

Grade 6 Mathematics

Full Curriculum Guide

Number Sense + Proportional Reasoning + Algebra Foundations + Geometry + Statistics

Course purpose: Establish a rigorous, age-appropriate Grade 6 foundation that transitions students from arithmetic into mathematical reasoning and prepares them for the Grade 7-10 ROED pathway.

Course	Grade 6 Mathematics
Primary focus	Number sense, rational numbers, ratios, proportional reasoning and algebra foundations
ROED model	Live online instruction small groups concept-focused learning
Structure	Five core mathematics units + cross-cutting financial literacy/modeling
Major strands	Number • Ratios/Proportions • Algebra • Geometry • Statistics • Probability • Modeling

Prepared as the master Grade 6 curriculum framework for ROED. This document outlines the progression of learning objectives, instructional strands, core content standards, extensions, assessment methodologies, and cross-cutting applications.

1. Course Overview

Grade 6 Mathematics at ROED marks the transition from elementary arithmetic to middle-school mathematical reasoning. Students consolidate fraction, decimal and integer fluency while learning to see relationships through ratios, variables, equations, graphs and data.

The course deliberately emphasizes connections: numbers can be represented in different forms; ratios connect tables, graphs and equations; algebra describes relationships; geometry connects measurement with coordinates; and statistics connects calculations with real data.

Course philosophy: Grade 6 should be rigorous enough to prepare students for increasingly abstract mathematics, but it should not become a premature Algebra I course. Core learning remains accessible while extensions provide additional depth for advanced students.

2. Course Mission & Learning Philosophy

- Build strong rational-number and integer fluency.
- Develop proportional reasoning as a central mathematical habit.
- Introduce algebra as a language for describing relationships, not merely symbol manipulation.
- Connect numerical, graphical, tabular and verbal representations.
- Develop spatial and measurement reasoning through geometry and coordinates.
- Teach statistics as reasoning about variability rather than only calculating averages.
- Introduce probability through intuitive, theoretical and experimental approaches.
- Use financial literacy and mathematical modeling in authentic contexts.
- Develop mathematical communication: students should explain how and why a solution works.
- Use Core and Extension pathways so advanced material adds depth without redefining Grade 6 expectations.

3. Grade 6 • Grade 7 • Grade 8 Progression

Area	Grade 6	Grade 7	Grade 8
Number	Rational-number fluency	Rational-number reasoning & proportionality	Real numbers, exponents & Algebra I bridge
Ratios	Ratios, rates, percent	Proportions and proportional relationships	Linear relationships/functions
Algebra	Expressions, 1-2 step equations	Expressions, equations & inequalities	Linear equations, functions & systems
Geometry	Measurement, coordinates, angles	Transformations, geometry & volume	Congruence, similarity, Pythagorean theorem
Statistics	Distributions & center/spread	Sampling, IQR/MAD & displays	Bivariate data & statistical modeling
Probability	Simple probability & simulation	Compound probability	Probability models & applications
Finance	Percent, budgeting, simple interest	Financial applications	Financial modeling
Overall role	Middle-school foundation	Pre-Algebra / proportional reasoning	Middle-school mastery + Algebra I bridge

4. Suggested Course Sequence

The sequence below provides a structured pathway across the academic year, organizing foundational number sense and proportional reasoning before progressing into formal algebraic expressions, spatial reasoning, data analysis, and integrated modeling projects.

Order	Unit	Primary focus
1	The Number System	Rational numbers, operations, factors, exponents, estimation
2	Ratios, Rates, Percent & Proportional Reasoning	Rates, percent, scale, unit conversions
3	Expressions, Equations, Inequalities & Relationships	Algebra foundations and representations
4	Geometry, Measurement & Coordinate Reasoning	Area, volume, surface area, angles, coordinates
5	Statistics, Probability & Data Analysis	Distributions, center/spread and probability
6	Financial Literacy & Mathematical Modeling	Cross-cutting applications and projects

Instructional Sequencing Note: Units 1 through 5 represent deep conceptual modules taught in instructional blocks, while Unit 6 serves as a cross-cutting applied strand woven throughout all units, culminating in dedicated quarterly modeling investigations.

Unit 1 The Number System: Whole Numbers, Fractions, Decimals & Integers

Learning Goal: Build a unified understanding of numbers and fluent operations while preparing students to reason confidently with rational numbers.

