Third Grade Math Instruction Guide

Early mathematics proficiency plays a pivotal role in shaping children's long-term academic success. Demonstrating proficiency with mathematical understandings such as numeracy and computation in the early grades continues to serve as a predictor of later mathematics outcomes (Kiss et al., 2019; DiPerna et al., 2007). During these early years, students deepen their understanding of foundational concepts introduced in kindergarten and expand their capacity to reason, problem-solve, and apply mathematical ideas in increasingly flexible ways.

In alignment with these findings, mathematics instruction in the elementary grades should focus on the following research-based practices:

1. Build on children's growing numeracy and computation foundations while fostering flexible thinking.
2. Strengthen learning behaviors such as perseverance, organization, and productive struggle to support mathematical growth.
3. Ensure instruction is sequenced in a coherent, learning progression across the early elementary grades.
4. Provide sustained opportunities for reasoning, problem-solving, and mathematical discourse.
5. Integrate mathematics with other content areas and in meaningful real-world contexts.
6. Offer adequate time, appropriate materials, and support for students to engage with math concepts in hands-on, exploratory, and structured ways.
7. Use a variety of teaching approaches to introduce, reinforce, and extend mathematical thinking.
8. Implement targeted intervention when needed, ensuring sufficient intensity and dosage for student success.
9. Employ ongoing formative assessment to adjust instruction and support individualized learning needs.
10. Cultivate a positive, engaging learning environment that nurtures students' curiosity, confidence, and sense-making in mathematics.

By prioritizing these research-aligned approaches, educators can create a robust, coherent math learning foundation that empowers students not only in elementary school but throughout their academic journey.

Third Grade Mathematical Domains

- **Operations and Algebraic Thinking:** represent multiplication and division situations; solve multiplication and division problems within 100; apply properties of operations, and the relationship between multiplication and division
- **Numbers and Operations in Base Ten:** use place value understanding and properties of operations to perform multi-digit arithmetic
- **Numbers and Operations – Fractions:** develop understanding of fractions as numbers

- **Measurement and Data:** solve problems involving money, measurement, and estimation of intervals of time, liquid volumes, and masses of objects; represent and interpret data; understand concepts of area and relate area to multiplication and to addition; recognize perimeter as an attribute of plane figures; distinguish between linear (perimeter) and area measures
- **Geometry:** reason with shapes and their attributes

Third Grade Critical Areas of Focus (What Students Learn)

In third grade, emphasis should be on developing students' understanding of multiplication and division, introducing formal work with fractions, and strengthening their ability to describe and analyze two-dimensional shapes. With multiplication and division, students use a variety of models to represent both operations, and they apply properties of operations to solve problems within 100. They extend their understanding of fractions by exploring unit fractions and using visual models to reason about the size of fractional parts. Students investigate area as a measurable attribute of plane figures and connect area concepts to multiplication and addition. Students compare and classify polygons of up to eight sides based on sides and angles as they develop more precise geometric reasoning. They also integrate all four operations to solve multi-step problems, using equations, models, and estimation strategies to justify the reasonableness of their solutions.

Critical Areas of Focus

Ohio's Learning Standards for Mathematics include critical areas for instruction in the introduction to each grade, kindergarten through grade 8. The critical areas are designed to bring focus to the standards at each grade by describing the big ideas that educators can use to build their curriculum and to guide instruction.

In third grade, instruction should focus on five critical areas.

- Developing understanding of multiplication and division and strategies for multiplication and division within 100.
- Developing understanding of fractions, especially unit fractions (fractions with numerator 1).
- Developing understanding of the structure of rectangular arrays and of area.
- Describing and analyzing two-dimensional shapes.
- Solving multi-step problems.

Critical Area 1: Developing and understanding of multiplication and division and strategies for multiplication and division within 100

Students develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays, and area models; multiplication is finding an unknown product, and division is finding an unknown factor in these situations. For equal-sized group situations, division can require finding the unknown number of groups or the unknown group size. Students use properties of operations to calculate products of whole numbers, using increasingly sophisticated strategies based on

these properties to solve multiplication and division problems involving single-digit factors. By comparing a variety of solution strategies, students learn the relationship between multiplication and division.

