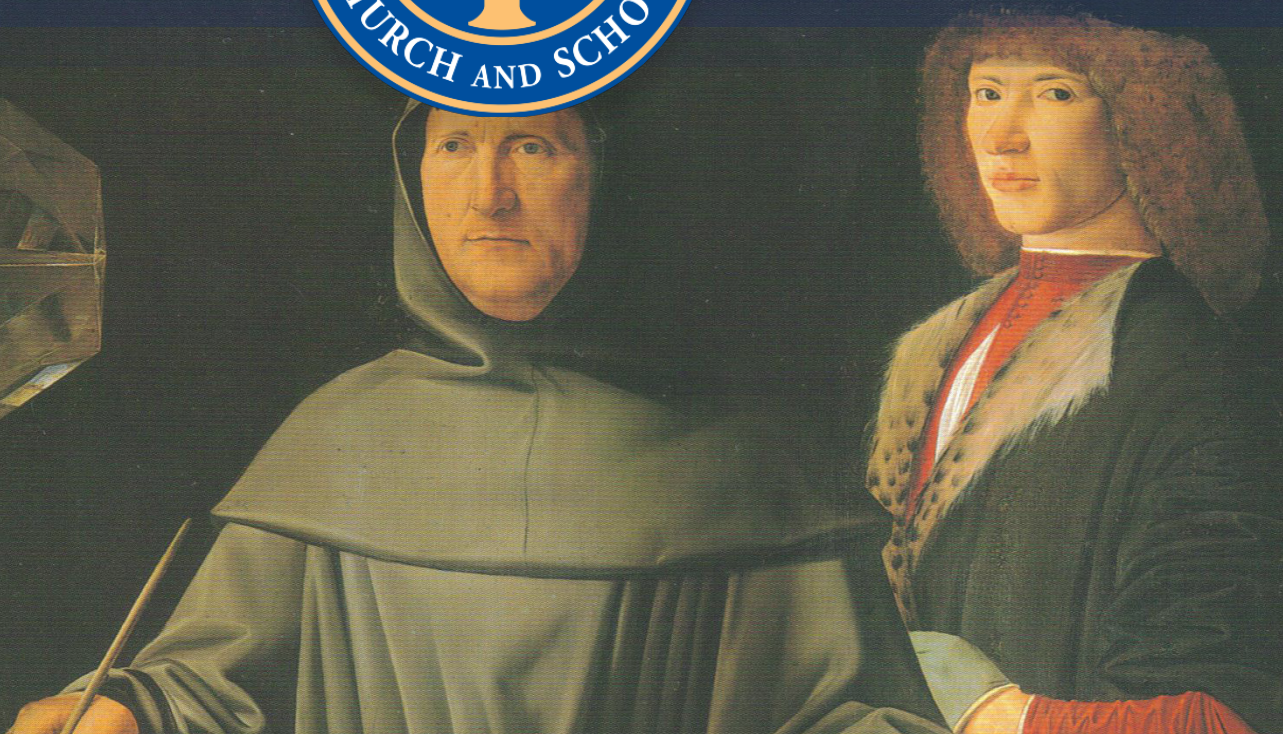
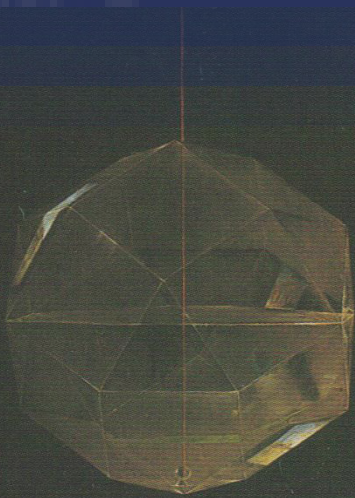
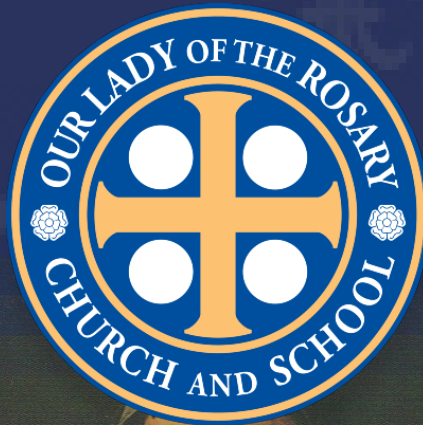




