Analytic Geometry is a state-designed mathematics course that presents the formal concepts of geometry and analyzes them through the means of algebraic operations alongside the engagement with correlated topics of probability and statistical analysis and representation. It builds upon students' command of geometric relationships and formulating mathematical arguments. 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 algebraic foundations; factoring polynomials; quadratic equations and functions; reasoning, proof, and the creation of sound mathematical arguments; points, lines, and angles; triangles and trigonometry; quadrilaterals and other polygons; circles; congruence, similarity, transformations, and constructions; coordinate geometry; three-dimensional solids; and applications of probability.

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 match the Georgia state Standards of Excellence (GSE).

Length: Two Semesters

Unit 1: Foundations of Algebra

- Rational and Irrational Numbers
- Algebraic Properties and Expressions
- Literal Equations
- Foundations of Algebra Wrap-Up

Unit 2: Operating with Expressions

- What Is a Polynomial?
- Adding and Subtracting Polynomials

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- Multiplying Binomials
- Multiplying Polynomials
- Basics of Radicals
- Multiplying and Dividing Radicals
- Adding and Subtracting Radicals
- Operating with Expressions Wrap-Up

Unit 3: Factoring Polynomials

- GCF and Factoring by Grouping
- Factoring x² + bx + c
- Factoring ax² + bx + c
- Special Cases
- Factoring and Graphing
- Factoring Polynomials Wrap-Up

Unit 4: Quadratic Equations and Functions

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

Unit 5: Undoing Functions and Moving Them Around

- Domain and Range
- Parent Functions
- Shifting Functions
- Stretching and Compressing Functions
- Transformations of Parent Functions
- Undoing Functions and Moving Them Around Wrap-Up

Unit 6: Foundations of Geometry

- 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

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- Intersecting Lines and Proofs
- Parallel Lines and Proofs
- Foundations of Geometry Wrap-Up

Unit 7: 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
- Performance Task: The Parallax Problem
- Triangles Wrap-Up

Unit 8: Semester 1 Exam

Unit 9: Right Triangles

- The Pythagorean Theorem
- Congruent Right Triangles
- Similar Right Triangles
- Special Right Triangles
- Right Triangles Wrap-Up

Unit 10: Trigonometry

- Trigonometric Ratios
- Law of Cosines and Proofs
- Law of Sines and Proofs
- Trigonometry Wrap-Up

Unit 11: Quadrilaterals and Other Polygons

- Angle Sums of a Polygon and Proofs
- Parallelograms and Proofs
- Tests for Parallelograms
- Rectangles
- Rhombi and Squares
- Trapezoids
- Coordinate Geometry with Polygons

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- Quadrilaterals and Other Polygons Wrap-Up

Unit 12: 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 13: Conic Sections

- From Lines to Conic Sections
- Geometry of Conic Sections
- Circles with Coordinates and Proofs
- Conic Sections Wrap-Up

Unit 14: Constructions and Transformations

- Constructions
- Paper Folding
- Transformations
- Symmetry
- Constructions and Transformations Wrap-Up

Unit 15: Three-Dimensional Solids

- Three Dimensions
- 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: Applications of Probability

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- Probability
- Probability of Independent and Dependent Events
- Conditional Probability
- Two-Way Frequency Tables
- Applications of Probability Wrap-Up

Unit 17: Semester 2 Exam

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