Critical Area 1: Connections to Second Grade

- Work with equal groups of objects to gain foundations for multiplication (2.OA.3-4)
- Understand place value (2.NBT.1-4)
- Use place value understanding and properties of operations to add and subtract (2.NBT.5-9)
- Relate addition and subtraction to length(2.MD.5-6)

Critical Area 2: Developing understanding of fractions, especially unit fractions (fractions with numerator 1)

Students develop an understanding of fractions, beginning with unit fractions. Students view fractions in general as being built out of unit fractions, and they use fractions along with visual fraction models to represent parts of a whole. Students understand that the size of a fractional part is relative to the size of the whole. For example, 1/2 of the paint in a small bucket could be less paint than 1/3 of the paint in a larger bucket, but 1/3 of a ribbon is longer than 1/5 of the same ribbon because when the ribbon is divided into 3 equal parts, the parts are longer than when the ribbon is divided into 5 equal parts.

Students are able to use fractions to represent numbers equal to, less than, and greater than one. They solve problems that involve comparing fractions by using visual fraction models and strategies based on noticing equal numerators or denominators.

Critical Area 2: Connections to Second Grade

- Reason with shapes and their attributes (2.G.3)
- Represent and interpret data (2.MD.9-10)

Critical Area 3: Developing understanding of the structure of rectangular arrays and of area

Students recognize area as an attribute of two-dimensional regions. They measure the area of a shape by finding the total number of same-size units of area required to cover the shape without gaps or overlaps, a square with sides of unit length being the standard unit for measuring area. Students understand that rectangular arrays can be decomposed into identical rows or into identical columns. By decomposing rectangles into rectangular arrays of squares, students connect area to multiplication and justify using multiplication to determine the area of a rectangle.

Critical Area 3: Connections to Second Grade

- Measure and estimate lengths in standard units (2.MD.4)
- Relate addition and subtraction to length (2.MD.5-6)
- Reason with shapes and their attributes (2.G.1)

Critical Area 4: Describing and analyzing two-dimensional shapes.

Students describe, analyze, and compare properties of two-dimensional shapes. They compare and classify shapes by their sides and angles and connect these with definitions of shapes. Students also relate their fraction work to geometry by expressing the area of part of a shape as a unit fraction of the whole.

Critical Area 4: Connections to Second Grade

- Reason with shapes and their attributes (2.G.1, 3)

Critical Area 5: Solving multi-step problems.

Students apply previous understanding of addition and subtraction strategies and algorithms to solve multi-step problems. They reason abstractly and quantitatively by modeling problem situations with equations or graphs, assessing their processes and results, and justifying their answers through mental computation and estimation strategies. Students incorporate multiplication and division within 100 to solve multi-step problems with the four operations.

Critical Area 5: Connections to Second Grade

- Represent and solve problems involving addition and subtraction (2.OA.1)
- Understand place value (2.NBT.1-4)
- Relate addition and subtraction to length (2.MD.5-6)
- Work with time and money (2.MD.7-8)
- Represent and interpret data (2.MD.9-10)

Examples of Mathematical Learning and Development in Third Grade

Instructional Activities to Support Learning in Operations and Algebraic Thinking

Operations and Algebraic Thinking - Students are introduced to multiplication and division. Grade-level work culminates in the expectation that students demonstrate fluency with multiplication and division within 100 with single-digit factors.[1]

- **Equal Groups Gallery-** Pose real-world situations with equal-sized groups (e.g., "There are 4 shelves with 6 books on each"). Ask students to build the equal groups with physical objects, draw a matching array, and write both equations: $4 \times 6 = 24$ and $24 \div 6 = 4$. *Optional Extension:* Ask, "If there are 24 books and 4 shelves, how many per shelf?" to highlight the inverse.
- **Array City-** On grid paper, design "city blocks" as arrays (rows × columns). Label each with factors and a product (e.g., 7 rows × 5 columns = 35). Rotate or reflect arrays to show $7 \times 5 = 5 \times 7$ (commutative property). *Optional Extension:* Compose a larger "city" by combining arrays to model the distributive property.
- **Number Line Jumps-** Tape or draw a classroom number line from 0 to 100 on the ground. Call a step size (e.g., jumps of 8). Students make equal jumps and record repeated addition and multiplication (8, 16, 24 → 3 jumps of 8 → $3 \times 8 = 24$). Flip the prompt: "How many jumps of 8 to reach 40?" to model division as measurement.

