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Graphs of Quadratic Functions</i>	- Find the vertex and intercepts of the graph of a quadratic function from an equation. - Apply the quadratic formula to find the vertex of a given function. - Identify the vertex of a graph from vertex form. - Sketch the graph of a quadratic equation. - Write a quadratic equation from its graph. - Compare properties of two quadratic functions, one represented algebraically, and one represented graphically.
Nonlinear Systems of Equations 1 hour, 40 minutes	<i>Overview: Nonlinear Systems of Equations</i> <i>Study: Nonlinear Systems of Equations</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Nonlinear Systems of Equations</i>	- Define a nonlinear system of equations. - Solve a nonlinear system of equations using a graph. - List the steps for solving systems of nonlinear equations using the substitution method. - Solve systems of nonlinear equations algebraically.
Linear, Quadratic, and Exponential Functions 2 hours, 25 minutes	<i>Overview: Linear, Quadratic, and Exponential Functions</i> <i>Study: Linear, Quadratic, and Exponential Functions</i> <i>Checkup: Practice Problems</i>	- Identify key features of linear, quadratic, and exponential functions. - Recognize when a function or situation has a constant rate of change.

Lesson and Duration	Activities	Objectives
	<i>Mastery Test: Linear, Quadratic, and Exponential Functions</i> <i>Practice: Modeling: Linear, Quadratic, and Exponential Functions</i>	- Calculate the average rate of change of a function (represented with a table) over a specified interval. - Determine the average rate of change of a function over a specified interval by using graphs. - Predict the average rate of change of a function for any unit interval of the function, based on the pattern shown in a table.
Performance Task 2 hours, 50 minutes	<i>Overview: Performance Task</i> <i>Study: The Headphones Problem</i> <i>Project: Your Dog-Walking Business</i>	- Apply your knowledge, skills, and resources to make sense of problems. - Solve problems using perseverance. - Present your thinking and solutions using precise mathematical vocabulary.
Wrap-Up: Quadratic Equations and Functions 2 hours, 45 minutes	<i>Review: Quadratic Equations and Functions</i> <i>Discussion: All Squared Away</i> <i>Posttest: Quadratic Equations and Functions</i> <i>Teacher-Graded Posttest: Quadratic Equations and Functions</i>	- Review key ideas presented in the unit. - Apply concepts and skills from the unit by completing a teacher-scored assignment. - Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment. - Demonstrate mastery of concepts and skills from the unit by completing a teacher-scored assessment.

UNIT 4: UNDOING FUNCTIONS AND MOVING THEM AROUND

In this unit, you will transform linear, quadratic, absolute value, and exponential parent functions.

Lesson and Duration	Activities	Objectives
Inverses 1 hour, 40 minutes	<i>Overview: Inverses</i> <i>Study: Inverses</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Inverses</i>	- Determine the ordered pair of the inverse of $f(x)$ when given an ordered pair of the function $f(x)$. - Write the equation for the inverse of $f(x)$ when given $f(x)$. - Compare the domain and range of a function and its inverse. - Write the equation for the inverse when given a function with variables other than x and y.
Parent Functions 1 hour, 40 minutes	<i>Overview: Parent Functions</i> <i>Study: Parent Functions</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Parent Functions</i>	- Define <i>parent function</i>. - List the key properties of and identify the graph of the linear parent function. - List the key properties of and identify the graph of the quadratic parent function. - List the key properties of and identify the graph of the absolute value parent function. - List the key properties of and identify the graph of an exponential parent function. - Identify the parent function for each function in a list. - Define a piecewise function and identify its graph.
Shifting Functions 2 hours, 25 minutes	<i>Overview: Shifting Functions</i> <i>Study: Shifting Functions</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Shifting Functions</i> <i>Journal: Shifting Functions</i>	- Determine how the equation of a graph changes when it is shifted horizontally, vertically, or both. - Write the equation of a function for a graph that has been shifted from its original graph, given the original function and its graph.