Algebra I Curriculum

Grade 08



Course Overview

Course Description

Algebra I is a year of discovery and wonder, an invitation to enter the ordered world of mathematics where logic, beauty, and truth meet. Through the study of variables, equations, functions, and their applications, students will not only learn how to solve problems but will also explore why these concepts hold together in harmony. Each lesson will strengthen analytical skills, sharpen reasoning, and reveal the deep connections between abstract thought and the patterns woven into creation. In the words of St. Augustine, “Numbers have fixed laws which were not made by man, but which the acuteness of ingenious men brought to light.” As we uncover these laws, we cultivate not only the mind but also a deeper appreciation for the divine order in the universe—a reminder that truth is as immutable in mathematics as it is in the moral law.

Why We Teach It...

We teach Algebra I to awaken in students a sense of wonder at the precision of creation, to discipline the intellect through logical reasoning, and to cultivate perseverance in the face of challenging problems. Mathematics is more than a utilitarian tool—it is a language of order, a reflection of the Creator’s wisdom, and a means of training the mind in truthfulness. By focusing on the why behind each concept, we guide students toward a deeper understanding that unites skill with insight. In this way, the study of algebra becomes not merely an academic exercise, but an act of participation in the divine order—a training ground for minds that seek to know and love what is true.

Course Objectives







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



Learning the language of Algebra: Understanding variables, expressions, and equations as tools for representing real-world situations.



Course Objectives | Continued...

-  Working with Real Numbers: Mastering operations and properties of integers, fractions, and decimals
-  Solving Equations & Inequalities: Developing strategies for finding solutions to linear and quadratic equations & inequalities.
-  Functions & Graphing: Understanding relationships between quantities & visualizing them through graphs.
-  Polynomials & Factoring: Exploring the structure of polynomials & developing techniques for factoring them.
-  Connect Math to God's Natural World: Through the use of problems involving spiritual lessons, Biblical principles, and contributions of Christian mathematicians that help us recognize the presence of order and beauty in the created world.
-  Grow In Virtue! Mathematics requires diligence, patience, and perserverance. In cultivating these virtues we will understand the meaning of hard work and that great things can be achieved all to the glory of God.

Source Material |

Algebra: Structure and Method, McDougal Littell/Houghton Mifflin, 2000



Key Concepts

Numerical Expressions	Real Numbers	Simplifying Quotients
Substitution Property	Absolute Value	Integer Equations
Grouping Symbols	Commutative Property	Opposite Numbers
Order Operations	Associative Property	Additive Inverse
Open Sentences	Number Line	Properties Review
Solution Set	Additive Identity	Skills Test
Verbal Expressions	Addition Rules	Problem Translation
Mathematical Equations	Reciprocals	Product Rules
Word Problems	Multiplicative Inverse	Quotient Rules
Problem Plan	Simplifying Products	Student Strategies

Assessments

Summative: 35%

- Unit Exams
- Quizzes

Formative: 35%

- Weekly Drills
- Quizzes
- Homework

Conscientiousness 30%

- Pop quizzes
- Homework
- Classwork
- Preparedness and participation



Scope & Sequence

Unit 1 | Foundations of Algebra

4 Weeks

Week 1-4 Overview: Chapter 1

This opening unit establishes the language and habits of algebra: working with variables, grouping symbols, and equations; translating words into symbols and equations; applying a five-step problem-solving plan; reading number lines; and working with opposites and absolute value. Expect to spend extra time on translating words into symbols—the plan notes this skill often proves difficult and can affect later work if not secured early. Checkpoints in this unit include a Quiz after 1.3, a Quiz after 1.7, followed by a Review and Test at the end of the chapter.

Key Concepts

Variables · Numerical Expressions · Substitution Property · Grouping Symbols · Order Operations · Equations · Open Sentences · Solution Set · Translating Words · Verbal Phrases · Translating Sentences · Mathematical Equations · Translating Problems · Word Equations · Problem Plan · Number Lines · Real Numbers · Opposite Numbers · Absolute Value

Sources

Algebra: Structure and Method, McDougal Littell/Houghton Mifflin, 2000



Week 5-8 Overview: Chapter 2

This unit builds mastery with the structure and properties of real numbers, reinforcing the logic of arithmetic as it applies to algebraic reasoning. Students will work with the commutative and associative properties, model addition and subtraction on the number line, apply the additive identity and inverse, and practice the distributive property. The unit extends into multiplication and division of real numbers, the use of reciprocals, and problem-solving with consecutive integers. Word problems are woven throughout to connect abstract operations with real-world applications. Assessments include a Quiz after 2.9, followed by a Review and Test at the end of the chapter.