CORE TOPICS

- Place value and decimal representation through thousandths and large whole numbers.
- Integers: meaning, ordering, number lines, opposites and absolute value.
- Addition, subtraction, multiplication and division of integers.
- Equivalent fractions and simplifying fractions.
- Add, subtract, multiply and divide fractions and mixed numbers.
- Decimal operations through thousandths.
- Connect fractions, decimals and integers as representations within the rational-number system.
- Compare and order rational numbers using symbols, benchmarks and number lines.
- Factors, multiples, prime factorization, GCF and LCM.
- Whole-number exponents, squares and cubes.
- Order of operations with parentheses and exponents.
- Estimation, mental math and checking reasonableness.

EXTENSION

Deeper number-line reasoning, challenging multi-step rational-number problems and advanced estimation strategies.

REAL-WORLD APPLICATIONS

Temperatures, elevations, money, measurements, distances, rates and numerical data.

END-OF-UNIT OUTCOMES

- Operate accurately with whole numbers, fractions, decimals and integers.
- Represent, compare and order rational numbers in multiple forms.
- Use factors, multiples, GCF and LCM strategically.
- Apply whole-number exponents and order of operations.
- Estimate and explain whether numerical answers are reasonable.

Unit 2 Ratios, Rates, Percent & Proportional Reasoning

Learning Goal: Develop proportional reasoning as a central Grade 6 idea and connect ratios, rates, percentages, tables, graphs and equations.

CORE TOPICS

- Part-to-part and part-to-whole ratios.
- Equivalent ratios and scaling.
- Unit rates and comparing rates.
- Ratio tables and double number lines.
- Percent as per hundred and as a ratio.
- Convert among fractions, decimals and percentages.
- Find the percent, part or whole.
- Percent increase and percent decrease.
- Proportional relationships through tables, graphs and equations.
- Constant rate and introductory constant of proportionality.
- Scale drawings and introductory scale factors.
- Unit conversions using rates and proportional reasoning.
- Discounts, tax, tips, markups, unit price and best-buy problems.

EXTENSION

Multi-step proportional models, complex scale problems and challenging percent applications.

REAL-WORLD APPLICATIONS

Shopping, recipes, maps, speed, unit prices, discounts, taxes, tips, budgets and comparisons.

END-OF-UNIT OUTCOMES

- Solve ratio and rate problems using multiple representations.
- Recognize and explain proportional relationships.
- Solve percent problems, including increase and decrease.
- Use scale and unit conversions appropriately.
- Interpret proportional models in real-world contexts.

Unit 3 Expressions, Equations, Inequalities & Relationships

Learning Goal: Transition students from arithmetic into formal algebraic reasoning without turning Grade 6 into premature Algebra I.

CORE TOPICS

- Numerical versus algebraic expressions.
- Variables, constants, coefficients and terms.
- Order of operations.
- Evaluating expressions by substitution.
- Commutative, associative and distributive properties.
- Writing algebraic expressions from verbal descriptions.
- Combining like terms at an introductory level.
- Recognizing and generating equivalent expressions.
- One-step equations in one variable.
- Two-step equations as Grade 6 core preparation.
- One-step inequalities and number-line graphs.
- Introductory two-step inequalities.
- Input/output relationships.
- Independent and dependent variables.
- Tables, graphs, equations and verbal descriptions of relationships.
- Coordinate-plane representations of simple relationships.
- Multi-step word problems connecting quantities and equations.

EXTENSION

More challenging multi-step equations, variables on both sides in carefully selected extension problems, and richer algebraic reasoning.

REAL-WORLD APPLICATIONS

Cost models, distance/time, age problems, shopping, patterns, simple business scenarios and measurement formulas.

END-OF-UNIT OUTCOMES

- Translate among words, expressions, tables, graphs and equations.
- Evaluate and simplify age-appropriate algebraic expressions.
- Solve one- and two-step equations and inequalities.
- Interpret variables and relationships in context.
- Explain why algebraic steps preserve equality.

Unit 4 Geometry, Measurement & Coordinate Reasoning

Learning Goal: Build strong spatial, measurement and coordinate reasoning while creating a bridge into the more formal geometry of Grades 7-10.

CORE TOPICS

- Coordinate plane in all four quadrants.
- Plot and interpret ordered pairs.
- Horizontal and vertical distance on coordinate grids.
- Perimeter of coordinate-based polygons.
- Area of rectangles, triangles and parallelograms.
- Area of composite figures.
- Volume of rectangular prisms and missing dimensions.
- Volume in cubic units and unit conversion.
- Nets and surface area of rectangular prisms.
- Classify angles: acute, right, obtuse, straight and reflex.
- Complementary and supplementary angles.
- Vertical angles and basic angle relationships.
- Classify triangles by sides and angles.
- Triangle angle sum of 180° .
- Circle vocabulary: radius and diameter.
- Circumference concept and basic circle applications.
- Introductory circle area as an extension where appropriate.
- Coordinate-based geometric problem solving.

