

ALGEBRA II, SEMESTER A

COURSE OVERVIEW AND GOALS

Algebra II introduces students to advanced functions, with a focus on developing a strong conceptual grasp of the expressions that define those functions. 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 quadratic equations and functions; polynomial functions; rational expressions and functions; radical expressions and functions; exponential and logarithmic functions; trigonometric functions; modeling with functions; probability and inferential statistics; probability distributions; and sampling distributions and confidence intervals.

This course supports all students as they develop computational fluency and deepen conceptual understanding. Students begin each lesson by discovering new concepts through guided instruction, then confirm their understanding in an interactive, feedback-rich environment. Modeling activities equip students with tools for analyzing a variety of real-world scenarios and mathematical ideas. Journaling activities allow students to reason abstractly and quantitatively, construct arguments, critique reasoning, and communicate precisely. Performance tasks prepare students to synthesize their knowledge in novel, real-world scenarios and require that they make sense of multifaceted problems and persevere in solving them.

This course is built to state standards.

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

- ❖ Write and solve linear and absolute value equations and compound inequalities to model real-world scenarios.
- ❖ Create and transform graphs of polynomial functions.
- ❖ Examine combinations and inverses of functions.
- ❖ Solve two-variable systems, including nonlinear systems and systems of inequalities.
- ❖ Analyze polynomial functions and identify zeros and factorizations in real and complex forms.
- ❖ Interpret the key features of polynomial functions using multiple representations.

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>	5	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>	4	10%
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>	2	5%
Mastery Test. <i>A mastery test is a computer-scored lesson-level summative assessment.</i>	30	50%
Posttest. <i>A posttest appears at the end of each unit.</i>	5	20%
End-Of-Semester Test. <i>An end-of-semester test (EOS) appears at the end of each course.</i>	1	15%
Total	47	100%

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

UNIT 1: EXPRESSIONS, EQUATIONS AND INEQUALITIES

In this unit, you will simplify expressions and solve linear equations. You will also solve absolute value equations and inequalities and graph the solutions.

Lesson and Duration	Activities	Objectives
Algebraic Expressions 1 hour, 25 minutes	<i>Overview: Algebraic Expressions</i> <i>Study: Algebraic Expressions</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Algebraic Expressions</i>	• Write an algebraic expression to represent a word description. • Recognize how to simplify algebraic expressions. • Evaluate algebraic expressions for given values. • Identify the parts of algebraic expressions, including terms, factors, and coefficients. • Identify and interpret parts of an expression in terms of its context. • Interpret a complicated expression by understanding that one or more of its parts represents a single quantity.
Solving Linear Equations 1 hour, 25 minutes	<i>Overview: Solving Linear Equations</i> <i>Study: Solving Linear Equations</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Solving Linear Equations</i>	• Solve linear equations by combining like terms, using the order of operations, and performing inverse operations. • Solve linear equations by using the distributive property and eliminating the variable on one side of the equation. • Identify equations that have no solution or infinitely many solutions. • Write and solve equations for real-world problems.
Solving Absolute Value Equations	<i>Overview: Solving Absolute Value Equations</i> <i>Study: Solving Absolute Value Equations</i>	• Rewrite one-variable absolute value equations as compound equations.

Lesson and Duration	Activities	Objectives
1 hour, 25 minutes	<i>Checkpoint: Practice Problems</i> <i>Mastery Test: Solving Absolute Value Equations</i>	- Solve one-variable absolute value equations with two solutions. - Solve one-variable absolute value equations with one solution. - Identify one-variable absolute value equations with no solution.
Solving Inequalities 1 hour, 55 minutes	<i>Overview: Solving Inequalities</i> <i>Study: Solving Inequalities</i> <i>Checkpoint: Practice Problems</i> <i>Mastery Test: Solving Inequalities</i> <i>Practice: Modeling: Solving Inequalities</i>	- Solve linear inequalities using addition or subtraction. - Solve linear inequalities using multiplication or division. - Solve multistep linear inequalities, including special cases. - Solve and graph compound linear inequalities in one variable. - Solve and graph absolute value inequalities in one variable.
Literal Equations and Formulas 1 hour, 25 minutes	<i>Overview: Literal Equations and Formulas</i> <i>Study: Literal Equations and Formulas</i> <i>Checkpoint: Practice Problems</i> <i>Mastery Test: Literal Equations and Formulas</i>	- Rewrite linear equations in two variables to solve for y or x. - Rewrite linear equations in one variable that have unknown coefficients. - Rewrite formulas to solve for a quantity of interest, and use them to solve real-world problems.
Wrap-Up: Expressions, Equations and Inequalities 1 hour, 5 minutes	<i>Review: Expressions, Equations and Inequalities</i> <i>Posttest: Expressions, Equations and Inequalities</i>	- Review key ideas presented in the unit. - Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment.

