

Common Core Mathematics II

Syllabus

Course Number: MA2006

Grade level: 9–12

Prerequisite Courses: Common Core Math I

Credits: 1.0

Course Description

This course begins by focusing on the extension of the number system. Students evaluate functions, touch on exponential functions, and explore the operations of polynomials. Next, nonlinear functions are covered before students complete a unit on factoring polynomials using various methods. The course continues with quadratic expressions, equations, and functions; comparing their characteristics and behavior to those of linear and exponential relationships from previous courses. As quadratic equations become more multifaceted, real and complex numbers are introduced to extend the set of rational numbers which can be used to solve quadratic equations. Students also explore the link between probability and data through conditional probability, two-way tables, and counting methods. Finally, this course challenges students to make connections between algebra and geometry as they study similarity, right triangle trigonometry and proofs, as well as circles with and without coordinates. Students are able to use coordinates to prove simple geometric theorems algebraically as well as analyze two- and three- dimensional figures. The content within this course allows students to practice problem solving and critical thinking as they attempt real-world scenario math problems.

Course Objectives

Throughout the course, you will meet the following goals:

- Demonstrate an understanding of functions and use functions to describe quantitative relationships
- Communicate effectively using graphic, numeric, symbolic, and verbal representations
- Students will solve geometric problems relating to triangles, circles, and solids
- Demonstrate an understanding of the relationship between real and non-real numbers
- Study the theory and application of probability.
- Solve and graph quadratic expressions and functions

Student Expectations

This course requires the same level of commitment from you as a traditional classroom

course would. Throughout the course, you are expected to spend approximately 5–7 hours per week online on the following activities:

- Interactive lessons that include a mixture of instructional videos and tasks
- Assignments in which you apply and extend learning in each lesson
- Assessments, including quizzes, tests, and cumulative exams

Communication

Your teacher will communicate with you regularly through discussions, email, chat, and system announcements. You will also communicate with classmates, either via online tools or face to face, as you collaborate on projects, ask and answer questions in your peer group, and develop your speaking and listening skills.

Grading Policy

You will be graded on the work you do online and the work you submit electronically to your teacher. The weighting for each category of graded activity is listed below.

Grading Category	Weight
Lesson Quizzes	20%
Unit Tests	30%
Cumulative Exams	20%
Assignments	20%
Projects	10%

Scope and Sequence

When you log into Edgenuity, you can view the entire course map—an interactive scope and sequence of all topics you will study. The units of study are summarized below:

Unit 1: Extending the Number System

Unit 2: Nonlinear Functions

Unit 3: Polynomial Expressions

Unit 4: Quadratic Functions and Modeling

Unit 5: Expressions and Equations: Part One

Unit 6: Expressions and Equations: Part Two

Unit 7: Applications of Probability

Unit 8: Similarity, Right Triangle Trigonometry, and Proof: Part One

Unit 9: Similarity, Right Triangle Trigonometry, and Proof: Part Two

Unit 10: Circles With and Without Coordinates

Unit 11: Two- and Three- Dimensional Figures

Unit	Lesson	Lesson Objectives
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Extending the Number System**Evaluating Functions**

- Analyze a function represented by an equation, table, or graph to determine the output when given the input, and vice versa.
- Find input and output values of two functions graphed in the same coordinate plane.
- Write the inverse of a given linear function.

Literal Equations

- Rearrange a literal equation to highlight a quantity of interest and use it to solve problems.

Translations of Exponential Functions

- Analyze key aspects of exponential functions that have been translated.
- Graph translations of exponential functions.

Exponential Functions with Radical Bases

- Determine the key aspects of an exponential function having a radical base by rewriting it using the properties of exponents.
- Simplify and evaluate exponential expressions having whole number bases and fractional exponents.
- Transform expressions in radical form to exponential form and vice versa.

Introduction to Polynomials

- Classify a polynomial by degree and number of terms.
- Identify a polynomial and its equivalent forms.

Adding and Subtracting Polynomials

- Add and subtract polynomials, determining the degree and number of terms of the sum or difference.
- Find and evaluate polynomial sums or differences that model real-world situations.

Multiplying Monomials and Binomials

- Identify a product that results in the difference of squares or a perfect square trinomial.
- Multiply a binomial by a monomial or binomial algebraically and by using geometric models.

