MATHEMATICAL IDEAS & CONCEPTS:

- Continue to solve problems involving multiplicative comparison
- Continue to use the four operations with whole numbers to solve problems, including multi-step problems and problems involving measurement and conversions
- Continue to generalize place value understanding for multi-digit whole numbers
- Continue to understand fraction equivalence, build fractions from unit fractions, and extend understanding of operations of whole numbers
- Continue to understand decimal notation for fractions and compare decimal fractions
- Continue to classify shapes by properties and understand concepts of angle measurement

ESSENTIAL QUESTIONS:

1. *Why are comparison situations helpful when problem solving?*
2. *How can I be strategic and accurate in my operations with whole numbers?*
3. *Why is it important to be flexible in how we represent numbers?*
4. *How do I notate my thinking when solving problems with fractions?*
5. *How can lines and angles help us classify two-dimensional figures?*

STANDARDS:

Aligned to Essential Questions; Big Idea/Concept Standard (★) with supporting standards (➔) connected below

Notes in gray font are from the AR Mathematics standards; RPS instructional pacing notes are in red font

EQ 1: Why are comparison situations helpful when problem solving?

★ **4.OA.A.2** *Q4 Focus: Problem solving involving comparison situations and notation of the comparison*

- Multiply or divide to solve word problems involving multiplicative comparison
- Use drawings and *equations* with a letter for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison

➔ **4.OA.A.1**

- Interpret a multiplication equation as a comparison (e.g., interpret 35 = 5 × 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*

➔ **4.MD.A.1**

- Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec; yd, ft, in; gal, qt, pt, c
- Within a single system of measurement, express measurements in the form of 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), and (3, 36)

EQ 2: How can I be strategic and accurate in my operations with whole numbers?

Note: Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.

★ **4.OA.A.3**
- 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

➔ **4.OA.C.5**
- 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 why the numbers will continue to alternate in this way.

★ **4.NBT.B.4** Add and subtract multi-digit *whole numbers* with *computational fluency* using a standard *algorithm*

*Fluency expectation: students should be able to use **any** valid base-ten strategy flexibly, efficiently and accurately*

Notes 4.NBT.B.4:
- *Computational fluency is defined as a student's ability to efficiently and accurately solve a problem with some degree of flexibility with their strategies.*
- *A standard algorithm can be viewed as, but should not be limited to, the traditional recording system.*
- *A standard algorithm denotes any valid base-ten strategy.*

★ **4.NBT.B.5** *Note: 4.NBT.B.5 Properties of operations need to be referenced.*
- 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 area models

★ **4.NBT.B.6** *Note: 4.NBT.B.6 Properties of operations need to be referenced.*
- 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 the relationship between multiplication and division
- Illustrate and explain the calculation by using *equations*, *rectangular arrays*, and area models

When performing operations with fractions at this grade level, the use of visual models to represent fractions is considered a proficient practice.
End of year expectation includes using visual fraction models and/or equations.

EQ 3: Why is it important to be flexible in how we represent numbers?

Note: Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.

★ **4.NF.A.1**

- By using *visual fraction models*, explain why a *fraction* a/b is equivalent to a *fraction* $(n \times a)/(n \times b)$ 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. For example:* 1/5 is equivalent to (2x1) / (2x5)

➔ **4.NF.C.5** 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. *For example:* Express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.
Note: 4.NF.C.5 Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. However, addition and subtraction with unlike denominators in general is not a requirement at this grade.

➔ **4.NF.C.6** Use decimal notation for *fractions* with *denominators* 10 or 100.
For example: Write 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a *number line diagram.*

➔ **4.NF.C.7**

- 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 using symbols (>, =, <), and justify the conclusions (e.g., by using a visual model)

When performing operations with fractions at this grade level, the use of visual models to represent fractions is considered a proficient practice.
End of year expectation includes using visual fraction models and/or equations.

EQ 4: How do I notate my thinking when solving problems with fractions?

Note: Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.
Q4 Focus: Connecting their visual models of operations to written notation.

- ★ **4.NF.B.3** Understand a *fraction a/b* with *a* > 1 as a *sum* of *fractions* 1/*b* (e.g., 3/8=1/8+1/8+1/8):
  - 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 the same *denominator* in more than one way, recording each decomposition by an equation and justify decompositions (e.g., by using a *visual fraction model*) (e.g., 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8)
  - Add and subtract mixed numbers with like *denominators* (e.g., by using properties of operations and the relationship between addition and subtraction and by replacing each number with an equivalent *fraction*)
  - 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)

  Note: 4.NF.B.3 Converting a mixed number to an improper fraction should not be viewed as a separate technique to be learned by rote memorization, but simply a case of fraction addition (e.g., 7 1/5 =7 + 1/5 = 35/5 + 1/5 = 36/5).

- ★ **4.NF.B.4** Apply and extend previous understandings of multiplication to multiply a *fraction* by a whole number:
  Note: 4.NF.B.4 Emphasis should be placed on the relationship of how the unit fraction relates to the multiple of the fraction.
  - Understand a *fraction a/b* as a multiple of 1/b (e.g., Use a *visual fraction model* to represent 5/4 as the *product* 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4))
  - Understand a multiple of a/b as a multiple of 1/b, and use this understanding to multiply a *fraction* by a whole number [e.g., Use a *visual fraction model* to express 3 × (2/5) as 6 × (1/5), recognizing this *product* as 6/5 (In general, n × (a/b) = (n × 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 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?

EQ 4: How can lines and angles help us classify two-dimensional figures?

★ **4.MD.C.5** Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: *Note: 4.MD.C.5 Use the degree symbol (e.g., 360°).*

- 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 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* degree .

➔ **4.MD.C.6**
  - Measure angles in whole-number degrees using a protractor
  - Sketch angles of specified measure

★ **4.G.A.2**

- 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

➔ **4.G.A.1**
  - Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines
  - Identify these in two-dimensional figures

➔ **4.G.A.3**
  - 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

Additional Standards:

➔ **4.MD.A.2** *Note: 4.MD.A.2 This is a standard that may be addressed throughout the year focusing on different context.*
  - Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money including the ability to make change; 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.