7th Grade American Online School

MATHEMATICS CURRICULUM

Reasoning, Representation, and Real-World Application

Version May/2025

1. Introduction

The Role of Mathematics Education in 7th Grade

The 7th Grade Mathematics curriculum strengthens foundational mathematical skills while introducing abstract reasoning, algebraic thinking, and data literacy. Students deepen their understanding of numbers, geometry, and mathematical modeling through inquiry-based and real-world tasks. Drawing from the competence model of Lehrplan 21 and Common Core practices, this course emphasizes logic, structure, and problem-solving to prepare students for advanced mathematics.

By the end of this course, students will:

✓ **Apply number operations and proportional reasoning in everyday and mathematical contexts.**

✓ **Solve linear equations and analyze functional relationships.**

✓ **Use geometric concepts to describe, model, and calculate with shapes.**

✓ **Interpret and represent data visually and statistically.**

✓ **Communicate mathematical thinking clearly and effectively.**

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2. Core Competence Areas

MTH.1 Number Systems and Rational Thinking

Learning Outcomes

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

✓ **Perform operations with integers, fractions, and decimals.**

✓ **Convert between percentages, decimals, and fractions.**

✓ **Use ratios, proportions, and rates in real-world problem-solving.**

Competencies

MTH.1.A.1 – Mastering operations with rational numbers.

- Add, subtract, multiply, and divide positive and negative numbers with fluency.
- Convert among number forms and estimate solutions strategically.

MTH.1.A.2 – Applying proportional reasoning.

- Solve ratio, rate, and percent problems including discounts, markups, and real-world applications.
- Use tables, graphs, and equations to model proportional relationships.

MTH.2 Algebraic Thinking and Functional Reasoning

Learning Outcomes

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

✓ **Use variables and algebraic expressions to generalize patterns.**

✓ **Solve multi-step equations and inequalities.**

✓ **Represent and interpret linear relationships.**

Competencies

MTH.2.A.1 – Building algebraic fluency.

- Simplify expressions and solve one- and two-step equations using inverse operations.
- Understand properties of equality and order of operations.

MTH.2.A.2 – Exploring functions and linear models.

- Recognize linear functions and represent them with tables, graphs, and equations.
- Analyze rate of change and y-intercepts in context.

MTH.3 Geometry and Measurement

Learning Outcomes

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

✓ **Analyze properties of geometric figures and transformations.**

✓ **Apply formulas to calculate perimeter, area, surface area, and volume.**

✓ **Use angle relationships and scale in real-world design and analysis.**

Competencies

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

- Identify and classify triangles, quadrilaterals, and 3D shapes.
- Use coordinate geometry to model and solve geometric problems.

MTH.3.A.2 – Solving measurement and design problems.

- Calculate area and perimeter of composite shapes.
- Find surface area and volume of prisms, cylinders, and pyramids.
- Use scale drawings and maps with proportional reasoning.

MTH.4 Data Analysis and Probability

Learning Outcomes

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

✓ **Collect, represent, and interpret data using visual displays.**

✓ **Analyze measures of central tendency and variability.**

✓ **Apply concepts of probability to simple and compound events.**

Competencies

MTH.4.A.1 – Interpreting data using graphical tools.

- Construct and interpret bar graphs, histograms, box plots, and dot plots.
- Describe data distributions and make predictions from data sets.

MTH.4.A.2 – Investigating probability through models and experiments.

- Calculate probabilities of simple and compound events.
- Use simulations, tree diagrams, and organized lists to analyze outcomes.

MTH.5 Mathematical Modeling and Reasoning

Learning Outcomes

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

✓ **Use mathematical tools and structures to solve contextual problems.**

✓ **Develop arguments and justify solutions.**

✓ **Represent problems using diagrams, symbols, and equations.**

Competencies

MTH.5.A.1 – Solving real-world and mathematical problems.

- Apply mathematical reasoning in scenarios involving finance, design, and science.
- Use models and representations (tables, graphs, and formulas) for explanation.

MTH.5.A.2 – Reflecting and communicating mathematically.

- Explain reasoning through written, verbal, and visual formats.
- Evaluate the accuracy of solutions and reflect on alternative strategies.

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3. Assessment and Evaluation

Formative Assessments – Ongoing Feedback for Learning

✓ **Daily warm-ups and skill checks.**
✓ **Concept maps and exit tickets.**
✓ **Peer review and discussion.**

Summative Assessments – Demonstrating Understanding

✓ **End-of-unit exams.**
✓ **Cumulative midterm and final assessments.**
✓ **Analytical math journal entries.**

Authentic Assessment – Application in Real-World Contexts

✓ **Mathematical modeling projects.**
✓ **Geometry design challenges.**
✓ **Data analysis presentations.**

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4. Instructional Strategies for Online Learning

Inquiry-Based Learning

✓ **Encourage exploration of patterns, conjectures, and generalizations.**
✓ **Pose real-world scenarios for collaborative problem solving.**

Concrete-to-Abstract Instruction

✓ **Budget planning using percentages and ratios.**
✓ **Create a scaled 3D architectural model.**
✓ **Statistical studies and survey analysis.**

Inclusive Learning Environment

✓ **Foster a growth mindset around mistakes and perseverance.**
✓ **Encourage multiple solution paths and justification of reasoning.**
✓ **Build mathematical confidence through mastery-based practice.**