Multiplying Polynomials and Simplifying Expressions

- Interpret the structure of an expression involving addition, subtraction, and multiplication of polynomials in order to write it as a single polynomial in standard form.
- Multiply a binomial by a trinomial algebraically and by using geometric models.

Nonlinear Functions**Linear Piecewise Defined Functions**

- Evaluate a piecewise-defined function that is defined by linear functions over all intervals of its domain.
- Graph a piecewise-defined function that is defined by linear functions over all intervals of its domain.
- Relate the graph of a piecewise-defined function to its algebraic representation, limiting it to linear functions over its domain.
- State the domain and range of linear piecewise-defined functions.

Unit	Lesson	Lesson Objectives
		Step Functions <ul style="list-style-type: none">Evaluate a step function.Graph a step function.Interpret a step function in terms of the problem it models.State the domain and range of step functions.
		Absolute Value Functions and Translations <ul style="list-style-type: none">Analyze key features of the absolute value function and its translations.Graph the absolute value function and its translations.
		The Square Root Function <ul style="list-style-type: none">Graph the square root function and reflections over the axes.Simplify a square root whose radicand is a perfect square.State the domain and range of square root functions.
		The Cube Root Function <ul style="list-style-type: none">Graph the cube root function, and translations and reflections of it.State the key features of the cube root function, and translations and reflections of it.
		Rewriting Exponential Functions <ul style="list-style-type: none">Use alternative forms of an exponential function to highlight different information about that function and the real-world situation it models.Write exponential functions and expressions in equivalent forms, using the properties of exponents to justify steps.
		Polynomial Expressions
		Factoring Polynomials: GCF <ul style="list-style-type: none">Determine an appropriate way to factor a polynomial for a given context.Determine the greatest common monomial factor of two or more terms.Write a polynomial as the product of a monomial and polynomial having the same number of terms.
		Factoring Polynomials: Double Grouping <ul style="list-style-type: none">Factor a polynomial by double grouping or indicate that the polynomial is prime.
		Factoring Trinomials: $a = 1$ <ul style="list-style-type: none">Determine if a trinomial with a leading coefficient of 1 and a positive constant is factorable and, if so, write it in factored form.Relate the factorization of a trinomial with a leading coefficient of 1 and a positive constant to a geometric model.
		Factoring Trinomials: $a > 1$ <ul style="list-style-type: none">Determine if a trinomial with a leading coefficient greater than 1 is factorable and, if so, write it in factored form.Relate the factorization of a trinomial with a leading coefficient greater than 1 to a geometric model.
		Factoring Polynomials: Difference of Squares <ul style="list-style-type: none">Determine if a polynomial is factorable by recognizing that it is a difference of two squares and, if so, applying the identity.Identify a monomial that is a perfect square and find the square root.

Unit	Lesson	Lesson Objectives
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Factoring Polynomials: Sum and Difference of Cubes

Determine if a polynomial is factorable by recognizing that it is a sum or difference of two cubes and, if so, applying the identity.
Identify a monomial that is a perfect cube and find the cube root.

Quadratic Functions and Modeling**Introduction to Quadratic Functions**

Calculate the rate of change of a quadratic function over an interval of its domain, and compare it to linear and exponential functions.
Evaluate a quadratic function using tables, graphs, and equations.
Identify a quadratic function and the values of the coefficients and constant from the standard form.

Quadratic Functions: Standard Form

Graph a quadratic function given in standard form, identifying the key features of the graph.

Quadratic Functions: Factored Form

Graph a quadratic function given in factored form, identifying the key features of the graph.

Quadratic Functions: Vertex Form

Graph a quadratic function given in vertex form, identifying the key features of the graph.
Relate the parameters of a quadratic function in vertex form to transformations of the graph $y = x^2$.

Completing the Square

Determine key aspects of the graph of a quadratic function given in standard form and with $a = 1$ by writing it in vertex form.
Relate the geometric model of completing the square to the algebraic process.
Relate the parameters of a quadratic function in vertex form to transformations of the graph $y = x^2$.
Write quadratic functions given in standard form and with $a = 1$ into vertex form by completing the square.