UNIT 2: FUNCTIONS AND RELATIONS

In this unit, you will graph and transform parent functions as you identify their key features. You will also combine functions and compare them with their inverses.

Lesson and Duration	Activities	Objectives
Functions 1 hour, 25 minutes	<i>Overview: Functions</i> <i>Study: Functions</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Functions</i>	- Identify the domains and ranges of discrete and continuous relations. - Determine whether a given relation is a function, using the vertical line test when applicable. - Show how the domain of a function is related to its graph. - Determine an appropriate domain for a function modeling a real-world situation.
Graphing Functions 1 hour, 25 minutes	<i>Overview: Graphing Functions</i> <i>Study: Graphing Functions</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Graphing Functions</i>	- Define <i>parent function</i>. - Graph the parent linear, quadratic, square root, cube root, reciprocal, and absolute value functions. - Identify the key features of parent functions: intercepts, intervals where the functions are positive or negative, and intervals where they are increasing or decreasing. - Identify a parent function from a graph or a list of functions. - Graph step and piecewise functions. - Interpret piecewise functions that model real-world situations.

Lesson and Duration	Activities	Objectives
Transforming Functions 1 hour, 25 minutes	<i>Overview: Transforming Functions</i> <i>Study: Transforming Functions</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Transforming Functions</i>	- Evaluate the effect of replacing $f(x)$ by $f(x) + d$: that adding a constant to or subtracting a constant from a function shifts its graph vertically by d units. - Evaluate the effect of replacing $f(x)$ by $f(x + c)$: that adding a constant to or subtracting a constant from the independent variable of a function shifts its graph horizontally by $-c$ units. - Evaluate the effect of replacing $f(x)$ by $af(x)$: that multiplying a function by a constant stretches (or compresses) its graph vertically, and, if a is negative, flips the graph over the x-axis. - Evaluate the effect of replacing $f(x)$ by $f(bx)$: that multiplying the independent variable of a function by a constant compresses (or stretches) its graph horizontally, and, if b is negative, flips the graph over the y-axis. - Graph functions involving single or multiple transformations of parent functions.
Combining Functions 1 hour, 25 minutes	<i>Overview: Combining Functions</i> <i>Study: Combining Functions</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Combining Functions</i>	- Practice how to add, subtract, multiply, and divide functions. - Combine two or more functions to form a new function. - Apply the arithmetic of functions to solve problems.
Inverse Functions 1 hour, 25 minutes	<i>Overview: Inverse Functions</i> <i>Study: Inverse Functions</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Inverse Functions</i>	- Determine the ordered pair of the inverse of $f(x)$, given an ordered pair of the function $f(x)$. - Write the equation for the inverse of $f(x)$, given $f(x)$.

Lesson and Duration	Activities	Objectives
		- Recognize the relationship between the domain and range of a function and those of its inverse. - Compare the graph of a function with the graph of its inverse. - Practice using the horizontal line test to determine whether a function is one-to-one.
Wrap-Up: Functions and Relations 1 hour, 5 minutes	<i>Review: Functions and Relations</i> <i>Posttest: Functions and Relations</i>	- Review key ideas presented in the unit. - Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment.

UNIT 3: QUADRATIC FUNCTIONS

In this unit, you will examine quadratic relationships that include complex solutions.

Lesson and Duration	Activities	Objectives
Factoring Trinomials, Part 1 1 hour, 25 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>	- Define and write the general form of a quadratic trinomial. - Find the binomial factors of a quadratic trinomial with a leading coefficient of 1. - Determine the signs of a trinomial's factors based on the sign of its x-term and its constant.
Factoring Trinomials, Part 2 1 hour, 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>	- List the steps used to factor a trinomial that has a leading coefficient other than 1. - Find the factors of a trinomial that has a leading coefficient that is not 1.