- **Fact Family Triangles (× and ÷)-** Give a triangle with three related numbers (e.g., 6, 3, 2). Students write the four related facts: 3 × 2 = 6, 2 × 3 = 6, 6 ÷ 3 = 2, 6 ÷ 2 = 3. Discuss how multiplication and division are inverse operations.
- **Distributive Tile Drop-** Use color tiles to model breaking apart a factor: 7 × 8 = 7 × (5 + 3). Build two rectangles (7 × 5 and 7 × 3), count partial products (35 and 21), and combine to 56. Emphasize structure and efficiency when facts are not yet fluent.
- **Sharing vs. Grouping Stories-** Act out division in two ways with manipulatives: _sharing_ (24 snacks shared equally among 6 students → 24 ÷ 6 = 4) and _grouping_ (24 snacks into groups of 6 → "How many groups?" → 24 ÷ 6 = 4). Verify with multiplication (6 × 4 = 24).
- **Row–Column Chorus-** Display an array and have partners alternate calling "rows" and "columns." They quickly state the product and then switch the factors to demonstrate the commutative property (e.g., "3 rows, 9 columns → 27; 9 rows, 3 columns → 27").
- **Unknown Factor Detective-** Present problems like __ × 6 = 54 or 48 ÷ __ = 8. Students build or sketch arrays/number lines, reason with the inverse (54 ÷ 6 = 9), and justify the solution with a check (9 × 6 = 54). Encourage multiple representations before moving to bare equations.

Instructional Activities to Support Learning in Numbers and Operations in Base Ten

Number and Operations in Base Ten – Students use place value understanding to extend work with addition and subtraction up to 1,000.

- **Place Value Towers-** Provide base-ten blocks or linking cubes. Give students a 3-digit number (e.g., 384). Students build the number using hundreds, tens, and ones, then decompose and rebuild it in different ways (e.g., 300 + 80 + 4, 200 + 180 + 4). Encourage students to record each decomposition with an equation.
- **Roll, Build, Add-** Students roll three dice to create two 3-digit numbers (e.g., 352 and 416). Build each number with base-ten blocks or quick sketches. Add the numbers first with models, then record the written method that matches their modeling. *Optional Extension:* Ask students to explain which place-value regroupings occurred.
- **I Can Trade That-** Give students a "bank" of base-ten pieces (hundreds, tens, ones). Present a series of addition or subtraction problems. Students must make exchanges as needed (10 ones → 1 ten, 10 tens → 1 hundred) and state aloud each exchange they made. Practice writing the matching equation and describing the regrouping.
- **Open Number Line Jumps-** Students solve addition and subtraction problems within 1,000 using an open number line. They make jumps of hundreds, tens, and ones, labeling each hop. Compare strategies by discussing how different jumps can lead to the same result (e.g., 347 + 286 solved with "+200, +80, +6" or "+300, –20, +6").
- **Break Apart & Rebuild-** Give students multi-digit numbers to add or subtract (e.g., 728 – 463). Students decompose each number by place value and solve using the expanded form method. Then they solve again using the standard algorithm and compare the two strategies to highlight place-value reasoning.
- **Estimate & Check-** Students estimate sums or differences of 3-digit numbers (e.g., 563 + 249 ≈ 800). Then they compute the exact answer using a written method and

determine whether the solution is reasonable. *Optional Extension:* Ask students to explain which rounded numbers they chose and why.

Instructional Activities to Support Learning in Numbers and Operations – Fractions

Numbers and Operations - Fractions -Students are formally introduced to fractions. Students work with models to develop an understanding of the meaning of a fraction as a number in relation to a defined whole and equivalence. Grade level work is limited to denominators of 2, 3, 4, 6, and 8.[1]

- **Paper Strip Fractions-** Give each student a long paper strip. Fold it into equal parts (halves, thirds, fourths, sixths, eighths), shade one part, and label the unit fraction. Compare strips to see how equal partitioning changes the size of the parts.
- **Fraction Tile Build-** Use fraction tiles to build and compare fractions. Ask students to show "one whole" in multiple ways (½ + ½, ¼ + ¼ + ¼ + ¼, etc.). Record the different combinations to highlight equivalence and reinforce that fractions are numbers on a continuum.
- **Number Line Hop-** Place a number line on desks or the floor from 0 to 1. Provide cards labeled with fractions (⅓, ¼, ⅙, ⅞, etc.) and have students "hop" to where the fraction belongs. Encourage them to justify placement by discussing the size of the denominator and distance from zero.
- **Spin and Partition-** Students spin a spinner labeled with denominators (2, 3, 4, 6, 8). They draw a shape (circle, rectangle, square, hexagon, octagon) and partition it into that many equal parts. Shade given portions (e.g., 3 out of 6) and write the matching fraction. Compare shaded fractions with partners.
- **Equivalent Match-Up-** Give students cards with visual fraction models and separate cards with numerical fractions. Students match the models to the correct fraction (e.g., ½, ¾, ⅜). Optional Extension: Sort matches into "same size" groups to highlight equivalence across denominators.
- **Build It, Break It-** Using counters or tiles, students build a shape representing one whole. Then they separate the shape into equal groups based on a denominator (e.g., 8 equal groups for eighths). Remove a certain number of groups to show fractions like ⅝. Have students write a statement to describe the whole and the part.