Completing the Square (Continued)

Determine key aspects of the graph of a quadratic function given in standard form by writing it in vertex form.
Relate the parameters of a quadratic function in vertex form to transformations of the graph $y = x^2$.
Write quadratic functions given in standard form into vertex form by completing the square.

Modeling with Quadratic Functions

Use quadratic functions to solve mathematical and real-world problems.
Write quadratic functions to model problems.

Comparing Exponential, Linear, and Quadratic Growth

Use tables and graphs to compare the growth of an exponential function to the growth of a linear function over equal intervals.
Use tables and graphs to compare the growth of an exponential function to the growth of a quadratic or a polynomial function over equal intervals.
Use tables and graphs to show that exponential functions grow by equal factors over equal intervals.

Expressions and Equations: Part One**Solving Quadratic Equations: Zero Product Property**

Solve problems by factoring quadratic equations given in standard form.
Write quadratic equations given rational solutions.

Unit	Lesson	Lesson Objectives
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Solving Quadratic Equations: Factoring

Solve problems by rewriting quadratic equations in standard form and factoring, pointing out the solutions that are viable or not viable in a modeling context.
Write a quadratic equation that models a scenario.

Solving Quadratic Equations: Square Root Property

Use the square root property to solve quadratic equations.

Solving Quadratic Equations: Completing the Square

Solve a quadratic equation whose leading coefficient is 1 by completing the square.

Solving Quadratic Equations: Completing the Square (Continued)

Solve a quadratic equation whose leading coefficient is greater than 1 by completing the square.

Introduction to the Quadratic Formula

Determine the values of a , b , and c from a given quadratic equation in standard form.
Justify the steps used to derive the quadratic formula by completing the square.
Recognize an expression that uses the quadratic formula to find the solutions of a quadratic equation.
Relate the discriminant in the quadratic formula to the types of solutions of a quadratic equation.

Solving Quadratic Equations: Quadratic Formula

Determine the number of real zeros of a quadratic function by finding the values of a , b , and c , and then calculating the discriminant.
Solve a quadratic equation using the quadratic formula.

Modeling with Quadratic Equations

Write and solve quadratic equations to model real-world scenarios, estimating where appropriate and identifying solutions that are not viable in terms of the context.

Expressions and Equations: Part Two
Solving Linear-Quadratic Systems

Solve a system of equations consisting of a line and a parabola algebraically and graphically, using technology where appropriate.

Complex Numbers

Determine the absolute value of a complex number.
Represent complex numbers in the form $a + bi$ or in the complex plane.
Represent square roots of negative numbers as multiples of i .
Simplify powers of i using their cyclic nature.

Operations with Complex Numbers

Identify the field properties of complex numbers.
Perform addition, subtraction, and multiplication of complex numbers.

Completing The Square

Find complex solutions to quadratic equations by completing the square.
Recognize the pattern of a perfect-square trinomial as the square of a binomial.
Use the square root property to solve equations.

Unit	Lesson	Lesson Objectives
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The Quadratic Formula

- Find real and complex solutions of quadratic equations using the quadratic formula.
- Use the discriminant to determine the number and type of roots of a quadratic equation.

Quadratic Inequalities

- Create quadratic inequalities in one variable and use them to solve problems.
- Find real solutions of quadratic inequalities algebraically and graphically.

The Fundamental Theorem of Algebra

- Apply the fundamental theorem of algebra to determine the number of roots of a polynomial function.
- Use the complex conjugate theorem to factor and solve polynomial equations.

Writing Polynomial Functions from Complex Roots

- Write polynomial functions from complex roots.

Applications of Probability**Sets and Venn Diagrams**

- Identify and represent elements of sets and subsets, including the empty and universal sets.
- Represent and interpret the union and intersection of sets using set notation and Venn diagrams.

Finding Outcomes

- Evaluate expressions involving factorials.
- Identify possible outcomes for an event.
- Solve combination problems including finding a subset of the total number of possible combinations.
- Solve permutation problems including finding a subset of the total number of possible permutations.

Theoretical and Experimental Probability

- Calculate theoretical and experimental probability.
- Identify the sample space of an experiment and the complement of an event.

Independent and Mutually Exclusive Events

- Calculate probabilities using the addition rule.
- Calculate probabilities using the multiplication rule of independent events.
- Identify mutually exclusive and independent events.

