6-3: Let's Be Rational

Unit Goals, Focus Questions, and Mathematical Reflections

Unit Goals

Numeric Estimation Understand that estimation can be used as a tool in a variety of situations including checking answers and making decisions, and develop strategies for estimating results of arithmetic operations

- Use benchmarks and other strategies to estimate results of operations with fractions
- Use estimates to check the reasonableness of exact computations
- Give various reasons to estimate and identify when a situation calls for an overestimate or an underestimate
- Use estimates and exact solutions to make decisions

Fraction Operations Revisit and continue to develop meanings for the four arithmetic operations and skill at using algorithms for each

- Determine when addition, subtraction, multiplication, or division is the appropriate operation to solve a problem
- Develop ways to model sums, differences, products, and quotients with areas, fraction strips, and number lines
- Use knowledge of fractions and equivalence of fractions to develop algorithms for adding, subtracting, multiplying, and dividing fractions
- Write fact families with fractions to show the inverse relationship between addition and subtraction, and between multiplication and division
- Compare and contrast dividing a whole number by a fraction to dividing a fraction by a whole number
- Recognize that when you multiply or divide a fraction, your answer might be less than or more than the numbers you started with
- Solve real-world problems using arithmetic operations on fractions

Variables and Equations Use variables to represent unknown values and equations to represent relationships

- Represent unknown real-world and abstract values with variables
- Write equations (or number sentences) to represent relationships among real-world and abstract values
- Use fact families to solve for unknown values

6-3 Let's Be Rational: Focus Questions (FQ) and Mathematical Reflections

Investigation 1 Extending Addition and Subtraction of Fractions	**Investigation 2** Building Multiplication With Fractions	**Investigation 3** Dividing With Fractions	**Investigation 4** Wrapping Up the Operations
Problem 1.1 **Getting Close: Estimating Sums** FQ: What are some strategies for estimating the sums of fractions? **Problem 1.2** **Estimating Sums and Differences** FQ: How do you know if your estimate is an underestimate or overestimate? What information does an underestimate or overestimate tell you? **Problem 1.3** **Land Sections: Adding and Subtracting Fractions** FQ: What are some strategies for adding and subtracting fractions? **Problem 1.4** **Visiting the Spice Shop: Adding and Subtracting Mixed Numbers** FQ: What are some strategies for adding and subtracting mixed numbers?	**Problem 2.1** **How Much of the Pan Have We Sold? Finding Parts of Parts** FQ: How does an area model relate to multiplying fractions? **Problem 2.2** **Modeling Multiplicative Situations** FQ: What strategies can you use to multiply all combinations of factors including whole numbers, fractions, and mixed numbers? **Problem 2.3** **Changing Forms: Multiplication With Mixed Numbers** FQ: How can you use number properties and equivalent fractions to multiply rational numbers?	**Problem 3.1** **Preparing Food: Dividing a Fraction by a Fraction** FQ: What does it mean to divide a fraction by a fraction? What strategies help you divide a fraction by a fraction? **Problem 3.2** **Into Pieces: Whole Numbers or Mixed Numbers Divided by Fractions** FQ: What does it mean to divide a whole number or mixed number by a fraction? What strategies help you divide a whole number or mixed number by a fraction? **Problem 3.3** **Sharing a Prize: Dividing a Fraction by a Whole Number** FQ: What does it mean to divide a fraction by a whole number? What strategies help you divide a fraction by a whole number? **Problem 3.4** **Examining Algorithms for Dividing Fractions** FQ: What is an efficient algorithm for division problems involving fractions and mixed numbers?	**Problem 4.1** **Just the facts: Fact Families for Addition and Subtraction** FQ: How do fact families help you solve equations such as $\frac{4}{5} - N = \frac{3}{8}$? **Problem 4.2** **Multiplication and Division Fact Families** FQ: How do fact families help you solve equations such as $\frac{2}{9} \div N = \frac{2}{3}$? **Problem 4.3** **Becoming an Operations Sleuth** FQ: How do you know when a particular operation is called for to solve a problem? How do you represent the problem with a number sentence?
Mathematical Reflections 1a. What are some situations in which estimating a sum or difference is useful? Why is estimation useful in these situations? 1b. When is it useful to overestimate? When is it useful to underestimate? 2. When should you use addition to solve a problem involving fractions? When should you use subtraction? 3. Suppose you are helping a student who has not studied fractions. Explain to him or her how to add and subtract fractions. Give an example of the type you think is easiest to explain. Give an example of the type you think is hardest to explain.	**Mathematical Reflections** 1. Explain and illustrate what *of* means when you find a fraction *of* another number. What operation do you use when you find parts of parts? 2a. If you forget the algorithm for multiplying fractions, how might you use rectangular models to help you multiply fractions? 2b. Describe an algorithm for multiplying any two fractions. 2c. Describe when it might be useful to estimate a product. 3. Use examples to explain the following statement: "When you multiply a fraction by another fraction, your answer might be less than both factors, more than one of the factors, or more than both factors."	**Mathematical Reflections** 1. When solving a problem, how do you recognize when division is the operation you need to use? 2a. How is dividing a whole number by a fraction similar to or different from dividing a fraction by a whole number? 2b. Explain your strategy for dividing one fraction by another fraction. Does your strategy also work for divisions where the dividend or divisor is a whole number or a mixed number? Explain. 3. When dividing a whole number by a whole number greater than 1, the quotient is always less than the dividend. For example, 15 ÷ 3 = 5, and 5 is less than 15 (the dividend). Use examples to explain the following statement: "When you divide a fraction by another fraction, your answer might be greater than the dividend or less than the dividend."	**Mathematical Reflections** 1. How do you decide which operation to use when you are solving a problem? 2. How is the relationship between addition and subtraction like the relationship between multiplication and division? How is it different? 3. While working with fact families, you thought about decomposing numbers. 3a. What does it mean to decompose a number? 3b. How do fact families help you figure out the value for *N* in a sentence such as $N \div 2\frac{1}{2} = 1\frac{1}{4}$?