Instructional Activities to Support Learning in Measurement and Data

Measurement and Data -Students continue to measure standardized units accurately and make connections to real-world situations. Data collection and analysis are used to make connections to other grade-level work on addition, subtraction, multiplication, and division.[1]

- **Measure & Compare Stations-** Set up stations with objects of different lengths, masses, and capacities (rulers, scales, and measuring cups). Students estimate first, then measure and record actual measurements. Have them compare items using statements such as "The book is heavier than the stapler" or "The bottle holds more than the cup."
- **Water Fill Challenge-** Provide a set of containers with different shapes and capacities. Students predict how many cups of water each will hold, then pour and record the

actual volumes. Ask students to represent findings on a simple bar graph. *Optional Extension:* Compare two containers with similar capacity and discuss why they might look different.

- **Area Tile Cover**- Give students various shapes drawn on grid paper or cutouts. Students cover the shapes with square tiles to determine area, then record the total number of tiles. Prompt students to identify when shapes have the same area but different perimeters. *Optional Extension:* Sketch a new shape with the same area as a partner's.
- **Perimeter Walk-** Tape a rectangular or irregular "floor shape" on the classroom floor. Students measure each side with meter sticks or yardsticks and add the lengths to find the perimeter. *Optional Extension:* Challenge students to create a shape that has the same perimeter but a different layout of side lengths.
- **Mass Mystery Bags-** Fill small bags with classroom objects (beans, cubes, pencils). Keep the overall mass of the objects in the bag to 1,000 grams or less. Label each bag with a letter. Students estimate the mass in grams, then check using a balance scale. Ask students to find the difference between their estimate and the actual mass in grams of the objects in the bag.
- **Data Detectives-** Students collect data on a classroom topic (favorite recess activity, pets at home, shoe colors, etc.). They organize data into picture graphs or bar graphs, then answer questions such as "How many more…?" and "Which category is least common?"

Instructional Activities to Support Learning in Geometry

Geometry – Students reason with shapes and their attributes. They work with polygons of up to 8 sides and partition shapes to contain equally sized areas.

- **Build-a-Shape Challenge-** Give students toothpicks, straws, or craft sticks and have them build polygons up to eight sides. Ask them to adjust side lengths to create regular and irregular versions of the same polygon. Discuss what changes and what stays the same.
- **Attribute Hunt-** Take a brief walk around the classroom or school. Students look for shapes in the environment (e.g., windows, signs, tiles). They sketch the shapes and label attributes such as number of sides and angles. *Optional Extension:* Classify the found shapes into triangles, quadrilaterals, pentagons, etc.
- **Partition It!-** Give students circles, rectangles, and other polygons drawn on paper. Students partition them into equal-sized areas (halves, thirds, fourths, sixths, eighths) and shade one or more parts. Discuss what makes the partitions "equal" and how different lines can produce the same number of equal areas.

Books that Promote Mathematical Thinking

The following list of books addresses grade-level-appropriate mathematics topics. These can be checked out from the local community or school libraries. They offer early literacy opportunities for students while integrating mathematics.

Number and Operations

365 Penguins by Jean-Luc Fromental

The Great Graph Contest by Loreen Leedy

The Great Tattle Battle by Anne Bowen

Picture Pie by Ed Emberley

Gator Pie by Louise Mathews

Geometry and Measurement

The Long Wait by Annie Cobb

Inchworm and a Half by Elinor J Pinczes.

Jim and the Beanstalk by Raymond Briggs

Lemonade for Sale by Stuart J. Murphy

Grandfather Tang's Story by Ann Tompert

Spaghetti and Meatballs for All by Marilyn Burns

Operations and Algebraic Thinking

Amanda Bean's Amazing Dream by Cindy Neuschwander

Divide and Ride by Stuart J. Murphy

The Doorbell Rang by Pat Hutchins

How Many Seeds in a Pumpkin? by Margaret McNamara

One Hundred Hungry Ants by Elinor J. Pinczes

Six Dinner Sid by Igna Moore

Each Orange Had 8 Slices by Paul Giganti Jr.

