Theme: The Number Concepts **Suggested Days of Instruction: 45 days**

Ohio's Learning Standards

NUMBER SYSTEMS (NS)

Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

6.NS.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e. g., by using visual fraction models and equations to represent the problem.

6.NS.2 Fluently divide multi-digit numbers using the standard algorithm.

6.NS.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

6.NS.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor.

Apply and extend previous understandings of numbers to the system of rational numbers.

6.NS.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or value.

6.NS.6 Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., −(−3) = 3, and that 0 is its own opposite. Understand ordering and absolute value of rational numbers.

6.NS.7 Understand ordering and absolute value of rational numbers.

a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. For example, interpret −3 > −7 as a statement that −3 is located to the right of −7 on a number line oriented from left to right.

b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. For example, write −3°C > –7°C to express the fact that −3°C is warmer than −7°C.

EXPRESSIONS AND EQUATIONS (EE)

Apply and extend previous understandings of arithmetic to algebraic expressions.

6.EE.1 Write and evaluate numerical expressions involving whole-number exponents.

Commentary:

Sixth graders continue their previous understanding of the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to explain why the procedures for dividing fractions make sense. Students use visual models and equations to divide whole numbers by fractions and fractions by fractions to solve word problems. Students work with the system of rational numbers, including negative rational numbers. Sixth graders focus on the order and absolute value of rational numbers and location of points in all four quadrants of the coordinate plane.

Resources:
SpringBoard: Unit 1 (Lessons 1-1 to 6-2) Unit 2 (Lessons 7-1 to 8-3)
Manipulatives: Fraction Strips, Number lines, Two-color counters, graph paper

Formative Assessments
SpringBoard Digital: Short-Cycle Assessment for each lesson

Summative Assessments
SpringBoard Digital: End of Unit or Customized Assessment

OST Released Items:

Embedded Assessments
Unit 1
EA1: Comparing and Computing with Whole Numbers and Decimals, ***For the Birds***
EA2: Prime Factorization, Exponents, GCF, and LCM, ***Winter Sports***
EA3: Multiplying and Dividing Fractions and Mixed Numbers, ***Juan's Bookcase***

Unit 2
EA1: Number Line and Adding and Subtracting Integers, ***Hot and Cold***

Addressing Student Misconceptions and Common Errors
6.NS.1
Sixth graders may incorrectly model division of fractions. Some students may think diving by $\frac{1}{2}$ is the same as dividing *in* half. Dividing by $\frac{1}{2}$ means to find how many one halves there are in a quantity. Dividing *in* half means to take quantity and divide it into two equal parts. To address this misconception, ask them to demonstrate two examples, one that shows dividing by $\frac{1}{2}$ and another that shows dividing in half. For example, 9 divided by $\frac{1}{2}$ equals 18 and 9 divided in half equals $4\frac{1}{2}$.

6.NS.2
For some students, the traditional standard division algorithm is difficult simply because of the many steps involved in the procedure. Some sixth graders may focus on individual digits when dividing rather than thinking about the whole number. Others may ignore place value and get an incorrect answer. To help students, remind them to describe both the place value as they divide and place value of the digits in the quotients. Ask them to show the steps of division, one at a time. Provide graph paper to keep the work legible.

Addressing Student Misconceptions and Common Errors - Continued

6.NS.3

Some students may not remember to use the concept of place value when adding tenths to hundredths. For example, when adding five-tenths to eighty-fie hundredths, some students may not realize the answer is one whole and thirty-five hundredths. To help with this misconception, try using decimal blocks or drawing a picture to show how the decimals have been added. Adding a zero to 0.5 to write 0.50 before adding it to 0.85 helps students focus on the place value.

6.NS.4

Some students may confuse the concepts of factors and multiples. To help with this, use the vocabulary of factors and multiples when working with multiplication and division such as the numbers being multiplied are the factors, the product is the multiple. Paper foldables with vocabulary definition or mathematics games may also help students practice confusing vocabulary terms.

6.NS.5

Some sixth graders may believe the greater the magnitude of a negative number, the greater the number. To help with this misconception, continue to use the number line. Have the students trace a horizontal number line with a finger starting at a positive number such as 10 and moving left one number at a time. Ask the student each time the finger moves one number left if the number is getting larger of smaller. Continue across 0. By then, a pattern of numbers getting smaller as you move left on the number line should be established.

6.NS.6

Some sixth graders do not understand that negative signs change a number to the same distance on the opposite of 0. Use a tool such as a ruler to measure the distance to prove this is true. Some students confuse quadrant labels I and IV going counterclockwise. When introducing the quadrant numbers in the quadrants to help them remember. Some learners may confuse (3, 2) and (-3, 2), thinking both ordered pairs look the same. Using paper folding or mirrors may help the students understand the connection between signs on coordinates and their reflections across the axes.

6.NS.7

Common misconceptions occur when students are unable to order rational numbers on the number line. Some students may incorrectly place $-1\frac{3}{4}$ between -1 and 0 instead of -2 and -1. To address this, have students order the opposites. For example, if a student has difficulty placing- $1\frac{3}{4}$ on the number line, have the student place $1\frac{3}{4}$. Discuss with the student how $1\frac{3}{4}$ came between 1 and 2. Then use that reasoning to help the student place $-\frac{3}{4}$.

6.EE.1

Some students interpret 3^2 as 3 x 2 = 6. This is a common error. Use a number line representation to model the expression. Also, writing the expanded notation of 3^2 = 3 x 3 helps students.

Source: The Common Core Mathematics Companion: The Standards Decoded (What They Say, What They Mean, How to Teach Them)
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