Conditional Probability

- Calculate conditional probabilities using formulas and Venn diagrams.
- Calculate probabilities of compound events.
- Use calculations to determine if two events are independent.

Probability and Two-Way Tables

- Compute conditional probabilities from data displayed in a two-way table.
- Construct a two-way table.
- Use a two-way table to determine if two events are independent.

Unit	Lesson	Lesson Objectives
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Probability with Combinations and Permutations

- Identify expressions that represent probabilities of compound events.
- Use combinations to compute probabilities of compound events.
- Use permutations to compute probabilities of compound events.

Performance Task: Applying Probability Concepts**Similarity, Right Triangle Trigonometry, and Proof: Part One****Parallel and Perpendicular Lines**

- Construct parallel and perpendicular lines.
- Identify parallel, perpendicular, and skew lines from three-dimensional figures.
- Solve problems involving the distance from a point on the perpendicular bisector to both endpoints of the line segment.

Lines Cut by a Transversal

- Complete the steps to prove angle relationships given parallel lines cut by a transversal.
- Solve for angle measures when parallel lines are cut by a transversal.

Proving Lines Parallel

- Apply theorems to determine if lines are parallel.
- Prove lines are parallel given angle relationships.

Triangle Angle Theorems

- Calculate the measures of interior and exterior angles of a triangle.
- Complete the steps to prove that the sum of the measures of the interior angles of a triangle is 180 degrees.
- Identify and relate the interior and exterior angles of a triangle.

Triangles and Their Side Lengths

- Analyze the relationships between the angles of acute, right, and obtuse triangles.
- Construct or justify the construction of isosceles and equilateral triangles.
- Determine if three given segments will satisfy the triangle inequality.
- Determine the length or parameters for a third side of a triangle given the other two sides.

Isosceles Triangles

- Complete the steps to prove the isosceles triangle theorem and its converse.
- Identify characteristics of an isosceles triangle.
- Solve for unknown measures of isosceles triangles.

Centroid and Orthocenter

- Complete the steps to prove that the medians of a triangle meet at a point.
- Identify the characteristics of the centroid or orthocenter of a triangle.
- Solve for unknown measures created by medians in a triangle.

Unit	Lesson	Lesson Objectives
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Similarity, Right Triangle Trigonometry, and Proof: Part Two**Dilations**

Calculate and interpret the scale factor for dilations of figures.

Determine the unknown measures of an image or pre-image of a dilated figure given the scale factor.

Verify experimentally the properties of dilations given a center and a scale factor.

Similar Figures

Determine if two polygons are similar using dilations.

Find the coordinates of the vertices of an image or pre-image of a dilated polygon given the scale factor.

Verify the properties of dilations, including the scale factor and slopes of corresponding line segments.

Triangle Similarity: AA

Complete the steps to prove triangles are similar using the AA similarity theorem.

Identify the composition of similarity transformations in a mapping of two triangles.

Triangle Similarity: SSS and SAS

Complete the steps to prove triangles are similar using SAS similarity theorem.

Complete the steps to prove triangles are similar using SSS similarity theorem.

Identify the sides and angle that can be used to prove triangle similarity using SSS similarity theorem and SAS similarity theorem.

Using Triangle Similarity Theorems

Complete the steps to prove theorems involving similar triangles.

Solve for unknown measures of similar triangles using the side-splitter theorem and its converse.

Solve for unknown measures of similar triangles using the triangle midsegment theorem.

Right Triangle Similarity

Apply the Pythagorean theorem to find side lengths of a right triangle.

Apply theorems to solve problems involving geometric means.

Complete the steps to prove the Pythagorean theorem using similar triangles.

Identify similar right triangles formed by an altitude and write a similarity statement.

Directed Line Segments and Modeling

Find the coordinates of a point on a directed line segment that partitions the segment into a given ratio.

Model and solve real-world problems involving directed line segments.

Trigonometric Ratios

Given an acute angle of a right triangle, label the hypotenuse, opposite, and adjacent sides.

Given an acute angle of a right triangle, write ratios for sine, cosine, and tangent.

Relate trigonometric ratios of similar triangles and the acute angles of a right triangle.

Solving for Side Lengths of Right Triangles

Apply trigonometric ratios to solve real-world problems.