Key Concepts

Commutative Property · Associative Property · Number Line Addition · Additive Identity · Additive Inverse · Rules for Addition · Word Problems · Using Additive Inverse · Simplifying Expressions · Products of Real Numbers · Integer Equations · Reciprocals · Simplifying Products · Quotients · Multiplicative Inverse · Simplifying Quotients

Sources

Algebra: Structure and Method, McDougal Littell/Houghton Mifflin, 2000



Unit 3 | Solving Equations & Problems

4 Weeks

Week 9-12

Overview: Chapter 3

This unit equips students with the tools to transform and solve equations through the application of addition, subtraction, multiplication, and division properties. Students will learn to combine several transformations in sequence, apply the five-step plan to real-world problem-solving, and work with equations containing variables on both sides. They will also develop strategies for organizing information through charts and for solving applied problems involving cost, income, and value. The chapter concludes with an introduction to formal proofs in algebra, laying a foundation for logical reasoning and theorem-based work in future courses. Assessments include a Quiz after 3.8, followed by a Review and Test at the end of the chapter.

Key Concepts

Addition Properties · Subtraction Properties · Word Problems · Multiplication Properties · Division Properties · Transformations · Five-Step Plan · Variable Equations · Chart Problems · Cost Problems · Income Problems · Value Problems · Algebraic Proofs · Theorems

Sources

*Algebra: Structure and Method, McDougal Littell/
Houghton Mifflin, 2000*



Week 13-14 Overview: Chapter 4

This unit introduces students to the structure, operations, and problem-solving applications of polynomials. Beginning with exponents and the simplification of exponential expressions, students will progress to adding, subtracting, and multiplying both monomials and polynomials. The unit also covers transforming formulas and applying polynomial skills to real-world contexts such as rate-time-distance, area, and identifying problems without solutions. The sequence of topics is deliberately structured to highlight the relationships between operations, though students may find the transitions between concepts challenging. Assessments include a Quiz after 4.10, followed by a Review and Test at the end of the chapter.

Key Concepts

Exponents · Simplifying Exponents · Combining Like Terms · Multiplying Monomials · Powers of Monomials · Multiplying Polynomials · Transforming Formulas · Rate-Time-Distance · Area Problems · No-Solution Problems

Sources

Algebra: Structure and Method, McDougal Littell/Houghton Mifflin, 2000



Week 15-19 Overview: Chapter 5

This unit develops mastery in recognizing and applying a variety of factoring techniques, beginning with the factoring of integers and monomials, then progressing to binomials and trinomials. Students will work with mental multiplication of binomials, special products such as the difference of two squares and the square of a binomial, and multiple factoring patterns for quadratic expressions. The unit also includes factoring by grouping, applying several methods of factoring to the same problem, and using factoring to solve equations and applied problems. Since factoring is a critical algebraic skill, special attention is given to areas where students often struggle. Assessments include a Quiz after 5.13, followed by a Review and Test at the end of the chapter.

Key Concepts

Factoring Integers · Dividing Monomials · Monomial Factors · Multiplying Binomials · Difference of Squares · Squares of Binomials · Quadratic Patterns · Factoring by Grouping · Multiple Methods · Solving by Factoring · Applied Factoring

Sources

Algebra: Structure and Method, McDougal Littell/Houghton Mifflin, 2000



Week 20-22 Overview: Chapter 6

This unit strengthens students' proficiency in working with fractions, from simplification to operations with unlike denominators. Students will master multiplying and dividing fractions, finding least common denominators, and adding and subtracting with accuracy. The unit also covers mixed expressions that combine fractional and whole-number components. Although polynomial long division is introduced, it will be studied in greater depth in Algebra II. Students will be assessed through a Quiz, followed by a Review and Test at the end of the chapter.

