


# 12th Grade American Online School

## MATHEMATICS CURRICULUM

### Advanced Mathematical Concepts and Applications



Version Mar/2025

## 1. Introduction

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### The Role of Mathematics in 12th Grade

In 12th grade, mathematics focuses on advanced algebra, geometry, and real-world applications of mathematical reasoning. This curriculum prepares students for higher education, problem-solving in various career fields, and financial literacy for everyday life.

By the end of this course, students will:

- ✓ Apply advanced algebra and geometric reasoning to solve complex problems.
  - ✓ Use numbers, formulas, and mathematical models in real-world contexts.
  - ✓ Develop logical thinking and problem-solving strategies.
  - ✓ Analyze mathematical concepts used in technology, business, and science.
  - ✓ Prepare for standardized tests and college-level mathematics.
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## 2. Core Competence Areas

### MTH.1 Advanced Number Operations and Mathematical Reasoning

#### Learning Outcomes

By the end of this unit, students will be able to:

- ✓ Perform complex calculations involving real, rational, and irrational numbers.
- ✓ Use number sense to estimate and check the reasonableness of answers.
- ✓ Apply mathematical logic to real-life situations and decision-making.

#### Competencies

##### MTH.1.A.1 – Understanding advanced number properties and operations.

- Work with fractions, exponents, logarithms, and radicals.
- Understand absolute value, modular arithmetic, and number sets.
- Apply scientific notation and significant figures in calculations.

##### MTH.1.A.2 – Developing problem-solving and mathematical reasoning.

- Use logical reasoning and mathematical proof techniques.
- Solve word problems with multi-step calculations.
- Develop mental math strategies for estimation and accuracy.

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### MTH.2 Algebra and Functions

#### Learning Outcomes

By the end of this unit, students will be able to:

- ✓ Solve and graph linear, quadratic, and exponential functions.
- ✓ Apply algebraic concepts to real-world applications.
- ✓ Understand the relationship between equations, inequalities, and graphs.

## Competencies

### **MTH.2.A.1 – Solving algebraic equations and inequalities.**

- Work with linear, quadratic, exponential, and logarithmic equations.
- Solve systems of equations using substitution, elimination, and matrices.
- Apply inequalities in real-world contexts, such as budgeting and data analysis.

### **MTH.2.A.2 – Understanding functions and their applications.**

- Graph functions and transformations on the coordinate plane.
  - Analyze domain, range, asymptotes, and intercepts.
  - Use functions to model population growth, financial calculations, and physics applications.
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## **MTH.3 Geometry and Spatial Reasoning**

### **Learning Outcomes**

By the end of this unit, students will be able to:

- ✓ Understand and apply geometric principles to real-life situations.
- ✓ Solve problems involving angles, triangles, circles, and polygons.
- ✓ Use coordinate and transformational geometry.

## Competencies

### **MTH.3.A.1 – Applying geometric concepts to problem-solving.**

- Solve problems involving congruence, similarity, and transformations.
- Use Pythagorean theorem, trigonometric ratios, and laws of sines/cosines.
- Apply geometric principles in architecture, engineering, and design.

### **MTH.3.A.2 – Understanding coordinate and three-dimensional geometry.**

- Graph shapes and transformations on a coordinate plane.
- Solve problems involving distance, midpoint, and slope.

- Explore three-dimensional shapes and volume calculations.
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## **MTH.4 Data Analysis, Probability, and Statistics**

### **Learning Outcomes**

By the end of this unit, students will be able to:

- ✓ **Analyze and interpret data using statistical methods.**
- ✓ **Understand probability and its applications in real-world scenarios.**
- ✓ **Use statistical models to make informed decisions.**

### **Competencies**

#### **MTH.4.A.1 – Understanding probability and combinatorics.**

- Calculate probabilities using counting principles, permutations, and combinations.
- Analyze independent and dependent events.
- Apply probability in games, risk assessment, and real-world decision-making.

#### **MTH.4.A.2 – Interpreting statistical data and trends.**

- Use mean, median, mode, and standard deviation.
  - Create histograms, box plots, and scatter plots.
  - Analyze real-world data and make predictions.
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## **MTH.5 Real-World Math Applications and Financial Literacy**

### **Learning Outcomes**

By the end of this unit, students will be able to:

- ✓ **Apply mathematical concepts to personal finance and decision-making.**
- ✓ **Understand interest rates, loans, and investments.**
- ✓ **Use math in business, technology, and science fields.**

## Competencies

### **MTH.4.A.1 – Understanding financial literacy and budgeting.**

- Learn how to manage a budget and track expenses.
- Calculate loan payments, interest rates, and credit scores.
- Analyze investment growth and retirement planning.

### **MTH.5.A.2 – Applying mathematics in technology and careers.**

- Explore math applications in physics, engineering, and medicine.
- Use coding and algorithms in mathematical modeling.
- Learn how businesses use statistics and financial analysis.

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## 3. Assessment and Evaluation

### **Formative Assessments – Checking Progress Through Interactive Learning**

- ✓ Practice problems and problem-solving activities.
- ✓ Group discussions on real-world applications of mathematics.
- ✓ Quizzes on algebra, geometry, and statistics topics.

### **Summative Assessments – Final Projects and Exams**

- ✓ Cumulative math exam covering all major topics.
- ✓ Statistical analysis project based on real-world data.
- ✓ Capstone problem-solving challenge incorporating multiple math concepts.

### **Authentic Assessment – Real-World Applications**

- ✓ Students create a financial plan for life after high school.
  - ✓ Collaboration with local businesses or professionals to explore career-related math.
  - ✓ Data analysis of real-life scenarios, such as sports statistics or economic trends.
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## 4. Instructional Strategies for Online Learning

### Inquiry-Based and Problem-Based Learning

- ✓ Students investigate and solve real-life financial and business problems.
- ✓ Exploration of probability in decision-making and risk assessment.

### Project-Based Learning (PBL)

- ✓ Students design and conduct a research study using statistics.
- ✓ Developing a financial plan for college, career, or entrepreneurship.

### Technology-Integrated Learning

- ✓ Use of graphing calculators and mathematical software (Desmos, GeoGebra, Excel).
- ✓ AI-powered math tutoring and adaptive learning tools.
- ✓ Online simulations for budgeting, investing, and data analysis.

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