Mathematics II extends students' geometric knowledge and introduces them to quadratic expressions, equations, and functions, exploring the relationship between these and their linear and exponential counterparts. 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 extending the number system; quadratic functions and modeling; expressions and equations; applications of probability; similarity, right-triangle trigonometry, and proof; and circles with and without coordinates.

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, and 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.

Length: Two Semesters

### Unit 1: Functions

- What Is a Function?
- Graphing Functions
- Linear Functions
- Linear Equations and Inequalities
- Linear Systems
- Linear and Nonlinear Functions
- Linear and Exponential Growth
- Arithmetic of Functions
- Functions Wrap-Up

### Unit 2: Exponential Functions

- Types of Numbers
- Exponents
- Exponential Functions
- Graphs of Exponential Functions
- Exponents and Exponential Functions Wrap-Up


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### Unit 3: Polynomials

- What Is a Polynomial?
- Adding and Subtracting Polynomials
- Multiplying Binomials
- Multiplying Polynomials
- Dividing Polynomials
- Polynomials Wrap-Up

### Unit 4: Factoring Polynomials

- GCF and Factoring by Grouping
- Factoring x<sup>2</sup> + bx + c
- Factoring ax<sup>2</sup> + bx + c
- Special Cases
- Factoring and Graphing
- Factoring Polynomials Wrap-Up

### Unit 5: Quadratic Equations and Functions

- Solving Quadratic Equations
- Completing the Square
- The Quadratic Formula
- Graphs of Quadratic Functions
- Working with Complex Numbers
- Nonlinear Systems of Equations
- Linear, Quadratic, and Exponential Functions
- Performance Task: Pricing for Profit
- Quadratic Equations and Functions Wrap-Up

### Unit 6: Undoing Functions and Moving Them Around

- Literal Equations
- Inverses
- Parent Functions
- Shifting Functions
- Stretching and Compressing Functions
- Transformations of Parent Functions
- Undoing Functions and Moving Them Around Wrap-Up

### Unit 7: Applications of Probability

- What Is Probability?
- Counting Principles
- Permutations and Combinations
- Basic Rules of Probability
- Geometric Models for Probability
- Conditional Probability
- Independence
- Simulations


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- Applications of Probability Wrap-Up

### Unit 8: Semester 1 Exam

### Unit 9: Preparing for Proofs

- Induction: The Search for Rules and Patterns
- Deduction: Making a Case
- The Look and Language of Logic
- Introduction to Proofs
- Basic Postulates in Geometry
- Planes and the Space of Geometry
- Intersecting Lines and Proofs
- Parallel Lines and Proofs
- Preparing for Proofs Wrap-Up

### Unit 10: Triangles

- What Is a Triangle?
- The Angles of a Triangle
- Congruence
- Congruence Postulates
- Proofs of Congruence
- Similar Triangles
- Similarity Theorems and Proportional Reasoning
- Triangle Theorems
- Medians and Altitudes
- Bisectors and Midsegments
- Triangles Wrap-Up

### Unit 11: Right Triangles and Trigonometry

- The Pythagorean Theorem
- Congruent Right Triangles
- Similar Right Triangles
- Special Right Triangles
- Trigonometric Ratios
- Trigonometric Ratios and the Unit Circle
- Right Triangles and Trigonometry Wrap-Up

### Unit 12: Quadrilaterals and Other Polygons

- Angle Sums of a Polygon and Proofs
- Parallelograms and Proofs
- Tests for Parallelograms
- Rectangles
- Rhombi and Squares
- Trapezoids
- Quadrilaterals and Other Polygons Wrap-Up


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## Unit 13: Circles Without Coordinates

- What Is a Circle?
- Chords
- Arcs
- Chord and Arc Relationships
- Circles, Angles, and Proofs
- Secants, Tangents, and Proofs
- Circumference and Arc Length
- Area and Sectors
- Circles and Triangles
- Circles and Polygons
- Circles Without Coordinates Wrap-Up

## Unit 14: Conic Sections

- From Lines to Conic Sections
- Geometry of Conic Sections
- Midpoint Formula
- The Distance Formula
- Circles with Coordinates and Proofs
- Parabolas
- Locus of Points
- Conic Sections Wrap-Up

## Unit 15: Three-Dimensional Solids

- What Is a Polyhedron?
- Cylinders and Cones
- Platonic Solids
- Surface Area
- Volume
- Spheres
- Similar Solids
- Performance Task: Three-Dimensional Solids
- Three-Dimensional Solids Wrap-Up

## Unit 16: Semester 2 Exam


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