MATHEMATICAL IDEAS & CONCEPTS:

- Continue to represent and solve problems involving multiplication and division
- Continue to solve two-step word problems involving all four operations
- Continue to add and subtract within 1000
- Continue to understand place value
- Continue to develop understanding of fractions
- Continue to understand concepts of area
- Continue to solve problems involving liquid volume and mass

ESSENTIAL QUESTIONS:

1. *Why does my multiplication/division strategy work??*
2. *How can I be strategic and accurate with addition and subtraction strategies?*
3. *Why is it important to represent four-digit numbers in a variety of ways?*
4. *How can different fractions be equal?*
5. *How does area measure relate to addition and multiplication?*

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

★ **3.OA.D.8** Solve two-step word problems using the four operations, and be able to:

- Represent these problems using *equations* with a letter standing for unknown quantity
- Assess the reasonableness of answers using mental computation and estimation strategies including rounding

Note: 3.OA.D.8 This standard is limited to problems posed with whole numbers and having whole-number answers; students should know how to perform operations in conventional order when there are no parentheses to specify a particular order (Order of Operations).

***This standard is not listed with a specific essential question because it should be embedded throughout all aspects of their mathematical work this year.*

EQ 1: Why does my multiplication/division strategy work?

★ **3.OA.A.3** 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)

➔ **3.OA.A.4** 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 × ? = 48; 5 = _ ÷ 3; 6 × 6 = ?

➔ **3.OA.B.6** Understand division as an unknown-factor problem.
For example: Find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8

➔ **3.OA.D.9** Identify arithmetic patterns (including, but not limited to, 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.

Standards associated with this essential standard continue on next page…

EQ 1: Why does my multiplication/division strategy work? continued...

★ **3.OA.C.7** *Q4 Expectation: Fluency with all products of two one-digit numbers and 10 facts: fluency with 7 and 8 facts; maintain fluency with 0,1,2,3,4,5,6,9, and 10 facts.*

- Using *computational fluency*, multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations
- By the end of Grade 3, automatically (*fact fluency*) recall all *products* of two one-digit numbers

Note: 3.OA.C.7 Computational fluency is defined as a student's ability to efficiently and accurately solve a problem with some degree of flexibility with their strategies.

➔ **3.OA.B.5** Apply properties of operations as strategies to multiply and divide. *Note: 3.OA.B.5 Students are not required to use formal terms for these properties.*
For example:
- If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known (*Commutative property of multiplication*).
- 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30 (*Associative property of multiplication*).
- Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56 (*Distributive property*)

★ **3.NBT.A.3** 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.

EQ 2: How can I be strategic and accurate with addition and subtraction strategies?

★ **3.NBT.A.2** Using *computational fluency*, add and subtract within 1000 using strategies and *algorithms* based on *place value*, properties of operations, and the relationship between addition and subtraction.

Note: 3.NBT.A.2 Computational fluency is defined as a student's ability to efficiently and accurately solve a problem with some degree of flexibility with their strategies.
Q4 expectation: Students will be strategic in selection of strategy and notate numerically based on place value and properties of operation.

EQ 3: Why is it important to represent four-digit numbers in a variety of ways?

★ **3.NBT.A.4** Understand that the four digits of a four-digit number represent amounts of thousands, hundreds, tens, and ones (e.g., 7,706 can be portrayed in a variety of ways according to *place value* strategies).
Understand the following as special cases:
- 1,000 can be thought of as a group of ten hundreds---called a thousand
- The numbers 1,000, 2,000, 3,000, 4,000, 5,000, 6,000, 7,000, 8,000, 9,000 refer to one, two, three, four, five, six, seven, eight, or nine thousands

➔ **3.NBT.A.5** Read and write numbers to 10,000 using base-ten numerals, number names, and *expanded form(*s).
For example:
- Using base-ten numerals "standard form" (347)
- Number name form (three-hundred forty seven)
- *Expanded form*(s) (300 + 40 + 7 = 3 × 100 + 4 × 10 + 7 × 1)

➔ **3.NBT.A.6** Compare two four-digit numbers based on meanings of thousands, hundreds, tens, and ones digits using symbols (<, >, =) to record the results of comparisons.

Q4 Focus: portraying numbers in a variety of ways - strategically decomposing numbers (leading towards operations with multi-digit numbers)

EQ 4: How can different fractions be equal?

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

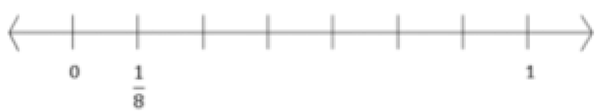
★ **3.NF.A.1**

- Understand a *fraction* 1/*b* as the quantity formed by 1 part when a whole is partitioned into *b* equal parts. *For example:* Unit fractions are fractions with a numerator of 1 derived from a whole partitioned into equal parts and having 1 of those equal parts (¼ is 1 part of 4 equal parts).
- Understand a *fraction a*/*b* as the quantity formed by *a* parts of size 1/*b*. *For example:* Unit fractions can be joined together to make non-unit fractions (¼ + ¼ + ¼ = ¾).

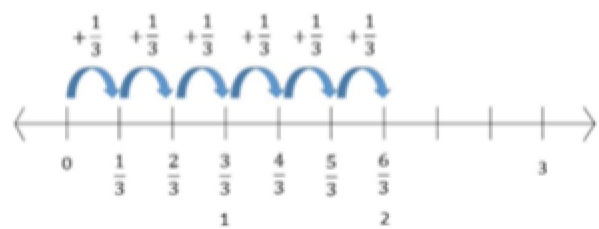
★ **3.NF.A.2** Understand a *fraction* as a number on the number line; represent *fractions* on a *number line diagram:*

- Represent a *fraction* 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 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line *(see example 1)*
- Represent a *fraction a*/*b* on a *number line diagram* by marking off a lengths 1/*b* from 0
- Recognize that the resulting interval has size *a*/*b* and that its endpoint locates the number *a*/*b* on the number line *(see example 2)*

Example 1



Example 2



★ **3.NF.A.3** Explain equivalence of *fractions* in special cases 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., 1/2 = 2/4, 4/6 = 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* (e.g., Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 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 symbols (>, =, <) and justify the conclusions (e.g., by using a *visual fraction model*)

EQ 5: How does area measure relate to addition and multiplication?

Area understanding evolves from additive to multiplicative. Q4 builds area understanding multiplicatively.

★ **3.MD.C.7** 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 side lengths

- 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

➔ **3.MD.D.8** 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

Additional Standards:

➔ **3.MD.A.2** *Due to the contextual nature of the standard, it is not connected with a specific EQ, as it can be associated with multiple EQs.*

- Measure and estimate liquid volumes and masses of objects using standard units such as: grams (g), kilograms (kg), liters (l), gallons (gal), quarts (qt), pints (pt), and cups (c)
- 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)

Note: 3.MD.A.2 Conversions can be introduced but not assessed. Excludes compound units such as cubic centimeters and finding the geometric volume of a container. Excludes multiplicative comparison problems (problems involving notions of "times as much").