Third Grade Standards: MATHEMATICS

*Note: This information has been adapted from the 2020 Colorado State Standards as presented on the Colorado Department of Education (CDE) website. It is *not* an exhaustive or detailed list. All standards mentioned represent skills grade-level students should have mastered by the end of the grade-level year. If you desire further information, please visit the Standards page on the CDE website: https://www.cde.state.co.us/standardsandinstruction/standards

This document provides tiered support in addressing the academic standards. Families can choose to approach their curriculum selection and content-area instruction in one or all of three categories: a general **Overview** of expectations and "mathematic" behaviors, **Learning Objectives** (a "fly by" glance of concepts a student masters throughout the school year) and **Specific Skills** (expanded ideas to explain the learning objectives). As you consider lesson planning for each grade level, use the "Overview" and "Learning Objectives" checklists to help you plan out your year. Start with the end in mind: If my child needs to know how to _____ by the end of the school year, what learning activities can be implemented to introduce and then reinforce the concepts? Think next about smaller steps in learning that your child needs to master in order to reach that end goal (he/she can't count to 100 if he/she can't first count to ten). Also keep in mind that most objectives are not learned in isolation, meaning learning objectives are often combined. You don't need to ensure your child has mastered learning objective #1 before moving on to the next. Combining two or more objectives in a week's lesson plan can make for more creative and integrated learning. If you are using a reputable and research-based curriculum, then your child will most likely be working his/her way through these learning objectives in a well-paced and consistent manner. (A brief sampling of solid curriculum options can be found on the CSP website under "Homeschool Resources.")

Overview

Expectations for 3rd Grade Students:

- **Number and Quantity**: Understand fractions as numbers that can be located on a number line.
- **Algebra and Functions**: Fluently (consistently) multiply and divide within 100 and add and subtract within 1000; understand the relationship between multiplication and division.
- **Data, Statistics, and Probability**: Create pictographs and bar graphs and connect them to the concepts of multiplication and division.
- **Geometry**: Find the area of a rectangle and connect area to the meaning of multiplication and division; create categories of shapes based on attributes.

Throughout 3rd Grade You May Find Students:

- Solving word problems involving addition, subtraction, multiplication, and division.
- Showing multiplication and division using pictures of equals groups and equations.
- Playing games to build fluency (consistency) with basic facts by discovering patterns related to multiplication and division.
- Connecting their work with fractions to their work with whole numbers (such as verbally counting with fractions).
- Drawing shapes to show fractions.
- Locating fractions on a number line and on a ruler.
- Covering shapes with squares to understand the difference between area and perimeter.

Learning Objectives

1. Use place value understanding and properties of operations to perform multi-digit arithmetic.
2. Develop understanding of fractions as numbers.
3. Represent and solve problems involving multiplication and division.
4. Apply properties of multiplication and the relationship between multiplication and division.
5. Multiply and divide within 100.
6. Solve problems involving the four operations and identify and explain patterns in arithmetic.
7. Solve problems involving measurement and estimation of time, liquid volumes, and masses.
8. Represent and interpret data.
9. Geometric measurement: Use concepts of area and relate area to multiplication and to addition.
10. Geometric measurement: Recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.
11. Reason with shapes and their attributes.

Specific Skills

1. Use place value understanding and properties of operations to perform multi-digit arithmetic.

- Use place value understanding to round whole numbers to the nearest 10 or 100.
- Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.
- Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9×80, 5×60) using strategies based on place value and properties of operations.

2. Develop an understanding of fractions as numbers.

- Describe a fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction $\frac{a}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$.
- Describe a fraction as a number on the number line; represent fractions on a number line.
    - Represent a fraction $\frac{1}{b}$ on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size $\frac{1}{b}$ and that the endpoint of the part based at 0 locates the number $\frac{1}{b}$ on the number line.

- Represent a fraction $\frac{a}{b}$ on a number line diagram by marking off a lengths $\frac{1}{b}$ from 0. Recognize that the resulting interval has size $\frac{a}{b}$ and that its endpoint locates the number $\frac{a}{b}$ on the number line.

