MATHEMATICAL IDEAS & CONCEPTS:

- Continue to understand place value system
- Continue to perform operations with multi-digit whole numbers *and begin to operate with decimals to hundredths*
- Develop strategies to add and subtract fractions *new this quarter*
- Continue to apply and extend previous understandings of multiplication and division when working with fractions
- Continue to classify two-dimensional figures into categories based on their properties
- Continue to develop strategies for multiplying multi-digit whole numbers
- Continue to convert like measurement units within a given measurement system
- Graph points on a coordinate plane to solve real world problems *new this quarter*
- Represent and interpret data using line plots *new this quarter*

ESSENTIAL QUESTIONS:

1. *How can visual models help support my operations with decimals?*
2. *What strategies do I have to divide?*
3. *How can I use notation to represent my strategies for division involving fractions?*
4. *How can I reason about the product when multiplying fractions?*
5. *What strategies can I use to solve addition and subtraction problems involving fractions?*
6. *How can I organize two-dimensional figures based on their properties?*

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: How can visual models help support my operations with decimals?

★ **5.NBT.B.7** *new this quarter; Q3 focus: use of concrete models, drawings to operate with decimals*

Perform basic operations on decimals to the hundredths place:

- Add and subtract decimals to hundredths using concrete models or drawings and strategies based on *place value*, properties of operations, and the relationship between addition and subtraction
- Multiply and divide decimals to hundredths using concrete models or drawings and strategies based on *place value*, properties of operations, and the relationship between multiplication and division

★ **5.NBT.A.2** Understand why multiplying or dividing by a power of 10 shifts the *value* of the digits of a whole number or decimal:

- Explain patterns in the number of zeros of the *product* when multiplying a whole number by powers of 10
- Explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10
- Use whole-number *exponents* to denote powers of 10

Q3 Focus: applying the multiplicative pattern to multiply and divide

➔ **5.MD.A.1**

- Convert among different-sized standard measurement units within the metric system. *For example:* Convert 5 cm to 0.05 m.
- Convert among different-sized standard measurement units within the customary system. *For example:* Convert 1½ ft to 18 in.
- Use these conversions in solving multi-step, real world problems

EQ 2: What strategies do I have to divide?

★ **5.NBT.B.6** *Q3 Focus on flexibility (developing multiple strategies)*

- Find whole-number *quotients* of *whole numbers* with up to four-digit *dividends* and two-digit *divisors*, using strategies based on:
    - *Place value*
    - The properties of operations
    - Divisibility rules; and
    - The relationship between multiplication and division
- Illustrate and explain calculations by using *equations*, *rectangular arrays*, and area models

➔ **5.NBT.B.5** Fluently (efficiently, accurately and with some degree of flexibility) multiply multi-digit *whole numbers* using a standard *algorithm.*

This standard is connected to promote the relationship between multiplication and division and to help students identify similarities in strategies through operations. Q1-Q3 should focus on developing use of a variety of base-ten strategies so that fluency can be obtained by end of year.

Notes 5.NBT.B.5:

- *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.*

EQ 3: How can I use notation to represent my strategies for division involving fractions?

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 expectations include using visual fraction models and/or equations.

★ **5.NF.B.7** Apply and extend previous understandings of division to divide *unit fractions* by *whole numbers* and *whole numbers* by *unit fractions*:

Note 5.NF.B.7: Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division, but division of a fraction by a fraction is not a requirement at this grade

- Interpret division of a *unit fraction* by a natural number, and compute such *quotients*
  For example: Create a story context for (1/3) ÷ 4, and use a *visual fraction model* to show the *quotient*. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3).*Ex: 4 children share ⅓ of a cake equally. How much would each child get? ⅓ ÷ 4 = n; ¼ x ⅓ = n*
- Interpret division of a whole number by a *unit fraction*, and compute such *quotients*
  For example: Create a story context for 4 ÷ (1/5), and use a *visual fraction model* to show the *quotient*. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4).*Ex: ⅕ of a bag of cement weighs 4 pounds. How much would the whole bag weigh? 4 ÷ ⅕ = n; ⅕ x n = 4*
- Solve real world problems involving division of *unit fractions* by natural numbers and division of *whole numbers* by *unit fractions*
  For example: Use *visual fraction models* and *equations* to represent the problem. How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?

➔ **5.MD.B.2** *new this quarter*

- Make a *line plot* to display a data set of measurements in *fractions* of a unit (1/2, 1/4, 1/8)
- Use operations on *fractions* for this grade to solve problems involving information presented in *line plots*
  For example: Given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally. Given different measurements of length between the longest and shortest pieces of rope in a collection, find the length each piece of rope would measure if each rope's length were redistributed equally or other examples that demonstrate measures of center (*mean*, *median*, *mode*).

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 expectations include using visual fraction models and/or equations.

EQ 4: How can I reason about the product when multiplying fractions?

