11th Grade American Online School

MATHEMATICS CURRICULUM

Advanced Problem Solving and Logical Reasoning

Version Mar/2025

1. Introduction

The Role of Mathematics in 11th Grade

Mathematics in 11th grade focuses on advanced problem-solving, logical reasoning, and real-world applications. This curriculum builds upon foundational skills and introduces complex concepts in algebra, geometry, and general mathematical reasoning, preparing students for college-level mathematics and professional applications.

By the end of this course, students will:

✓ **Strengthen their number sense and mathematical reasoning**.

✓ **Master advanced algebraic operations and problem-solving techniques**.

✓ **Apply geometric principles to real-world and theoretical scenarios**.

✓ **Develop critical thinking and logical reasoning skills through mathematical modeling**.

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2. Core Competence Areas

MTH.1 Use of Numbers and Mathematical Operations

Learning Outcomes

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

✓ **Perform advanced calculations with whole numbers, fractions, decimals, and percentages**.

✓ **Understand number theory concepts, including factors, multiples, and prime numbers**.

✓ **Use mathematical reasoning to solve numerical and logical problems**.

Competencies

MTH.1.A.1 – Strengthening numerical fluency and operations.

- Perform operations with rational and irrational numbers.
- Apply scientific notation and significant figures in calculations.
- Understand exponents, roots, and logarithms.

MTH.1.A.2 – Applying number theory in problem-solving.

- Use greatest common factor (GCF) and least common multiple (LCM) in problem-solving.
- Explore modular arithmetic and its real-world applications.
- Analyze patterns and sequences in number sets.

MTH.2 Algebra and Functions

Learning Outcomes

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

✓ **Solve and manipulate complex algebraic equations and expressions**.

✓ **Analyze and graph functions, including linear, quadratic, exponential, and logarithmic functions**.

✓ **Apply algebraic concepts to real-world problems**.

Competencies

MTH.2.A.1 – Mastering algebraic operations.

- Solve quadratic, polynomial, and exponential equations.
- Work with rational and radical expressions.
- Apply factoring techniques and function transformations.

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

- Analyze linear, quadratic, and higher-order functions.
- Explore logarithmic and exponential relationships.
- Use function notation and transformations.

MTH.3 Geometry and Spatial Reasoning

Learning Outcomes

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

✓ **Apply geometric principles to solve real-world problems**.

✓ **Understand properties of two- and three-dimensional shapes**.

✓ **Use trigonometry to analyze angles and distances**.

Competencies

MTH.3.A.1 – Understanding geometric properties and relationships.

- Explore parallel and perpendicular lines, angles, and polygons.
- Solve problems involving circles, triangles, and quadrilaterals.
- Apply coordinate geometry principles to graphing and transformations.

MTH.3.A.2 – Using trigonometry in problem-solving.

- Apply Pythagorean Theorem and trigonometric ratios.
- Solve right and non-right triangle problems using sine, cosine, and tangent.
- Explore trigonometric identities and graphing trigonometric functions.

MTH.4 General Mathematics and Real-World Applications

Learning Outcomes

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

✓ **Use mathematical models to solve real-world problems**.

✓ **Apply probability and statistics in everyday contexts**.

✓ **Develop logical reasoning and problem-solving strategies**.

Competencies

MTH.4.A.1 – Applying mathematical reasoning to real-world scenarios.

- Solve real-life financial, engineering, and scientific problems.
- Use dimensional analysis to convert units and measurements.
- Apply algebra and geometry in physics, economics, and computer science.

MTH.4.A.2 – Understanding probability and statistics.

- Calculate probabilities of independent and dependent events.
- Analyze mean, median, mode, and standard deviation.
- Interpret data using statistical graphs and models.

3. Assessment and Evaluation

Formative Assessments – Checking Progress Through Interactive Learning

✓ **Quick quizzes and algebraic drills** to reinforce skills.

✓ **Problem-solving challenges and mathematical reasoning exercises**.

✓ **Graphing and geometry practice activities**.

Summative Assessments – Final Projects and Exams

✓ **Cumulative exams covering algebra, geometry, and probability**.

✓ **Mathematical modeling applying real-world concepts**.

✓ **Student presentations on problem-solving strategies**.

Authentic Assessment – Real-World Applications

✓ **Students analyze stock market trends using mathematical models**.
✓ **Engineering and architecture-based geometry projects**.
✓ **Case studies on mathematical applications in careers**.

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4. Instructional Strategies for Online Learning

Inquiry-Based and Problem-Based Learning

✓ **Case studies on how math is used in business, science, and engineering**.
✓ **Problem-solving projects focusing on real-world mathematical challenges**.

Project-Based Learning (PBL)

✓ **Design-based geometry projects, such as bridge-building simulations**.
✓ **Mathematical exploration of cryptography and coding applications**.

Technology-Integrated Learning

✓ **Graphing calculator and math software (Desmos, GeoGebra, Wolfram Alpha)**.
✓ **AI-powered tutoring and adaptive learning platforms**.