Fourth 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 4th Grade Students:

- **Number and Quantity**: Extend the concept of multiplication to multiplying a fraction by whole number through the idea of scaling (the picture is 3 times the original size versus the picture is 1/3 times the original size); compare and contrast simple addition and subtraction of fractions to whole number addition and subtraction; compare the size of fractions; solve simple multi-digit multiplication and division problems by making connections to place value.
- **Algebra and Functions**: Fluently (consistently) add and subtract multi-digit numbers; generate and analyze patterns involving multiplication and division.
- **Data, Statistics, and Probability**: Solve word problems involving measurements including simple conversions from one unit to another; create bar graphs from measurement data.
- **Geometry**: Find the measure of angles; classify shapes based on lines and angles.

Throughout 4th Grade You May Find Students:

- Adding and subtracting large numbers with ease using place value.
- Explaining the connection between addition and subtraction.
- Solving multi-digit multiplication and division problems.
- Solving word problems about the addition and subtraction of fractions.
- Explaining what it means when something is one-half or one-third times the original size (1/2 x 1; 1/3 x 1) versus three times the original size of an object (3 x 1).
- Describing turns with angle measurements ("He just did a 180 on his skateboard").
- Exploring what happens when you measure an item in inches versus feet and vice versa.

Learning Objectives

1. Generalize place value understanding for multi-digit whole numbers.
2. Use place value understanding and properties of operations to perform multi-digit arithmetic.
3. Fractions: Extend understanding of fraction equivalence and ordering.
4. Fractions: Build fractions from unit fractions.
5. Fractions: Use decimal notation for fractions and compare decimal fractions.
6. Use the four operations with whole numbers to solve problems.
7. Gain familiarity with factors and multiples.
8. Generate and analyze patterns.
9. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
10. Represent and interpret data.
11. Understand concepts of angle and measure angles.
12. Draw and identify lines and angles and classify shapes by properties of their lines and angles.

Specific Skills

1. Generalize place value understanding for multi-digit whole numbers.

- Explain that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that* $700 \div 70 = 10$ *by applying concepts of place value and division.*
- Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.
- Use place value understanding to round multi-digit whole numbers to any place. (When is it helpful to use a rounded number instead of the exact number?)

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

- Fluently add and subtract multi-digit whole numbers.
- Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
- Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or

the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

3. **Fractions: Extend understanding of fraction equivalence and ordering.**
   - Explain why a fraction $\frac{a}{b}$ is equivalent to a fraction $\frac{n\times a}{n\times b}$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
   - Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as $\frac{1}{2}$. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual fraction model.
   - Use 1, the multiplicative identity, to create equivalent fractions by structuring 1 in the fraction form $\frac{n}{n}$.

4. **Fractions: Build fractions from unit fractions.**
   - Understand a fraction $\frac{a}{b}$ with $a > 1$ as a sum of fractions $\frac{1}{b}$.
     - Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
     - Decompose a fraction into a sum of fractions with like denominators in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples:* $\frac{3}{8} = \frac{1}{8} + \frac{1}{8} + \frac{1}{8}$; $\frac{3}{8} = \frac{1}{8} + \frac{2}{8}$; $2\frac{1}{8} = 1 + 1 + \frac{1}{8} = \frac{8}{8} + \frac{8}{8} + \frac{1}{8}$.
     - Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.
     - Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.
   - Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.
     - Understand a fraction $\frac{a}{b}$ as a multiple of $\frac{1}{b}$. *For example, use a visual fraction model to represent* $\frac{5}{4}$ *as the product* $5 \times \frac{1}{4}$*, recording the conclusion by the equation* $\frac{5}{4} = 5 \times \frac{1}{4}$.
     - Understand a multiple of $\frac{a}{b}$ as a multiple of $\frac{1}{b}$, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express* $3 \times \frac{2}{5}$ *as* $6 \times \frac{1}{5}$*, recognizing this product as* $\frac{6}{5}$*. (In general,* $n \times \frac{a}{b} = \frac{n\times a}{b}$*.)*
     - Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For*

example, if each person at a party will eat $\frac{3}{8}$ of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?

5. Fractions: Use decimal notation for fractions and compare decimal fractions.

- Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. (Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.) *For example, express $\frac{3}{10}$ as $\frac{30}{100}$, and add $\frac{3}{10} + \frac{4}{100} = \frac{34}{100}$.*
- Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as $\frac{62}{100}$; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*
- Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual model.

6. Use the four operations with whole numbers to solve problems.

- Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
- Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.
- Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. 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.

7. Gain familiarity with factors and multiples.

- Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.

8. Generate and analyze patterns.

- Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.*

9. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

- Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that* 1 *ft is* 12 *times as long as* 1 *in. Express the length of a* 4 *ft snake as* 48 *in. Generate a conversion table for feet and inches listing the number pairs* $(1,12)$*,* $(2,24)$*,* $(3,36)$*,* …
- Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.
- Apply the area and perimeter formulas for rectangles in real-world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*
- Generate and use conversion tables to aid in measurement conversions and represent measurement quantities on scaled line diagrams.

10. Represent and interpret data.

- Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*

11. Understand concepts of angle and measure angles.

- Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:
    - An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through $\frac{1}{360}$ of a circle is called a "one-degree angle," and can be used to measure angles.
    - An angle that turns through n one-degree angles is said to have an angle measure of n degrees.
- Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.
    - Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

12. Draw and identify lines and angles and classify shapes by properties of their lines and angles.

- Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. Use appropriate tools strategically to

draw lines (parallel, perpendicular, lines of symmetry), line segments, rays, and angles (right, acute, obtuse).

- Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category and identify right triangles.
- Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.