# Teaching Math

**Reasons Why Teaching Math Is Important**

- Math is essential for practical life skills, such as budgeting, building, cooking, and any job requiring precise calculations.
- Math fosters orderly thinking, logical problem-solving, and careful work habits.
- Math reflects God's character, showcasing His order, precision, consistency, and dependability. It is described as the "blueprint of the universe" and the "language of the universe," revealing God's glory through its patterns and structures.
- Studying math allows students to "think God's thoughts after Him" (Johannes Kepler).
- Math is not neutral; it is a subject that can draw students' minds to God's attributes and foster a biblical worldview.

**General Guidelines and Teaching Tips**

- Students should be given the opportunity to engage with real problems that require significant effort but are within their ability to solve.
- Guide your students in rejecting fixed notions of "smartness." There is no such thing as a "math person." Instead, foster a growth mindset, encouraging students to remember that anyone can learn math with the right explanation and enough effort. Reframe "math is hard" as "math is challenging."
- Struggle is valuable for building neural connections. Let students struggle briefly with problems, but don't let them struggle alone for so long that they get overwhelmed.
- Normalize mistakes as learning opportunities, not failures. You can highlight "good mistakes" for discussion, avoiding shame and focusing on why errors occur rather than demanding corrections of all wrong answers.
- Prioritize skills like logical thinking and conceptual understanding over speed in calculations. Focus on process and understanding, not quickly-gained correct answers.
- Teach the concept before the skill. You will use repetitive practice to automate skills, but ensure conceptual understanding first.
- Students often complain that "math is useless." Whenever possible, use real-world examples to help combat this mindset. Also, emphasize that math develops the mind, fostering discipline and problem-solving. Those things prepare students for life, even if specific equations are never directly applied.
- Group work can be a powerful tool for high-achieving and low-achieving students alike. Low achievers can benefit from hearing concepts being explained in a slightly different way, and high achievers strengthen their own understanding by helping those who are struggling.
- Consider allowing students to do their calculations on graph paper, particularly for lengthy processes like long division. The grid helps keep numbers in a straight line both horizontally and vertically. This can improve accuracy dramatically for some students.

**Elementary**

- Spend time and energy instilling strong number sense into young students. This often comes through lots of hands-on work with manipulatives as well as intentional focus on teaching the concepts of basic math. Only teaching rote memorization of facts with no deeper understanding of the concepts sets students up with a shaky mathematical foundation.
- Use visuals and stories to help concepts stick. Incorporating imagination helps learning stick for young students.
- Putting a particular focus on the following topics can help students obtain foundational skills that will be needed for higher-level math:
    - Long division
    - Fractions (especially multiplying and dividing fractions)
    - Decimals and percentages
    - Place value

**Junior High and High School**

- In the upper grades, math fosters critical thinking and problem-solving skills rather than basic concepts. Emphasize that the purpose of learning math is to foster deeper-level thinking skills, handle complexity, and equip students to serve in God's kingdom.
- Require students to show all steps for multi-step problems. While mental arithmetic is useful, solving multi-step problems mentally builds a fragile foundation that collapses with complexity.
- To manage workload, focus on checking key problems, not every one.
- Teach standard notation (e.g. variables in alphabetical order with coefficients first) for consistency across curricula and readability in advanced math.
- Award partial credit for correct processes in algebra, as the process is key.

**Recommended Resources for Various Topics**

- Methods to learn addition and subtraction:
    - Two Plus Two Is Not Five - The Dock for Learning
    - A Math Teaching Aid: How to String Counting Beads - The Dock for Learning
    - Rekenreks:
        - Rekenreks: A Visual Aid to First Grade Math - The Dock for Learning
        - Show Me a Way to Make Eleven: How I Teach Math with Rekenreks - The Dock for Learning
        - Making Elementary Math Come Alive: Rekenreks and Read-Alouds - The Dock for Learning
- Methods to learn multiplication and division:
    - A Tip for Teaching Times Tables - The Dock for Learning
- How to use manipulatives in Math-U-See: The Math They See, the Math They Use: Demonstrating Concepts with Math Manipulatives - The Dock for Learning
- Math drill sheets for addition and subtraction: Math Drill Sheets - The Dock for Learning

- Math drill sheets for multiplication: Challenge Math - The Dock for Learning
- Tricks for teaching a variety of math concepts, such as rounding, fractions, percentages, etc.: Math Tricks - The Dock for Learning
- Games for math fact review: Games For Math Fact Review - The Dock for Learning
- A tool for teaching basic algebra: Tipping the Scales to Teach Basic Algebra - The Dock for Learning
- A system for students struggling with algebra equations: Equation Town - The Dock for Learning
- Open-ended but solvable challenge questions: Open-Ended Math - The Dock for Learning
- A way to teach powers of the square root of -1: Powers of the Square Root of -1 - The Dock for Learning
- Tips on teaching math to girls: Girls and Math: How Going beyond the Rules Helps Students Engage with Math - The Dock for Learning

# Sources


- Open-Ended Math by John Mark Kuhns Open-Ended Math - The Dock for Learning
- What Math Is Important? By Conrad Shank What Math is Important? - The Dock for Learning
- Why Teach Math? By John Swartz Why Teach Math? - The Dock for Learning
- Making Math Come Alive by John Mark Kuhns Making Math Come Alive (John Mark Kuhns) - The Dock for Learning
- Upper Grades Math by Nathan Yoder Upper Grades Math - The Dock for Learning