Solve for unknown side lengths of right triangles using trigonometric ratios.

Write equations using trigonometric ratios that can be used to solve for unknown side lengths of right triangles.

Unit	Lesson	Lesson Objectives
		Evaluating the Six Trigonometric Functions Evaluate the six trigonometric functions for angles in degrees or radians based on one or more given trigonometric function values. Evaluate the six trigonometric functions for angles in degrees or radians given a point on the terminal ray.
		Circles With and Without Coordinates
		Introduction to Circles Calculate the degree measure of an arc using the arc addition postulate. Complete the steps to prove that all circles are similar. Identify and describe terms related to circles.
		Central Angles Determine the measures of central angles, chords, and arcs using theorems about angle, chord, and arc congruency. Identify congruent central angles, chords, and arcs. Solve problems using the radius tangent theorem and its converse.
		Inscribed Angles Apply theorems about inscribed angles and angles formed by a tangent and a chord. Complete the steps to prove theorems involving inscribed angles and their intercepted arcs.
		Secants, Tangents, and Angles Solve problems involving angles formed by a secant and a tangent that intersect outside a circle. Solve problems involving angles formed by two intersecting chords. Solve problems involving angles formed by two intersecting tangents. Solve problems involving angles formed by two secants that intersect outside a circle.
		Circumference and Arc Length Determine the radian measure of a central angle. Solve problems involving arc length with central angles measured in degrees. Solve problems involving arc length with central angles measured in radians. Solve problems involving circumference of a circle.
		Area of a Circle and a Sector Solve problems involving area of a circle. Solve problems involving area of a sector with central angles measured in degrees. Solve problems involving area of a sector with central angles measured in radians.
		Angle Relationships Determine segment lengths, angle measures, and arc measures using definitions and theorems relating to circles.
		Performance Task: Circle Constructions
		Equation of a Circle Determine if a given point lies on a circle. Determine the equation of a circle. Identify the center and radius from the equation of a circle, including equations given in general form.

Unit	Lesson	Lesson Objectives
		Parabolas <ul style="list-style-type: none">Describe key features of a parabola.Determine the equation of a parabola given the focus and directrix.
Two- and Three-Dimensional Figures		
		Classifying Quadrilaterals <ul style="list-style-type: none">Classify and describe relationships within the family of quadrilaterals.Describe real-world objects using characteristics of quadrilaterals.Solve mathematical problems using characteristics of quadrilaterals.Solve real-world problems using characteristics of quadrilaterals.
		Parallelograms <ul style="list-style-type: none">Apply properties of parallelograms to solve problems.Complete the steps to prove theorems about properties of parallelograms.
		Proving a Quadrilateral Is a Parallelogram <ul style="list-style-type: none">Analyze a figure to determine if it is a parallelogram.Apply properties of parallelograms to solve for unknown values.Complete the steps to prove that a quadrilateral is a parallelogram.
		Special Parallelograms <ul style="list-style-type: none">Apply properties of rectangles to solve mathematical and real-world problems.Apply properties of rhombi to solve mathematical and real-world problems.Apply properties of squares to solve mathematical and real-world problems.Complete the steps to prove theorems about properties of parallelograms.
		Trapezoids and Kites <ul style="list-style-type: none">Apply properties of kites to solve mathematical and real-world problems.Apply properties of trapezoids to solve mathematical and real-world problems.Complete proofs involving properties of trapezoids and kites.
		Volume of Pyramids <ul style="list-style-type: none">Calculate the volume or an unknown measure of a right pyramid based on a mathematical or real-world model.Calculate the volume or an unknown measure of an oblique pyramid based on a mathematical or real-world model.Write expressions to represent the volumes or unknown measures of right and oblique pyramids.
		Volume of Cylinders, Cones, and Spheres <ul style="list-style-type: none">Solve mathematical and real-world problems involving the volume of right and oblique cones.Solve mathematical and real-world problems involving the volume of right and oblique cylinders.Solve mathematical and real-world problems involving the volume of spheres.Write expressions to represent the volumes or unknown measures of cylinders and cones.
		Cavalieri's Principle and Volume of Composite Figures <ul style="list-style-type: none">Calculate the volumes of composite figures, including those that model real-world objects.Write an expression to represent the volume of a composite figure.