EXTENSION

More complex composite figures, introductory pyramids/cylinders, coordinate-based area strategies and richer circle problems.

REAL-WORLD APPLICATIONS

Floor plans, packaging, construction, architecture, maps, design, sports fields and three-dimensional objects.

END-OF-UNIT OUTCOMES

- Calculate area, volume and surface area with appropriate units.
- Use coordinates to analyze geometric figures.
- Solve unknown-angle problems using basic relationships.
- Classify triangles and apply the triangle angle-sum relationship.
- Connect geometric formulas to diagrams and real situations.

Unit 5 Statistics, Probability & Data Analysis

Learning Goal: Develop statistical thinking: ask questions that anticipate variability, represent data, describe distributions and reason about simple probability.

CORE TOPICS

- Statistical versus non-statistical questions.
- Population and sample concepts.
- Collecting and organizing data.
- Frequency tables.
- Dot plots and line plots.
- Histograms.
- Box plots.
- Stem-and-leaf plots.
- Mean, median and mode.
- Range and interquartile range.
- Outliers and their effects on measures of center.
- Shape of distributions: clusters, gaps, skew and symmetry.
- Compare two data distributions using center and spread.
- Choose an appropriate display for a dataset.
- Probability from 0 to 1.
- Certain, likely, unlikely and impossible events.
- Simple theoretical probability.
- Experimental probability.
- Sample spaces for simple events.
- Simple simulations and comparison of experimental versus theoretical probability.

EXTENSION

More sophisticated data comparisons, multi-step simulations and introductory expected-value intuition without moving into later-grade probability.

REAL-WORLD APPLICATIONS

Sports data, surveys, classroom data, science experiments, games, weather data and real-world graphs.

END-OF-UNIT OUTCOMES

- Represent and interpret data in multiple ways.
- Calculate and interpret measures of center and spread.
- Recognize outliers and describe distribution shape.
- Compare datasets using center and spread.
- Calculate and interpret simple theoretical and experimental probability.

Unit 6 Financial Literacy & Mathematical Modeling - Cross-Cutting Strand

Learning Goal: Use mathematics to make sense of real-world decisions. This strand is integrated throughout the course rather than treated as a conventional isolated chapter.

CORE TOPICS

- Unit price and best-buy analysis.
- Budgets and spending constraints.
- Discounts, markups, sales tax and tips.
- Percent change in realistic situations.
- Simple interest introduction.
- Income, expenses and savings goals.
- Planning an event, trip or shopping list within a budget.
- Reading and interpreting graphs from news, advertising and science.
- Building tables, graphs and equations from real situations.
- Identifying assumptions and constraints.
- Estimating before calculating.
- Checking whether a model and answer are reasonable.
- Integrated multi-topic word problems.
- Short mathematical modeling projects.

EXTENSION

Multi-step financial models, more complex constraints and student-designed scenarios.

REAL-WORLD APPLICATIONS

Personal finance, shopping, budgeting, travel, entrepreneurship, science, sports and everyday decision-making.

END-OF-UNIT OUTCOMES

- Build simple mathematical models from real situations.
- Use ratios, percent, equations and data together.
- Interpret financial information and constraints.
- Communicate assumptions and conclusions.
- Evaluate whether a model and result make sense.

Mathematical Practices & Mathematical Thinking – Embedded All Year

The eight mathematical practices are embedded across every unit. Grade 6 students should increasingly be asked not only what answer they got, but why the method works, whether the answer is reasonable, and how the idea can be represented another way.

- **1. Make sense of problems and persevere:** identify information, constraints and a productive starting strategy.
- **2. Reason abstractly and quantitatively:** connect symbols to quantities and contexts.
- **3. Construct arguments and critique reasoning:** explain solutions and identify errors in reasoning.
- **4. Model with mathematics:** represent situations using diagrams, tables, graphs, expressions and equations.
- **5. Use tools strategically:** use number lines, grids, manipulatives, calculators and digital tools when appropriate.
- **6. Attend to precision:** use correct units, notation, labels, signs and reasonable levels of accuracy.
- **7. Look for and use structure:** recognize patterns in numbers, expressions, ratios and geometric figures.
- **8. Look for regularity in repeated reasoning:** notice patterns across repeated calculations and generalize them.