Lesson and Duration	Activities	Objectives
		Find the trinomial for a given set of factors.
Special Cases 1 hour, 55 minutes	<i>Overview: Special Cases</i> <i>Study: Special Cases</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Special Cases</i> <i>Journal: Breakdown Ahead</i>	- Identify and factor a difference of two squares. - Identify and factor a perfect square trinomial. - Solve binomials to produce a difference of two squares.
Solving Quadratic Equations 1 hour, 25 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>	- Write quadratic equations in the standard form. - Apply the zero product rule to find the solutions to an equation. - Solve quadratic equations that contain perfect square trinomials. - Determine the correct steps to solve quadratic equations in various forms.
Completing the Square 1 hour, 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>	- Solve the square algebraically to find the solutions to a quadratic equation. - Solve the square with tiles. - Convert a quadratic equation in standard form to vertex form by completing the square. - Apply the vertex form of a quadratic function to identify key attributes of its graph.
The Quadratic Formula 1 hour, 25 minutes	<i>Overview: The Quadratic Formula</i> <i>Study: The Quadratic Formula</i> <i>Checkup: Practice Problems</i>	Write the general form of the quadratic formula and state its use.

Lesson and Duration	Activities	Objectives
	<i>Mastery Test: The Quadratic Formula</i>	- Recognize the conditions that must be met to use the quadratic formula. - Identify equations that can be solved using the quadratic formula. - Apply the quadratic formula to find the solutions to a quadratic equation. - Define <i>discriminant</i> and state what it tells about the solutions to the equation. - Apply the quadratic formula to find the roots of a quadratic equation. - Determine how many roots a polynomial has by using the discriminant.
Graphs of Quadratic Functions <i>1 hour, 55 minutes</i>	<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> <i>Practice: Modeling: Pumpkin Launch</i>	- Determine the number of times that a given function crosses the x-axis. - Find the vertex and x-intercepts of the graph of a quadratic function. - Apply the quadratic formula to find the vertex of a given function. - Determine if a discriminant is positive, negative, or zero when given the graph of the function. - Compare a graph with its quadratic equation.

Lesson and Duration	Activities	Objectives
Imaginary Numbers 1 hour, 25 minutes	<i>Overview: Imaginary Numbers</i> <i>Study: Imaginary Numbers</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Imaginary Numbers</i>	- Define <i>imaginary number</i>. - Apply arithmetic operations to simplify expressions that include imaginary and complex numbers. - Write the equivalent imaginary number, given the square root of a negative number. - Find an equivalent expression for i raised to the n^{th} power. - Define complex numbers.
Wrap-Up: Quadratic Functions 1 hour, 5 minutes	<i>Review: Quadratic Functions</i> <i>Posttest: Quadratic Functions</i>	- Review key ideas presented in the unit. - Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment.

UNIT 4: SYSTEMS OF EQUATIONS AND INEQUALITIES

In this unit, you will write and solve systems of both linear and nonlinear equations and inequalities on the coordinate plane.

Lesson and Duration	Activities	Objectives
Linear Systems of Equations 1 hour, 25 minutes	<i>Overview: Linear Systems of Equations</i> <i>Study: Linear Systems of Equations</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Linear Systems of Equations</i>	- Calculate the solution to a system of linear equations. - Determine multiple techniques for determining the solution(s) to a system.
Nonlinear Systems of Equations 1 hour, 25 minutes	<i>Overview: Nonlinear Systems of Equations</i> <i>Study: Nonlinear Systems of Equations</i> <i>Checkup: Practice Problems</i>	- Define <i>nonlinear system of equations</i>. - Determine the number of solutions that a system of nonlinear equations has when given a graph of the system.

Lesson and Duration	Activities	Objectives
	<i>Mastery Test: Nonlinear Systems of Equations</i>	- List the steps for solving systems of nonlinear equations using the substitution method. - Solve systems of nonlinear equations. - Isolate a variable in a nonlinear equation using algebra.
Linear Systems of Inequalities 1 hour, 55 minutes	<i>Overview: Linear Systems of Inequalities</i> <i>Study: Linear Systems of Inequalities</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Linear Systems of Inequalities</i> <i>Practice: Modeling: Two-Variable Systems of Inequalities</i>	- Graph half planes to find common solutions to systems of inequalities. - Identify graphs of half planes in which there are no common solutions. - Create a system of inequalities to represent real-world constraints, and use this system to solve a problem. [[id1282585]]
Wrap-Up: Systems of Equations and Inequalities 1 hour, 5 minutes	<i>Review: Systems of Equations and Inequalities</i> <i>Posttest: Systems of Equations and Inequalities</i>	- Review key ideas presented in the unit. - Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment.

