Analytic Geometry extends students' geometric knowledge and introduces them to quadratic expressions, equations, and functions, and helps them explore 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 proofs; and circles with and without coordinates.

This course supports all students as they simultaneously develop computational fluency, deepen conceptual understanding, and apply the eight Mathematical Practice Standards. Students begin each lesson by discovering new concepts through guided instruction, and they 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 help students synthesize their knowledge in novel, real-world scenarios that require them to make sense of multifaceted problems and persevere in solving them. Throughout the course, students are evaluated through a diversity of assessments specifically designed to prepare them for the content, form, and depth of Georgia's End of Course Test.

This course is built to the Common Core Georgia Performance Standards for Mathematics.

Length: Two semesters

UNIT 1: PREPARING FOR PROOFS

- Lesson 1: Induction: The Search for Rules and Patterns
- Lesson 2: Deduction: Making a Case
- Lesson 3: The Look and Language of Logic
- Lesson 4: Introduction to Proofs
- Lesson 5: Basic Postulates in Geometry
- Lesson 6: Planes and the Space of Geometry
- Lesson 7: Intersecting Lines and Proofs
- Lesson 8: Parallel Lines and Proofs
- Lesson 9: Preparing for Proofs Wrap-Up

UNIT 2: TRIANGLES

- Lesson 1: What Is a Triangle?
- Lesson 2: The Angles of a Triangle
- Lesson 3: Congruence
- Lesson 4: Congruence Postulates
- Lesson 5: Proofs of Congruence
- Lesson 6: Similar Triangles
- Lesson 7: Similarity Theorems and Proportional Reasoning
- Lesson 8: Triangle Theorems
- Lesson 9: Medians and Altitudes
- Lesson 10: Bisectors and Midsegments
- Lesson 11: Triangles Wrap-Up

UNIT 3: RIGHT TRIANGLES AND TRIGONOMETRY

- Lesson 1: The Pythagorean Theorem
- Lesson 2: Proving Congruence of Right Triangles

- Lesson 3: Similar Right Triangles
- Lesson 4: Special Right Triangles
- Lesson 5: Trigonometric Ratios
- Lesson 6: Right Triangles and Trigonometry Wrap-Up

UNIT 4: QUADRILATERALS AND OTHER POLYGONS

- Lesson 1: Angle Sums of a Polygon and Proofs
- Lesson 2: Parallelograms and Proofs
- Lesson 3: Tests for Parallelograms
- Lesson 4: Rectangles
- Lesson 5: Rhombi and Squares
- Lesson 6: Trapezoids
- Lesson 7: Quadrilaterals and Other Polygons Wrap-Up

UNIT 5: CIRCLES WITHOUT COORDINATES

- Lesson 1: What Is a Circle?
- Lesson 2: Chords
- Lesson 3: Arcs
- Lesson 4: Chord and Arc Relationships
- Lesson 5: Circles, Angles, and Proofs
- Lesson 6: Secants, Tangents, and Proofs
- Lesson 7: Circumference and Arc Length
- Lesson 8: Area and Sectors
- Lesson 9: Circles and Triangles
- Lesson 10: Circles and Polygons
- Lesson 11: Circles Without Coordinates Wrap-Up

UNIT 6: FUNCTIONS

- Lesson 1: What Is a Function?
- Lesson 2: Graphing Functions
- Lesson 3: Linear Functions
- Lesson 4: Linear Equations and Inequalities
- Lesson 5: Linear Functions and Data
- Lesson 6: Linear Systems
- Lesson 7: Linear and Nonlinear Functions
- Lesson 8: Linear and Exponential Growth
- Lesson 9: Arithmetic of Functions
- Lesson 10: Functions Wrap-Up

UNIT 7: EXPONENTIAL FUNCTIONS

- Lesson 1: Types of Numbers
- Lesson 2: Exponents
- Lesson 3: Exponential Functions
- Lesson 4: Examples and Applications of Exponential Functions
- Lesson 5: Graphs of Exponential Functions
- Lesson 6: Exponential Functions Wrap-Up

UNIT 8: ANALYTIC GEOMETRY SEMESTER 1 EXAM

- Lesson 1: Analytic Geometry Semester 1 Exam

UNIT 9: POLYNOMIALS

- Lesson 1: What Is a Polynomial?
- Lesson 2: Adding and Subtracting Polynomials

- Lesson 3: Multiplying Binomials
- Lesson 4: Multiplying Polynomials
- Lesson 5: Dividing Polynomials
- Lesson 6: Polynomials Wrap-Up

UNIT 10: FACTORING OF POLYNOMIALS

- Lesson 1: Why Factor?
- Lesson 2: Factoring with Tiles
- Lesson 3: Factoring and Graphing
- Lesson 4: Grouping
- Lesson 5: Factoring $x^2 + bx + c$
- Lesson 6: Factoring $ax^2 + bx + c$
- Lesson 7: Special Cases
- Lesson 8: Factoring of Polynomials Wrap-Up

UNIT 11: QUADRATIC EQUATIONS AND FUNCTIONS

- Lesson 1: Parabolas
- Lesson 2: Solving Quadratic Equations
- Lesson 3: Completing the Square
- Lesson 4: The Quadratic Formula
- Lesson 5: Graphs of Quadratic Functions
- Lesson 6: Working with Complex Numbers
- Lesson 7: Nonlinear Systems of Equations
- Lesson 8: Linear, Quadratic, and Exponential Models
- Lesson 9: Performance Task: Pricing for Profit
- Lesson 10: Quadratic Equations and Functions Wrap-Up

UNIT 12: SHIFTING AND STRETCHING FUNCTIONS

- Lesson 1: Parent Functions
- Lesson 2: Shifting Functions
- Lesson 3: Stretching Functions Vertically
- Lesson 4: Transformation of Parent Functions
- Lesson 5: Shifting and Stretching Functions Wrap-Up

UNIT 13: CONSTRUCTIONS AND CONIC SECTIONS

- Lesson 1: Constructions
- Lesson 2: Paper Folding
- Lesson 3: From Lines to Conic Sections
- Lesson 4: Geometry of Conic Sections
- Lesson 5: Midpoint Formula
- Lesson 6: The Distance Formula
- Lesson 7: Circles with Coordinates and Proofs
- Lesson 8: Parabolas
- Lesson 9: Locus of Points
- Lesson 10: Constructions and Conic Sections Wrap-Up

UNIT 14: THREE-DIMENSIONAL SOLIDS

- Lesson 1: Three Dimensions
- Lesson 2: What Is a Polyhedron?
- Lesson 3: Cylinders and Cones
- Lesson 4: Platonic Solids
- Lesson 5: Surface Area

- Lesson 6: Volume
- Lesson 7: Spheres
- Lesson 8: Similar Solids
- Lesson 9: Performance Task: Three-Dimensional Solids
- Lesson 10: Three-Dimensional Solids Wrap-Up

UNIT 15: APPLICATIONS OF PROBABILITY

- Lesson 1: What Is Probability?
- Lesson 2: Counting Principles
- Lesson 3: Basic Rules of Probability
- Lesson 4: Geometric Models for Probability
- Lesson 5: Conditional Probability
- Lesson 6: Independence
- Lesson 7: Applications of Probability Wrap-Up

UNIT 16: ANALYTIC GEOMETRY SEMESTER 2 EXAM

- Lesson 1: Analytic Geometry Semester 2 Exam