Key Concepts

Simplifying Fractions · Multiplying Fractions · Dividing Fractions · Least Common Denominator · Adding Fractions · Subtracting Fractions · Mixed Expressions · Polynomial Long Division

Sources

*Algebra: Structure and Method, McDougal Littell/
Houghton Mifflin, 2000*



Week 23-25 Overview: Chapter 7

This unit focuses on extending fraction skills into practical and applied contexts. Students will review ratios and proportions, ensuring mastery from earlier courses, and apply these concepts to equations with fractional coefficients and fractional equations. They will also explore percentages in depth, working through percent problems, mixture problems, and work problems to connect mathematics to real-world problem solving. The chapter concludes with study of negative exponents and scientific notation, preparing students to handle small and large numbers with precision. Assessments include a Quiz after 7.10, followed by a Review and Test at the end of the chapter.

Key Concepts

Ratios · Proportions · Fractional Coefficients · Fractional Equations · Percents · Percent Problems · Mixture Problems · Work Problems · Negative Exponents · Scientific Notation

Sources

*Algebra: Structure and Method, McDougal Littell/
Houghton Mifflin, 2000*



Week 26-29 Overview: Chapter 8

This unit introduces students to the concept of functions and their representations. Beginning with equations in two variables, students will learn to interpret and construct graphs of points, lines, and functions. They will master calculating slope, applying the slope-intercept form, and determining equations of lines from given information. The unit explores functions as defined by tables, graphs, and equations, as well as special categories such as linear, quadratic, and direct variation. While inverse variation is noted, it will be covered more thoroughly in Algebra II or Precalculus. Assessments include a Quiz after 8.10, followed by a Review and Test at the end of the chapter.

Key Concepts

Equations in Two Variables · Graphing Points · Graphing Lines · Slope · Slope-Intercept Form · Equation of a Line · Functions from Tables · Functions from Equations · Linear Functions · Quadratic Functions · Direct Variation

Sources

*Algebra: Structure and Method, McDougal Littell/
Houghton Mifflin, 2000*



Week 26-29 Overview: Chapter 9

This unit equips students with multiple strategies for solving systems of linear equations, beginning with graphical solutions and moving through algebraic methods such as substitution, addition, and subtraction.

Students will also learn how to combine multiplication with the addition-or-subtraction method for more complex systems. Real-world applications include solving wind and water current problems and logic-based puzzle problems, reinforcing both procedural skill and creative problem-solving. Assessments include a Quiz after 9.7, followed by a Review and Test at the end of the chapter.

Key Concepts

Graphing Method · Substitution Method · Two-Variable Problems · Addition Method · Subtraction Method · Multiplication with Elimination · Wind Problems · Water Current Problems · Puzzle Problems

Sources

*Algebra: Structure and Method, McDougal Littell/
Houghton Mifflin, 2000*



Week 30-31 Overview: Chapter 10

This unit focuses on the properties, solution methods, and applications of inequalities. Students will begin by reviewing the order of real numbers and move into solving simple and combined inequalities. They will apply these skills to real-world problem contexts and learn to handle absolute value in open sentences, including cases with products. The unit also introduces graphing linear inequalities and extends to systems of linear inequalities, connecting algebraic reasoning with visual representation. Assessments include a Quiz after 10.8, followed by a Review and Test at the end of the chapter.

Key Concepts

Order of Real Numbers · Solving Inequalities · Inequality Word Problems · Combined Inequalities · Absolute Value · Absolute Value of Products · Graphing Linear Inequalities · Systems of Linear Inequalities

Sources

*Algebra: Structure and Method, McDougal Littell/
Houghton Mifflin, 2000*



Week 32-34 Overview: Chapter 11

This unit introduces students to the properties of rational numbers and their decimal forms, then moves into the study of square roots—both rational and irrational—and the square roots of variable expressions. Some related topics, such as the Pythagorean Theorem and operations with radicals, are covered in Geometry, while advanced radical operations and equations are reserved for Algebra II. The focus here is to build foundational understanding of root concepts, preparing students for more complex applications in later courses. Assessments include a Quiz after 11.10, followed by a Review and Test at the end of the chapter.