UNIT 5: POLYNOMIAL FUNCTIONS

In this unit, you will identify the parts of polynomial expressions. You will also apply factoring and expansion techniques to solve, graph, and manipulate polynomials.

Lesson and Duration	Activities	Objectives
Polynomial Basics 1 hour, 55 minutes	<i>Overview: Polynomial Basics</i> <i>Study: Polynomial Basics</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Polynomial Basics</i> <i>Practice: Modeling: Multiplying Polynomials</i>	• Categorize expressions as monomial, binomial, trinomial, polynomial, or non-polynomial. • Write polynomials in standard form and identify their coefficients, variables, and powers. • Determine the degree and formal name of a given polynomial. • Identify the similarities between integers and polynomials as closed sets under addition, subtraction, and multiplication. • Apply multiple methods for multiplying and collecting like terms of higher-order polynomials.
Polynomial Functions 1 hour, 25 minutes	<i>Overview: Polynomial Functions</i> <i>Study: Polynomial Functions</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Polynomial Functions</i>	• Evaluate polynomial functions. • Identify the characteristics of a function and derive its equation from its graph. • Recognize the end behavior of polynomial functions.
Synthetic Division 1 hour, 25 minutes	<i>Overview: Synthetic Division</i> <i>Study: Synthetic Division</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Synthetic Division</i>	• Identify divisors and dividends, and correctly set up a problem involving division of polynomials. • Apply synthetic division to divide polynomials. • Find the remainder when dividing polynomials.

Lesson and Duration	Activities	Objectives
Factoring Polynomials Completely 1 hour, 25 minutes	<i>Overview: Factoring Polynomials Completely</i> <i>Study: Factoring Polynomials Completely</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Factoring Polynomials Completely</i>	• Apply the remainder and factor theorems. • Apply the rational root theorem. • Apply conjugate theorems for radical and complex numbers. • Apply synthetic division to factor higher-order polynomials. • Find the possible roots of a polynomial.
Solving Polynomial Equations 1 hour, 25 minutes	<i>Overview: Solving Polynomial Equations</i> <i>Study: Solving Polynomial Equations</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Solving Polynomial Equations</i>	• List the possible rational roots for a polynomial function. • Apply synthetic division to test for roots. • Define a polynomial function as a product of linear factors. • Solve a polynomial equation. • Compare x-intercepts on a graph with a polynomial equation's solutions. • Solve a polynomial by factoring completely over the complex numbers. • Construct a polynomial function to fit given specifications.
Graphing Polynomial Functions 1 hour, 55 minutes	<i>Overview: Graphing Polynomial Functions</i> <i>Study: Graphing Polynomial Functions</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Graphing Polynomial Functions</i> <i>Journal: Designing a Mountain Landscape</i>	• Recognize the general behavior of a graph of a polynomial function based on its degree. • Find and interpret relative extrema of the graph of a polynomial function. • Identify critical points of a graph using algebraic and graphical approaches.

Lesson and Duration	Activities	Objectives
Polynomial Identities 1 hour, 25 minutes	<i>Overview: Polynomial Identities</i> <i>Study: Polynomial Identities</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Polynomial Identities</i>	- Recognize how to transform polynomial expressions to create identities. - Identify patterns on both sides of polynomial identities. - Apply polynomial identities to solve problems.
Binomial Theorem 1 hour, 25 minutes	<i>Overview: Binomial Theorem</i> <i>Study: Binomial Theorem</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Binomial Theorem</i>	- Create and utilize Pascal's triangle in binomial expansion. - Examine the patterns of binomial expansion that lead to the binomial theorem. - Apply the combinations formula to find entries in Pascal's triangle. - Apply the binomial theorem.
Transformations of Polynomial Functions 1 hour, 25 minutes	<i>Overview: Transformations of Polynomial Functions</i> <i>Study: Transformations of Polynomial Functions</i> <i>Checkup: Practice Problems</i> <i>Mastery Test: Transformations of Polynomial Functions</i>	- Identify parent functions of higher-order equations. - Apply standard transformation techniques to change parent functions to fit graphs. - Compare differing representations of functions.
Wrap-Up: Polynomial Functions 1 hour, 5 minutes	<i>Review: Polynomial Functions</i> <i>Posttest: Polynomial Functions</i>	- Review key ideas presented in the unit. - Demonstrate mastery of concepts and skills from the unit by completing a computer-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 <i>1 hour, 10 minutes</i>	<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.