Digital Mathematics & Technology

- Use Desmos or equivalent graphing technology for coordinate relationships and simple graphs.
- Use calculators strategically after students understand the underlying mathematics.
- Use spreadsheets for tables, budgeting and repeated calculations at an introductory level.
- Use digital geometry tools to explore coordinates, shapes, angles and measurement.
- Use simulations for introductory probability.
- Use virtual manipulatives when they clarify fractions, ratios, integers or geometric ideas.
- Students should explain and check technology-generated results rather than treating technology as an authority.

Assessment Framework

Assessment should measure conceptual understanding, procedural fluency, reasoning, application and communication.

Assessment	Purpose
Diagnostic/readiness	Identify gaps in arithmetic, fractions, decimals and prerequisite number sense.
Formative checks	Catch misconceptions during instruction.
Skill practice	Build reliable computational and algebraic fluency.
Reasoning tasks	Assess explanations, multiple methods and error analysis.
Unit assessments	Measure mastery of core unit outcomes.
Modeling/project tasks	Integrate multiple strands in realistic contexts.
Cumulative review	Spaced retrieval of earlier Grade 6 skills and readiness for Grade 7.

Homework & Practice Philosophy

- Use homework to reinforce ideas that have already been taught.
- Mix procedural fluency with reasoning and application.
- Use spaced retrieval of fractions, decimals, integers and ratios throughout the year.
- Include estimation and answer-checking regularly.
- Use occasional technology-free practice to preserve mathematical independence.
- Avoid assigning large quantities of repetitive questions when a smaller set can demonstrate mastery.
- Provide challenge questions as extensions rather than making advanced content mandatory for all students.

Differentiation at ROED

Student profile	ROED response
Prerequisite gaps	Targeted number/fraction/decimal review alongside current Grade 6 content.
On-level	Core Grade 6 instruction with regular reasoning and application.
Strong mastery	More complex multi-step problems, alternative methods and modeling.
Advanced	Extension work in algebraic reasoning, proportional models, coordinate geometry, statistics and probability.
Needs more practice	Concrete models, visual representations, guided examples and spaced retrieval.
Fast procedural solver	Increase explanation, error analysis, representation switching and modeling.

Suggested Integrated Projects

- **Plan a Trip:** use ratios, unit rates, percent, budgeting and data to design a trip within a fixed budget.
- **Best Buy Challenge:** compare package sizes, unit prices, discounts and taxes to justify purchasing decisions.
- **Class Data Investigation:** collect a dataset, represent it in multiple displays, calculate center/spread and compare groups.
- **Design a Room:** use scale, coordinates, area, perimeter and budgeting to design a floor plan.
- **Probability Game:** design a simple game, calculate theoretical probability, run trials and compare results.
- **Mini Business Model:** create a simple product/pricing scenario using unit rate, percent and equations.

End-of-Year Grade 6 Outcomes

By the end of the Grade 6 Core program, a successful student should be able to:

- Operate fluently with whole numbers, fractions, decimals and integers.
- Represent, compare and order rational numbers.
- Use factors, multiples, prime factorization, GCF and LCM strategically.
- Use whole-number exponents and order of operations.
- Estimate and evaluate the reasonableness of answers.
- Use ratios, unit rates and proportional relationships to solve problems.
- Solve percent problems, including percent increase/decrease and real-world applications.
- Use scale and unit conversions in appropriate contexts.
- Write, evaluate and simplify age-appropriate algebraic expressions.
- Solve one- and two-step equations and inequalities.
- Interpret independent/dependent variables and relationships through tables, graphs and equations.
- Use coordinates, area, volume, surface area and angle relationships to solve geometry problems.
- Analyze data using multiple representations and measures of center and spread.
- Describe distributions and identify the effect of outliers.
- Calculate and interpret simple theoretical and experimental probability.
- Build basic mathematical models from real situations.
- Use technology strategically and verify results independently.
- Explain mathematical reasoning clearly using words, symbols, diagrams, tables and graphs.

Final Curriculum Map - One-Page Reference

Unit	Core focus	Major integrated/application focus
1	Number system & rational-number operations	Fluency, estimation, factors, exponents
2	Ratios, rates, percent & proportional reasoning	Scale, conversions, financial applications
3	Expressions, equations, inequalities & relationships	Algebraic modeling and representations
4	Geometry, measurement & coordinate reasoning	Area, volume, surface area, angles, coordinates
5	Statistics, probability & data analysis	Distributions, center/spread, simple probability
6	Financial literacy & mathematical modeling	Budgeting, percent, simple interest, real-world models

Curriculum design principle: Grade 6 is the first stage of the ROED middle-school pathway. It builds the number, proportional, algebraic, geometric and data reasoning that students will use in Grade 7 and the Algebra I bridge of Grade 8.