Key Concepts

Properties of Rational Numbers · Decimal Forms · Rational Square Roots · Irrational Square Roots · Square Roots of Variables · Pythagorean Theorem · Multiplying Radicals · Dividing Radicals

Sources

*Algebra: Structure and Method, McDougal Littell/
Houghton Mifflin, 2000*



Week 35-36 Overview: Chapter 12

This unit introduces the fundamental forms, methods, and applications of quadratic functions. Topics include solving quadratic equations with perfect squares, completing the square, and using the quadratic formula. Students will also explore the discriminant as a tool for analyzing graphs, compare methods of solution, and solve applied problems involving quadratics. Variations involving squares, including direct, inverse, joint, and combined variation, are also presented. While all of these topics will be revisited in Algebra II, this unit provides the initial exposure necessary for deeper mastery later. Assessments include a Quiz after 12.8, followed by a Review and Test at the end of the chapter.

Key Concepts

Perfect Square Quadratics · Completing the Square · Quadratic Formula · Discriminant · Solution Methods · Quadratic Applications · Direct Variation (Squares) · Inverse Variation (Squares) · Joint Variation · Combined Variation

Sources

*Algebra: Structure and Method, McDougal Littell/
Houghton Mifflin, 2000*



Course Catechism

This section is structured as a series of questions and answers—intended to cultivate wisdom, virtue, and a love of tradition in the soul of the reader. Drawing from classical education, Christian orthodoxy, and the accumulated insights of Western civilization, this catechism aims to form not only the mind but the moral imagination.



Each question is crafted to provoke contemplation, and each answer is more than mere information—it is a small liturgy of truth, designed to be memorized, internalized, and lived. In the tradition of ancient catechisms, this section assumes that learning is not just for passing tests, but for becoming someone.

Section I | The Language of Algebra

Q: What is a variable?

A: *A symbol, usually a letter, that represents one or more numbers.*

Q: What is a numerical expression?

A: *A combination of numbers and operations without variables.*

Q: What is the substitution property?

A: *The rule that allows a number to replace a variable in an expression.*

Q: What are grouping symbols?

A: *Symbols such as parentheses or brackets that show which operations to perform first.*

Q: What is the order of operations?

A: *The agreed-upon sequence for performing operations: parentheses, exponents, multiplication/division, addition/subtraction.*

Q: What is an open sentence?

A: *An equation or inequality containing a variable.*

Q: What is a solution set?

A: *The set of all values of the variable that make an open sentence true.*



Section II | Law of Real Numbers

Q: What is the commutative property?

A: *Changing the order of numbers in addition or multiplication does not change the result.*

Q: What is the associative property?

A: *Changing the grouping of numbers in addition or multiplication does not change the result.*

Q: What is the additive identity?

A: *Zero, which does not change a number when added to it.*

Q: What is the additive inverse?

A: *The opposite of a number, which sums with the number to make zero.*

Q: What is the multiplicative inverse?

A: *The reciprocal of a number, which multiplies with the number to make one.*

Q: What is a product of real numbers?

A: *The result of multiplying real numbers according to the rules of multiplication.*

Section III | Equations & Problem Solving

Q: What is the addition property of equality?

A: *Adding the same number to both sides of an equation keeps the equation true.*

Q: What is the subtraction property of equality?

A: *Subtracting the same number from both sides of an equation keeps the equation true.*

Q: What is the multiplication property of equality?

A: *Multiplying both sides of an equation by the same number keeps the equation true.*

Q: What is the division property of equality?

A: *Dividing both sides of an equation by the same nonzero number keeps the equation true.*



Section IV | Polynomials

Q: What is an exponent?

A: *A number that shows how many times a base is used as a factor.*

Q: What are like terms?

A: *Terms with the same variable(s) raised to the same power(s).*

Q: What is a monomial?

A: *A single term consisting of a number, a variable, or both.*

Q: What is a polynomial?

A: *A sum of one or more monomials.*

Q: What is a rate-time-distance formula?

A: *An equation relating rate, time, and distance: $d=rt$.*

Section V | Factoring

Q: What is factoring?

A: *Writing a number or expression as a product of its factors.*

Q: What is the difference of squares?

A: *The difference of squares is...*

Q: What is a perfect square trinomial?

A: *A trinomial that factors into the square of a binomial.*

Q: What is factoring by grouping?

A: *A method of factoring in which terms are arranged and common factors are taken out in groups.*

Q: What is solving by factoring?

A: *Setting each factor equal to zero to find solutions.*



Section VI | Fractions

Q: What is a least common denominator?