- Explain equivalence of fractions and compare fractions by reasoning about their size.
  - Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.
  - Recognize and generate simple equivalent fractions, e.g., $\frac{1}{2} = \frac{2}{4}, \frac{4}{6} = \frac{2}{3}$. Explain why the fractions are equivalent, e.g., by using a visual fraction model.
  - Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. *Examples: Express* 3 *in the form* $3 = \frac{3}{1}$*; recognize that* $\frac{6}{1} = 6$*; locate* $\frac{4}{4}$ *and* 1 *at the same point of a number line diagram.*
  - Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual fraction model.
- Flexibly describe fractions both as parts of other numbers but also as numbers themselves.
- Use the structure of fractions to locate and compare fractions on a number line.

3. Represent and solve problems involving multiplication and division.

- Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as* 5×7*.*
- Interpret whole-number quotients of whole numbers, e.g., interpret $56 \div 8$ as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. *For example, describe a context in which a number of groups can be expressed as* $56 \div 8$*.*
- Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
- Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations* $8 \times ? = 48$*,* $5 = \_ \div 3$*,* $6 \times 6 = ?$

4. Apply properties of multiplication and the relationship between multiplication and division.

- Apply properties of operations as strategies to multiply and divide. (Students need not use formal terms for these properties.) *Examples: If* $6 \times 4 = 24$ *is known, then* $4 \times 6 = 24$ *is also known. (Commutative property of multiplication.)* $3 \times 5 \times 2$ *can be found by* $3 \times 5 = 15$*, then* $15 \times 2 = 30$*, or by* $5 \times 2 = 10$*, then* $3 \times 10 = 30$*. (Associative property of multiplication.) Knowing that* $8 \times 5 = 40$ *and* $8 \times 2 = 16$*, one can find* 8×7 *as* $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$*. (Distributive property.)*
- Interpret division as an unknown-factor problem. *For example, find* $32 \div 8$ *by finding the number that makes* 32 *when multiplied by* 8*.*

- Use the relationship between multiplication and division to rewrite division problems as multiplication.

5. Multiply and divide within 100.

- Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. *By the end of Grade 3, know from memory all products of two one-digit numbers.*

6. Solve problems involving the four operations and identify and explain patterns in arithmetic.

- Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
- Identify arithmetic patterns (including patterns in the addition table or multiplication table) and explain them using properties of operations. *For example, observe that* 4 *times a number is always even, and explain why* 4 *times a number can be decomposed into two equal addends.*

7. Solve problems involving measurement and estimation of time, liquid volumes, and masses.

- Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.
- Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). (This excludes compound units such as cm3 and finding the geometric volume of a container.) Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

8. Represent and interpret data.

- Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent* 5 *pets.*
- Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.
    - Analyze data to distinguish the factual evidence offered, to reason about judgments, to draw conclusions, and to speculate about what data represents.
    - Abstract real-world quantities into scaled graphs.
    - Model real-world quantities with statistical representations such as bar and line graphs.

9. Geometric measurement: Use concepts of area and relate area to multiplication and to addition.

- Recognize area as an attribute of plane figures and understand concepts of area measurement.
- Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).
- Use concepts of area and relate area to the operations of multiplication and addition.

- Find the area of a rectangle with whole-number side lengths by tiling it and show that the area is the same as would be found by multiplying the sides.
- Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real-world and mathematical problems and represent whole-number products as rectangular areas in mathematical reasoning.
- Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.
- Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real-world problems.

10. Geometric measurement: Recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

- Solve real-world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.
  - Make sense of the relationship between area and perimeter by calculating both for rectangles of varying sizes and dimensions. (Is it possible for two rectangles to have the same area but different perimeters? Is it possible for two rectangles to have the same perimeter but different areas?)

11. Reason with shapes and their attributes.

- Explain that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals).
- Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into* 4 *parts with equal area, and describe the area of each part as* $\frac{1}{4}$ *of the area of the shape.*