Unit 05: Rational Numbers, Operations, and Equations

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 13**
Length: **3 Weeks**
Status: **Published**

Unit Overview

In this unit, students will begin by writing, comparing, and ordering rational numbers. They will then add and subtract fractions, including mixed numbers and variable expressions, first with the same denominator and then with different denominators. Next, students will multiply and divide fractions, mixed numbers and variable expressions. Students will use the multiplicative inverse to solve equations with fractional coefficients. Lastly, students will use their knowledge of rational numbers, equations, and inequalities to solve equations and inequalities involving rational numbers.

Standards

MA.7.NS.A.1	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
MA.6.NS.A.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.
MA.7.NS.A.1d	Apply properties of operations as strategies to add and subtract rational numbers.
MA.7.NS.A.2	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
MA.7.NS.A.2a	Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.
MA.7.EE.A.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
MA.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
MA.7.EE.B.4b	Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

Essential Questions

- Why are equations and inequalities useful?
- Why are there different types of numbers?
- What can we learn from studying patterns?

Application of Knowledge and Skills...

Students will know that...

- A rational number is a number that can be written as a quotient of two integers.
- The product of a number and its multiplicative inverse is 1.
- The product of two or more fractions is equal to the product of the numerators over the product of the denominators.
- To add and subtract fractions you will need a common denominator.
- To add or subtract fractions with the same denominator, write the sum or difference of the numerators over the same denominator.
- To divide by any non-zero number, multiply by its reciprocal.

Students will be skilled at...

Students will be able to:

- Convert decimals to fractions and fractions to decimals.
- Graph inequalities with rational numbers.
- Identify rational numbers and repeating and terminating decimals.
- Order rational numbers from least to greatest.
- Perform all operations with algebraic fractions.
- Perform all operations with all types of fractions (mixed, improper, common denominators, unlike denominators).
- Solve equations with rational numbers.
- Solve inequalities with rational numbers.
- Use the multiplicative inverse to solve equations.
- Write fractions and mixed numbers and improper fractions.

Assessments

Digits Readiness Assessments:

The readiness assessment screens students on their understanding of the prerequisite content of a unit. Students are then assigned invidualized intervention lessons to address specific needs.

- Benchmark Assessment Summative: Benchmark Assessment Students will complete a benchmark (mid-term) developed by the Mathematics Department to assess their mastery of the objectives covered since the beginning of the year. Benchmark may take the place of the unit test.
- Daily Formative Assessments Formative: Instructional/Assessment Focus Formative assessments, such as: Do Now Assignments, Homework Assignments, Tickets to Leave, and Communicators, will provide daily data for teachers.
- Fractions and Science Formative: Lab Assignment Students will use graph paper to make a grid with as many sections as they like. Then they will color in the segments that represent cloud coverage in the sky. The result is that each student creates his or her own fraction to describe the sky.
- Recipe Formative: Personal Project Using their own personal recipes, students will expand and reduce their recipes to feed different amounts of people. They will also determine the amount of money they will spend based on their ingredients. Students will utlize the Internet to find pricing.
- Tic Tac Toe Review Formative: Self Assessment Students will complete unit review using tic tac toe boards. Each board will have a different concept: +/- fractions, x/÷ fractions, equations and inequalities. Students will be grouped according to their self-assessed weaknesses.
- Unit Quiz Formative: Written Test Students will complete a teacher-constructed unit quiz assessing their understanding of the following: -Converting fractions to decimals -Converting decimals to fractions -Adding and subtracting fractions with common denominators -Adding and subtracting fractions with uncommon denominators. -Simplifying variable expressions involving fractions. -Solving fractions involving variables.
- Unit Test Summative: Written Test Students will complete a teacher-constructed unit test to determine their understanding of the objectives covered in the unit.

Activities

- **Foldable/Guided Notes:** students complete example problems as a class. Break solutions down into steps and write in foldable graphic organizer: 1. covert to improper fractions. 2. find a common denominator. 3. change numerator. 4. perform the operation
- **Graphing Calculators:** students will learn how to insert and solve problems with fractions on graphing calculators and TI 34 calculators.
- **Recipe Activity:** using their personal recipes, students will expand and reduce their recipes to feed different amounts of people. They will complete their projects on poster board.
- **Numbers Venn Diagram:** complete a Venn Diagram to show the comparison between rational numbers, integers and whole numbers. Provide examples and have students include their own examples. Include key vocabulary words: terminating and repeating decimals and rational numbers.
- <u>Digits cd grade 6:</u>

  Launch Activity

  Multiply Fractions: r-5 Math in Music: In this activity students will solve problems concerning music to review multiplication of whole numbers and adding fractions.

  Divide Fractions: r-6 Making Pizzas: In this activity students will solve problems concerning pizza to review simplifying, multiplying, and adding fractions. Students will also divide whole numbers.

Activities to Differentiate Instruction

- **Human Number Line Activity:** Each students is given a fraction based on ability and must re-write the fraction in decimals. Then all students must order their decimals from least to greatest. Provide students with different fractions based on ability. For more advanced students, provide negative fractions, mixed numbers, etc.

- **Adding/Subtracting Fractions:**

Lower Level: work with students on adding two and three fractions at a time with different denominators.

On Level: have students add and subtract positive and negative fractions.

Above Level: have students think critically and relate fractions to the stock exchange. Have them determine overall profit or loss of several stocks using fractions.

- **Inequalities Activity:(group by ability)** create your own two-step inequality with fractions, switch with a partner to solve. Then check each other's work. Repeat with two different partners.

- **Tic-Tac-Toe Self-Assessment:** students will complete a unit review using tic-tac-toe boards. Each board will have a different concept: +/- fractions, x/÷ fractions, equations and inequalities. Students will be grouped according to their self- assessed weaknesses.
- **Operations with fractions:** Have advanced students use their knowledge of order of operations to solve multi-step arithmetic problems involving fractions

Differentiated Homework

- **Digits Supported Materials:**

    - Math XL Printables
    - Leveled Homework G and K
    - Help Me Solve This: This function scaffolds math problems by asking prompting question at each individual step.
    - View An Example: This function provides a fully worked out step-by-step solution of a similar problem.
    - Readiness Assessment: After a student completes the readiness assessment intervention lessons are individually assigned to address prerequisite skills .
    - Tools: On line manipulatives

Integrated/Cross-Disciplinary Instruction

Science: This activity reviews fractions in the context of clouds, demonstrating how math and science work together. By using math and science to describe clouds, the lesson gives students several means of communication (fractions and meteorological terms) to describe a meteorological situation. Whereas a student may have looked up at the sky before the lesson and said there are a lot of clouds in the sky, after the lesson, the student may look up and think that not only are there a lot of clouds in the sky, but also that it is about 90

percent covered and/or that it is overcast.

Linking fractions to Science

Resources

Kuta software

Digits teacher materials and support: www.pearsonrealize.com

Digits student access and support: www.MyMathUniverse.com

SMART Exchange

Smart Board

Computers to conduct research for pricing of ingredients for the Recipe Project

Graphing Calculators

Sciencelinks.com

21st Century Skills

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.