A: *The smallest denominator that is a multiple of each given denominator.*

Q: What is a mixed expression?

A: *An expression combining fractions with whole numbers or variables.*

Section VII | Applying Fractions

Q: What is a ratio?

A: *A comparison of two quantities by division.*

Q: What is a proportion?

A: *An equation stating that two ratios are equal.*

Q: What is a percent?

A: *A ratio comparing a number to 100.*

Q: What is scientific notation?

A: *A way of writing numbers as a product of a number between 1 and 10 and a power of ten.*

Section VIII | Functions

Q: What is a function?

A: *A relation in which each input has exactly one output.*

Q: What is slope?

A: *The ratio of vertical change to horizontal change between two points on a line.*

Q: What is the slope-intercept form of a line?

A: *$y=mx+b$, where m is slope and b is the y -intercept.*

Q: What is direct variation?

A: *A relationship where $y=kx$ for some constant k .*



Section IX | System of Linear Functions

Q: What is the graphing method?

A: *Solving a system by graphing each equation and finding the intersection point.*

Q: What is the substitution method?

A: *Solving one equation for a variable, then substituting into the other.*

Q: What is the addition method?

A: *Adding or subtracting equations to eliminate a variable.*

Section X | Inequalities

Q: What is an inequality?

A: *A statement that compares two expressions using symbols such as $<$, $>$, \leq or \geq .*

Q: What is a combined inequality?

A: *Two inequalities joined by “and” or “or.”*

Q: What is a system of linear inequalities?

A: *A set of two or more inequalities with the same variables, solved by finding the region of overlap in their graphs.*

Section XI | Roots & Radicals

Q: What is a rational square root?

A: *A square root that is a rational number.*

Q: What is an irrational square root?

A: *A square root that is not a rational number.*

Q: What is the Pythagorean Theorem?

A: *In a right triangle, $a^2 + b^2 = c^2$.*

Section XII | Quadratics

Q: What is the quadratic formula?

A: *The quadratic formula is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.*

Week 1

Weekly Logos | *Variables & Grouping Symbols*

Algebra begins with symbols, structure, and order. To work truthfully, we must speak its language correctly from the first step. In these opening days, students learn how numbers and variables combine in expressions, how to follow the order of operations, and how to use grouping symbols to preserve meaning. A variable is not a mystery to be feared, but a place-holder for truth yet to be discovered. Just as a sentence requires proper grammar, an expression requires proper structure.

What Are We Assessing? | *The Facts*

- ▣ Definition and use of a variable
- ▣ Numerical expressions and the substitution property
- ▣ Grouping symbols (parentheses, brackets, braces)
- ▣ Order of operations (PEMDAS)

What Are We Assessing? | *The Skills*

- ▣ Identify variables and constants in an expression
- ▣ Evaluate numerical expressions using substitution
- ▣ Apply grouping symbols correctly in simplifying expressions
- ▣ Execute operations in the correct order

What Are We Assessing? | *The Truths*

“Sign point to symbols, symbols to reality”

These truths unify every element of the lesson:

- Symbols gain meaning only when interpreted in order
- Mathematical order reflects the logic and harmony of creation



Assessments | *Suggested Types*

- ▮ Vocabulary check (variable, expression, grouping symbols, substitution)
- ▮ Order of operations drill with and without grouping symbols
- ▮ Substitution property practice problems
- ▮ Oral “walk-through” of complex expressions, step-by-step

Pacing | *By Week*

Day	Focus	Homework
Monday	Introduction to variables and constants; what algebra represents	Text §1.1: Odd problems, #1–15
Tuesday	Numerical expressions; substitution property	Worksheet: Substitution drills
Wednesday	Grouping symbols; nested parentheses	Text §1.2: #5–20 (every other problem)
Thursday	Order of operations with grouping symbols	Mixed practice set: #1–10 (order of operations)
Friday	In-class review; timed drill; short quiz	Study notes for next week; vocabulary review



Teacher Tips

Begin each day with a 3–5 minute “symbol drill” — write an expression and ask students to name each part before simplifying.

Use visual brackets and color-coding to show operation order.

Tie the structure of operations to moral order: just as actions have a right sequence, so do mathematical steps.

Have students “narrate” their steps aloud to reinforce proper sequencing.