★ **5.NF.B.4** Apply and extend previous understandings of multiplication to multiply a *fraction* or whole number by a *fraction*:

- Interpret the *product* (*a*/*b*) × *q* as *a* parts of a partition of *q* into *b* equal parts; equivalently, as the result of a sequence of operations *a* × *q* ÷ *b*. *For example:* Use a *visual fraction model* to show (2/3) × 12 means to take 12 and divide it into thirds (1/3 of 12 is 4) and take two of the parts (2 X 4 is 8), so (2/3) X 12 = 8, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.).
- Find the area of a rectangle with fractional (less than and/or greater than 1) side lengths, by tiling it with unit squares of the appropriate *unit fraction* side lengths, by multiplying the fractional side lengths, and then show that both procedures yield the same area

Area is a visual support for understanding multiplication as scaling

➔ **5.NF.B.5** Interpret multiplication as scaling (resizing), by:

- Comparing the size of a *product* to the size of one *factor* on the basis of the size of the other *factor*, without performing the indicated multiplication *For example:* Understand that 2/3 is twice as large as 1/3.
- Explaining why multiplying a given number by a *fraction* greater than 1 results in a *product* greater than the given number
- Explain why multiplying a given number by a *fraction* less than 1 results in a *product* smaller than the given number
- Relate the principle of *fraction* equivalence *a*/*b* = (*n* × *a*)/(*n* × *b*) to the effect of multiplying *a*/*b* by 1

➔ **5.NF.B.6** Solve real world problems involving multiplication of *fractions* and mixed numbers. *For example:* Use *visual fraction models* or *equations* to represent the problem.

Q3 Focus:

- *A fraction x a fraction*
- *Mixed number x a fraction (partial groups)*
- *Mixed number x a mixed number*

➔ **5.MD.B.2** *new this quarter*

- Make a *line plot* to display a data set of measurements in *fractions* of a unit (1/2, 1/4, 1/8)
- Use operations on *fractions* for this grade to solve problems involving information presented in *line plots*
  For example: Given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally. Given different measurements of length between the longest and shortest pieces of rope in a collection, find the length each piece of rope would measure if each rope's length were redistributed equally or other examples that demonstrate measures of center (*mean*, *median*, *mode*).

EQ 5: What strategies can I use to solve addition and subtraction problems involving fractions?

★ **5.NF.A.2** *new this quarter; Q3 begins with experiences involving one denominator as a factor of the other denominator Ex:* $1/3 + 1/6 = n$

- Solve word problems involving addition and subtraction of *fractions* referring to the same whole, including cases of unlike *denominators*. *For example:* Use *visual fraction models* or *equations* to represent the problem.
- Use benchmark *fractions* and number sense of *fractions* to estimate mentally and assess the reasonableness of answers. *For example:* Recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.

➔ **5.NF.A.1** Efficiently, accurately, and with some degree of flexibility, add and subtract *fractions* with unlike *denominators* (including mixed numbers) using equivalent *fractions* and common *denominators* *For example:* Understand that 2/3 + 5/4 = 8/12 + 15/12 = 23/12 (In general, a/b + c/d = (ad + bc)/bd) *new this quarter;*

Note: 5.NF.A.1 The focus of this standard is applying equivalent fractions, not necessarily finding least common denominators or putting results in simplest form.

➔ **5.MD.B.2** *new this quarter*

- Make a *line plot* to display a data set of measurements in *fractions* of a unit (1/2, 1/4, 1/8)
- Use operations on *fractions* for this grade to solve problems involving information presented in *line plots*

  For example: Given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally. Given different measurements of length between the longest and shortest pieces of rope in a collection, find the length each piece of rope would measure if each rope's length were redistributed equally or other examples that demonstrate measures of center (*mean*, *median*, *mode*).

EQ 6: How can I organize two-dimensional figures based on their properties?

★ **5.G.B.3** Understand that *attributes* belonging to a category of two-dimensional figures also belong to all subcategories of that category.
For example: All rectangles have four right angles and squares are rectangles, so all squares have four right angles. All isosceles triangles have at least two sides *congruent* and equilateral triangles are isosceles. Therefore, equilateral triangles have at least two *congruent* sides.

➔ **5.G.B.4** Classify two-dimensional figures in a hierarchy based on properties *new this quarter*

Note 5.G.B.4: Trapezoids will be defined as a quadrilateral with at least one pair of opposite sides parallel, therefore all parallelograms are trapezoids.
The coordinate system could be used as a tool to illustrate properties of two-dimensional figures.

➔ **5.G.A.1** *new this quarter; Note 5.G.A.1: Graphing will be limited to the first quadrant and the non-negative x- and y-axes only.*

- Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the *origin*) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its *coordinates.*
- Understand that the first number indicates how far to travel from the *origin* in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the *coordinates* correspond (e.g., *x*-axis and *x*- coordinate, *y*-axis and *y*-coordinate).

➔ **5.G.A.2** *new this quarter*

- Represent real world and mathematical problems by graphing points in the first quadrant and on the nonnegative *x*- and *y*-axes of the *coordinate plane.*
- Interpret coordinate values of points in the context of the situation

Application of the following standards will be seen throughout most of your mathematical experiences:

- **5.OA.A.1** Use *grouping symbols* including parentheses, brackets, or braces in numerical *expressions*, and evaluate *expressions* with these symbols. *Note: 5.OA.A.1 Expressions should not contain nested grouping symbols such as [4+2(10+3)] and they should be no more complex than the expressions one finds in an application of the associative or distributive property (e.g., (8+7) x2 or {6 X 30} + {6 X 7}).*

- **5.OA.A.2** Write simple *expressions* that record calculations with numbers, and interpret numerical *expressions* without evaluating them.
  For Example: Express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated *sum* or *product.*