The Mathemagician's Apprentice by Brian Boyd

The Best of Times by Greg Tang

Grapes of Math by Greg Tang

Additional Content/Informational Resources

- Grade 3 Mathematics Standards - Provide learning outcomes for the end of the Grade 1 academic year.
- Grade 3 Model Curriculum – Provides content elaborations for the grade level standards and the expectations for learning for all students.
- Grade 3 Standards for Mathematical Practice – These describe the skills that mathematics educators should seek to develop in their students.
- Color Coded K-5 Learning Progressions – Identifies the learning progression of mathematical content across K-5.

- Achieve the Core - These guides will help educators understand and implement the mathematics standards. They can use the guides as they observe teachers giving instruction and provide them with feedback that supports their planning and reflection.
    - K - 8 Content Emphases
    - K - 8 Instructional Practice Guide
- Arizona Progressions - These narrative documents by the University of Arizona describe the typical learning progression of a topic, informed by both research on children's cognitive development and the logical structure of mathematics.
- Illustrative Mathematics – Showcases the range and types of mathematical work that students should experience as teachers use Ohio's Learning Standards in Mathematics. It also presents other tools supporting standards-based instruction.
- Progression Videos of "How" students build math knowledge

Instructional Resources

- Erikson Institute Early Math Collaborative - Developmentally aligned information and instructional activities.
- Teaching Channel - Provides guiding questions to use during planning and instruction. Classroom videos model best practices. Learning activities showcase rigorous problems that deepen conceptual understanding.
- YouCubed – Showcases research-based teaching methods, mathematics tasks, videos, and ideas on how to bring about high levels of student engagement.
- National Library of Virtual Manipulatives - The site contains manipulatives and concept tutorials across the grade bands.
- Learning Trajectories – Discover how children develop their mathematical thinking and learning skills.
- Inside Mathematics - Educators can find exemplary standards-based lesson ideas, as well as classroom videos. Teachers interested in the lessons can search under "performance task" for lesson ideas organized by grade and course.
- Illuminations - This project by the National Council of Teachers of Mathematics provides quality lessons and interactive resources for teaching and learning mathematics.
- Resources for 3-Act Math Class (Choose appropriateness for your grade level. These are tasks that foster mathematical modeling.)

Dan Meyer	Graham Fletcher	Robert Kaplinsky
Andrew Stadel	John Stevens	Michael Fenton
Geoff Krall	Jon Orr	Kyle Pearce

- Steve Wyborney -Contains popular instructional activities such as Splat, Hundred Maze, Subitizing, Fraction Splat, Primary Tile, Tile Area, and Esti mystery.
- MCTM Collection of Cognitively Demanding Tasks – A collection of resources for finding those rich multidimensional math tasks.

- Number Talks-provide video resources about how to engage students in mathematical conversation using mental math to solve problems.
- Building Number Sense (Jo Boaler, Ruth Parker, Sherry Parrish)
- Inside Mathematics Number Talks
- Fraction Talks – Fraction images that open up a world of mathematical understanding based on the relationship between a numerator/denominator while the students are quantifying the value the entire time.
- Visual Patterns - great site for students to think algebraically and build expressions to model the world with mathematics.
- Clothesline Math – Mathematical tasks using a clothesline as an interactive number line.
- Which One Does Not Belong- Contains many low-floor and high-ceiling tasks. These are excellent for getting all students to contribute during mathematical discourse.

References

DiPerna, J. C., Lei, P. W., & Reid, E. E. (2007). Kindergarten predictors of mathematical growth in the primary grades: An investigation using the Early Childhood Longitudinal Study–Kindergarten cohort. *Journal of Educational Psychology, 99*(2), 369–379. https://doi.org/10.1037/0022-0663.99.2.369

[1]Gojak, Linda M., and Ruth Harbin Miles. *The Common Core Mathematics Companion the Standards Decoded, Grades K-2; What They Say, What They Mean, How to Teach Them*, Corwin Mathematics, Thousand Oaks, CA, 2015, pp. 2, 22, 74, 120, 164.

Kiss, A. J., Nelson, G., & Christ, T. J. (2019). Predicting third-grade mathematics achievement: A longitudinal investigation of the role of early numeracy skills. *Learning Disability Quarterly, 42*(3), 161–174. https://doi.org/10.1177/0731948718823083