Lesson and Duration	Activities	Objectives
		Write the equation of a new function, given the equation of the original function and a vertical and/or horizontal shift.
Stretching and Compressing Functions 2 hours, 25 minutes	<i>Overview: Stretching and Compressing Functions</i> <i>Study: Stretching and Compressing Functions</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Stretching and Compressing Functions</i> <i>Practice: Modeling: Stretching and Compressing Functions</i>	- Write the equation of a new function $g(x)$, given the graph or equation of $f(x)$ and a vertical stretch or compression. - Determine how the graph of a function changes when the function or input value is multiplied by a positive or negative number. - Write the equation of a new function $g(x)$, given the graph or equation of $f(x)$ and a horizontal stretch or compression. - Write the equation of a new function $g(x)$, given the graph or equation of $f(x)$ and a combination of transformations.
Transformations of Parent Functions 1 hour, 40 minutes	<i>Overview: Transformations of Parent Functions</i> <i>Study: Transformations of Parent Functions</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Transformations of Parent Functions</i>	- Find the equation of a function after it has been horizontally or vertically shifted, given the graph or equation of the parent function. - Find the equation of a function after it has been vertically stretched or compressed, given the graph or equation of the parent function. - Find the equation of a function after it has been horizontally stretched or compressed, given the graph or equation of the parent function.

Lesson and Duration	Activities	Objectives
		- Find the equation of a function after it has been reflected over the x- or y-axis, given the graph or equation of the parent function. - Find the equation of a function after it has undergone a combination of shifts, stretches, or compressions, given the graph or equation of the parent function.
Wrap-Up: Undoing Functions and Moving Them Around 2 hours, 45 minutes	<i>Review: Undoing Functions and Moving Them Around</i> <i>Discussion: Transformation Station</i> <i>Posttest: Undoing Functions and Moving Them Around</i> <i>Teacher-Graded Posttest: Undoing Functions and Moving Them Around</i>	- Review key ideas presented in the unit. - Apply concepts and skills from the unit by completing a teacher-scored assignment. - Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment. - Demonstrate mastery of concepts and skills from the unit by completing a teacher-scored assessment.

UNIT 5: DESCRIPTIVE STATISTICS

In this unit, you will create tables, graphs, and plots to visualize data, drawing upon both graphical and numerical methods of descriptive statistics.

Lesson and Duration	Activities	Objectives
Measures of Center and Spread 1 hour, 40 minutes	<i>Overview: Measures of Center and Spread</i> <i>Study: Measures of Center and Spread</i> <i>Checkup: Practice Problems</i>	- Calculate the mean and median of sample data. - Recognize how unusual and extreme data points can influence measures of center.

Lesson and Duration	Activities	Objectives
	<i>Mastery Test: Measures of Center and Spread</i>	- Calculate the range and standard deviation of sample data. - Recognize how unusual and extreme data points can influence measures of spread. - Determine which measures of center and spread are most appropriate for a data set.
Dot Plots, Box Plots, and Histograms 2 hours, 25 minutes	<i>Overview: Dot Plots, Box Plots, and Histograms</i> <i>Study: Dot Plots, Box Plots, and Histograms</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Dot Plots, Box Plots, and Histograms</i> <i>Practice: Modeling: Dot Plots, Box Plots, and Histograms</i>	- Display data sets using frequency tables, dot plots, histograms, and box plots. - Find the five-number summary for given data sets. - Find the IQR (interquartile range) for given data sets. - Interpret and display numerical data collected from two different populations using comparative dot plots, box plots, and histograms.
Describing Distributions 2 hours, 25 minutes	<i>Overview: Describing Distributions</i> <i>Study: Describing Distributions</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Describing Distributions</i> <i>Journal: Describing Distributions</i>	- Identify distribution shapes, including data that have skewed or symmetrical distributions. - Recognize how the shape of a distribution is related to its mean and median. - Determine how outliers affect the shape of a distribution. - Determine whether the median and interquartile range are better measures of center and spread than the mean and standard deviation, given a particular data set.

