Curriculum Parent Overview (Grade 5)

MATHEMATICS

UNIT #7 RACES, ARRAYS AND GRIDS (Rational Numbers 3: Multiplication and Division)

CONTENT FOCUS:

Students extend their understanding of multiplication and division to include fractions. Students use representations such as fraction bars and arrays to solve problems that involve multiplying a whole number and a fraction or a mixed number, or multiplying two fractions. Students use representations to divide unit fractions by whole numbers and whole numbers by unit fractions.

Students solve problems that involve dividing a whole number by a whole number that result in a fraction or a mixed number. Students find decimals equivalent to fractions by dividing the numerator of a fraction by the denominator.

Students extend their understanding of multiplication, division, and place value to include decimals. They use representation and reasoning to multiply and divide whole numbers and decimals by powers of 10, and to solve problems involving multiplication and division of decimals. Students also use understanding of multiplication and division to convert measurements.

UNIT FOCUS:

- Multiplying and dividing fractions, mixed numbers, and whole numbers: Students build on their understanding of the operations of multiplication and division and their understanding of fractions to multiply and divide with fractions. They'll use contexts and representations to solve multiplication and division problems that involve fractions and mixed numbers to help them explain their understanding of multiplication and division to include fractions.

  Students will use an array model to solve problems that involve multiplying two fractions. They'll have to consider that one square is a whole, find a part of that whole, and then find a part of that part. In order to visualize multiplying two fractions, students will have to shift their thinking about what the whole is.

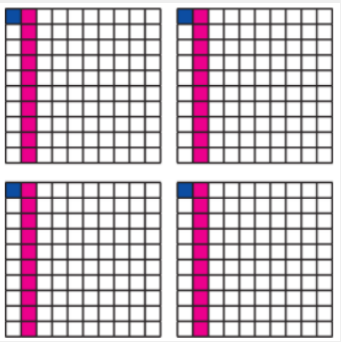
  Students will also work on dividing a unit fraction by a whole number and dividing a whole number by a unit fraction. Students will have to use what they already know about the concept of division to divide with fractions. It's important that students think of division as how many of one number can fit into another number.
  - For example, 3 ÷ 2 can represent "How many 2s fit in 3?"
- Interpreting fractions as division: In this unit, students solve problems that result in an answer that is a fraction or a mixed number.
  - For example, "If 4 people share 3 brownies, how much of a brownie does each person get?" The answer is 4/3 or 4 ÷ 3.

  Students also work on the idea that by carrying out the division represented by a fraction, they find an equivalent decimal. Through this work, students extend their knowledge of fraction-decimal equivalents.
- Multiplying with decimals: When multiplying with decimals, many pre-requisite skills that need to be understood in order for students to build this new concept- multiplying with whole numbers, place value understanding, and fraction equivalents.

- One significant idea about place value that students will rely on is that regardless of the location of the digit in reference to the decimal point, the same base-10 relationship exists from one digit to another.
    - For example, whether it's the relationship between the tens and hundreds or the tenths and hundredths places, each place value is one-tenth less than the digit to its left and ten times greater than each digit on its right.

  To begin their work, students solve problems by multiplying a whole number and a power of 10 (0.01, 0.1, 1, 10, 100). They discuss how the magnitude of the answer changes and how the place value of digits in the answer also changes. Seeing the effect of multiplying the same number by different powers of 10 helps students conceptualize how multiplying with decimals differs from, but also fits with, multiplying with whole numbers.

  Students use hundredths grids and number lines to begin their work with multiplying decimals. They represent 4 x 0.01 asn 4 x 0.1 on hundredths grids and write equations for both the decimal and the fraction equivalents.



$$4 \times 0.01 = 0.04$$

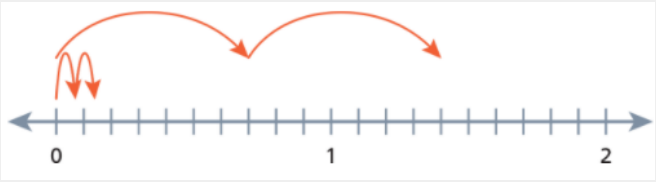
$$4 \times \frac{1}{100} = \frac{4}{100}$$

$$4 \times 0.1 = 0.4$$

$$4 \times \frac{1}{10} = \frac{4}{10}$$

  Another familiar representation that students use to multiply decimals is a number line. This helps them think about what constitutes a reasonable answer, as well as how the representation shows the place value relationship of the numbers.

    - For example, when the context of running 0.7 miles 2 different times is presented, the visual representation on a number line would look like this.

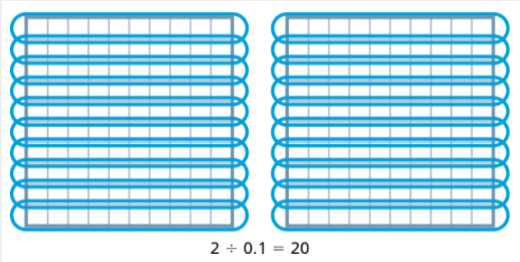


  These problems and representations are important because students understand that when you multiply, the answer doesn't always result in a number larger than both factors. It also reinforces that not only is the product of 2 x 0.07 smaller than the product of 2 x 0.7, but that it is exactly one tenth smaller, because of the nature of the place value system.