Lesson and Duration	Activities	Objectives
		- Determine the appropriate statistics to compare the centers and spreads of two data sets, given the shapes of the distributions. - Interpret the differences in data distributions using measures of center, shape, and spread.
Two-Way Frequency Tables <i>1 hour, 40 minutes</i>	<i>Overview: Two-Way Frequency Tables</i> <i>Study: Two-Way Frequency Tables</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Two-Way Frequency Tables</i>	- Summarize categorical data in two-way frequency tables. - Interpret relative frequencies in the context of the data. - Interpret marginal relative and conditional relative frequencies in the context of the data. - Recognize possible trends and associations in the data.
Wrap-Up: Descriptive Statistics <i>2 hours, 45 minutes</i>	<i>Review: Descriptive Statistics</i> <i>Discussion: Not All Plots Are Suspicious</i> <i>Posttest: Descriptive Statistics</i> <i>Teacher-Graded Posttest: Descriptive Statistics</i>	- Review key ideas presented in the unit. - Apply concepts and skills from the unit by completing a teacher-scored assignment. - Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment. - Demonstrate mastery of concepts and skills from the unit by completing a teacher-scored assessment.

UNIT 6: DATA AND MATHEMATICAL MODELING

In this unit, you will display bivariate data in scatterplots. You will also model real-world scenarios with linear and nonlinear equations.

Lesson and Duration	Activities	Objectives
Two-Variable Data and Scatterplots 1 hour, 40 minutes	<i>Overview: Two-Variable Data and Scatterplots</i> <i>Study: Two-Variable Data and Scatterplots</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Two-Variable Data and Scatterplots</i>	• Create a scatterplot for a given set of data. • Distinguish between positive, negative, and no correlation. • Calculate the correlation coefficient using appropriate technology. • Interpret a correlation coefficient (r-value) in context. • Distinguish between correlation and causation.
Fitting Linear Models to Data 2 hours, 25 minutes	<i>Overview: Fitting Linear Models to Data</i> <i>Study: Fitting Linear Models to Data</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Fitting Linear Models to Data</i> <i>Practice: Modeling: Fitting Linear Models to Data</i>	• Find the equation for the line of best fit using two points on the line. • Calculate the line of best fit using appropriate technology. • Interpret the slope and y-intercept of a linear model in context. • Predict outcomes and solve problems using the line of best fit. • Calculate the residual when given the equation for the line of best fit and a given point. • Assess the fit of a function in an informal way by plotting and analyzing residuals.
Nonlinear Models 2 hours, 25 minutes	<i>Overview: Nonlinear Models</i> <i>Study: Nonlinear Models</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Nonlinear Models</i> <i>Journal: Nonlinear Models</i>	• Identify the appropriate regression model to best represent given data from a real-world application. • Model a function and make predictions using exponential and quadratic regression techniques.

Lesson and Duration	Activities	Objectives
Wrap-Up: Data and Mathematical Modeling 2 hours, 45 minutes	<i>Review: Data and Mathematical Modeling</i> <i>Discussion: The Latest Model</i> <i>Posttest: Data and Mathematical Modeling</i> <i>Teacher-Graded Posttest: Data and Mathematical Modeling</i>	- Review key ideas presented in the unit. - Apply concepts and skills from the unit by completing a teacher-scored assignment. - Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment. - Demonstrate mastery of concepts and skills from the unit by completing a teacher-scored assessment.

SEMESTER WRAP-UP

In this unit, you will review the concepts and skills presented in the course and take a semester exam.

Lesson and Duration	Activities	Objectives
Semester Wrap-Up 1 hour, 30 minutes	<i>Review: Semester Review</i> <i>End-of-Semester Test: Semester Exam</i>	- Review key ideas presented in the semester. - Demonstrate mastery of concepts and skills from the semester by completing a computer-scored assessment.