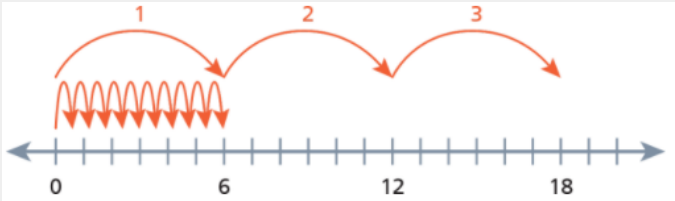
- Dividing with decimals: While fluency with dividing whole numbers is essential, the understanding of place value as it relates to division is the focus and central to the conceptual understanding of the division of whole numbers.

  Students will start by dividing by powers of 10 and studying the pattern in the placement of the decimal point in the answers. Just as with multiplication of decimals, they'll become aware of how the location of the decimal point impacts the magnitude of the answer.

  Once again, students will use hundredths grids and number lines to visualize division of fractions and place-value relationships. The grids will help them solve 2 ÷ 1 to ground them in the idea of division. Then, they'll solve 2 ÷ 0.1 and 2 ÷ 0.01.



They'll also use a number line to consider division with decimals. *If Celia ran 6 miles a day and ran 18 miles in all, how many days did she run?* The solution is shown on a number line, and then students are asked to solve the problem *If Celia only ran 0.6 miles a day, how many days would it take her to run 18 miles?*



These problems and representations are important because students discover and understand that the division of two numbers doesn't always result in an answer that is smaller. Their work also highlights important place value relationships.
Finally, students solve division problems in this unit by dividing the numbers as if they were whole numbers and then deciding what a reasonable answer would be.

- For example, to solve 16.8 ÷ 12, students find the quotient of 168 ÷ 12 (14), and then apply reasoning to decide on the placement of the decimal point. Since 16 ÷ 12 is slightly greater than 1, students know the answer is 1.4.

- Converting measurements: In the last part of this unit, students apply what they have learned about multiplying and dividing fractions and decimals to solve problems on converting measurements within the U.S. and Metric measurement systems. The key to understanding measurement conversions is the ongoing development of understanding that if you convert a larger unit of measure to a smaller one, you're going to have more of the smaller units. If you convert a smaller unit of measure to a larger one, you're going to have fewer of the larger units. Using the powers of 10 to multiply and divide to convert units is a key skill in this unit.

MATHEMATICAL PRACTICES:
MP1: Make sense of problems and persevere in solving them.
MP8: Look for and express regularity in repeated reasoning.

CONNECTIONS TO PREVIOUS CONTENT: This unit builds on the work students did in Grade 4, when they multiplied a fraction by a whole number. It also builds on the work students have done with rational numbers in Grade 5. In Unit 3, students deepened their understanding of fractions, as they added and subtracted fractions and mixed numbers with unlike denominators. In Unit 6, students extended their understanding of place value, and their understanding of decimals, as they worked with numbers that included thousandths and added and subtracted decimals. This unit also builds on students' work with multiplication and division of whole numbers in Units 1 and 4. It is expected that students beginning this unit have a strong understanding of the meaning of fractions and decimals, and of computation with all operations using whole numbers.

CONNECTIONS TO FUTURE CONTENT: This unit is the final unit in 5th grade that focuses on rational numbers. The focus of students' work in Grade 5 is on understanding and performing

computation of all operations with fractions and decimals. In future grades, students build on this knowledge to develop fluency with computation involving rational numbers.

MATH AT HOME:

- **Multiplying and Dividing with Fractions:** Look for familiar and interesting situations that you can use as a basis for exploring multiplying and dividing with fractions with your child. For example, when you are cooking with your child, ask questions like these:
    - This recipe calls for # " cup of flour. We are going to triple the recipe. How much flour do we need? (3 x # " = ___)
    - We have 3 cups of milk. This recipe for muffins calls for ! " cup of milk, how many batches of muffins can we make? (3 ÷ ! " = ____)
    - This recipe calls for 2 cups of flour. We are going to make only # " of a recipe. How much flour do we need? (# " x 2 = _____)
    - This recipe calls for # " cup of milk. We are going to make only half of a recipe. How much milk do we need? (# " x ! $ = _____) Encourage your child to draw pictures to solve these problems.
- **Multiplying and Dividing Decimals:** Look for familiar and interesting situations that you can use as a basis for exploring problems that involve multiplying and dividing with decimals with your child. Here are some examples:
    - The box of crackers costs $2.35. We are going to buy 3 boxes. How much will 3 boxes of crackers cost? (3 x $2.35 = _____)
    - Our bill at the restaurant is $69.18. We are going to split the bill evenly among our 3 families.
    - How much does each family have to pay? ($69.18 ÷ 3 = _____)
- Review the Math Words and Ideas videos for this unit on Savvas Site