Unit 1: Rational Number Arithmetic
Grade 7 Math

20 Class Meetings

Revised June 2022

Essential Questions

- How do numbers relate and compare to one another?
- Why is it important to understand our number system?

Enduring Understandings with Unit Goals

EU 1: The adding and subtracting of rational numbers can be solved using properties of operations.

- Interpret and represent positive and negative numbers on horizontal and vertical number lines.
- Apply opposite quantities to make zero.
- Evaluate absolute value of rational numbers.
- Demonstrate subtraction as addition using the additive inverse.
- Solve real-world and mathematical problems with rational numbers involving addition and subtraction.

EU 2: The properties of operations for multiplication and division (including long division) hold true for rational numbers.

- Analyze positive and negative numbers to solve for products and quotients.
- Interpret rational numbers using the properties of operations.
- Utilize long division to convert fractions to decimals.
- Evaluate if a decimal is terminating or repeating.
- Solve real-world and mathematical problems with rational numbers involving multiplication and division.
- Apply the Order of Operations to simplify expressions

Unit 1: Rational Number Arithmetic
Grade 7 Math

20 Class Meetings

Revised June 2022

Standards

Common Core State Standards:

- **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.
- **7.NS.A.1.A:** Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*
- **7.NS.A.1.B:** Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
- **7.NS.A.1.C:** Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference and apply this principle in real-world contexts.
- **7.NS.A.1.D:** Apply properties of operations as strategies to add and subtract rational numbers.
- **7.NS.A.2:** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
- **7.NS.A.2.A:** 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.
- **7.NS.A.2.B:** Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.
- **7.NS.A.2.C:** Apply properties of operations as strategies to multiply and divide rational numbers.
- **7.NS.A.2.D:** Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.
- **7.NS.A.3:** Solve real-world and mathematical problems involving the four operations with rational numbers

ISAAC Vision of the Graduate Competencies

Competency 1: Write effectively for a variety of purposes.
Competency 2: Speak to diverse audiences in an accountable manner.
Competency 3: Develop the behaviors needed to interact and contribute with others on a team.
Competency 4: Analyze and solve problems independently and collaboratively.
Competency 5: Be responsible, creative, and empathetic members of the community.

Unit 1: Rational Number Arithmetic
Grade 7 Math

20 Class Meetings

Revised June 2022

Unit Content Overview

1. **Adding and Subtracting Rational Numbers**
    - Represent rational numbers on horizontal and vertical number lines
    - Define opposites and absolute value
    - Compare and ordering rational numbers
    - Write and interpret inequalities to describe the order of rational numbers
    - Describe situations in which opposite quantities combine to make zero
    - Add rational numbers with and without a number line
    - Understand subtraction as addition of the opposite value (additive inverse)
    - Represent distance between two rational numbers as the absolute value of their difference
    - Use subtraction of rational numbers with and without a number line
    - Use addition and subtraction of rational numbers using properties of operations to solve problems
    - **Vocabulary and Key Terms –** Number line, Positive, Negative, Absolute value, Additive inverses, Opposites, Integers, Rational number, Real numbers, Whole numbers, Natural numbers, Counting numbers, Irrational number, Fraction, Decimal, Improper fraction, Mixed number, Equivalent, Sum, Difference, Evaluate, Convert, Long division, Dividend, Divisor, Quotient, Factors, Product, Repeating decimal, Terminating decimal, Distributive property, Associative property, Commutative property, Multiplicative inverse property, Additive inverse property, Property of zero

2. **Multiplying and Dividing Rational Numbers**
    - Determine the rules for multiplying signed numbers
    - Use multiplication of signed rational numbers and interpret products in real-world contexts
    - Determine the rules for dividing signed numbers
    - Use division of signed rational number and interpret quotients in real-world contexts
    - Convert rational numbers to decimals using long division and equivalent fractions
    - Use multiplication and division with rational number using properties of operations to solve problems
    - **Vocabulary and Key Terms –** Number line, Positive, Negative, Absolute value, Additive Inverses, Opposites, Integers, Rational number, Real numbers, Whole numbers, Natural numbers, Counting numbers, Irrational number, Fraction, Decimal, Improper fraction, Mixed number, Equivalent, Evaluate, Convert, Long division, Dividend, Divisor, Quotient, Factors, Product, Repeating decimal, Terminating decimal, Distributive property, Associative property, Commutative property, Multiplicative inverse property, Additive inverse property, Property of zero

<u>Interdisciplinary Connection:</u>

- Language Arts - Word Problems
- Science – Word Problems

Unit 1: Rational Number Arithmetic
Grade 7 Math

20 Class Meetings

Revised June 2022

Daily Learning Objectives with *Do Now Activities*

Students will be able to…

- Compare and order rational numbers on vertical and horizontal number lines.
    - Solve multi-digit decimal problems
- Evaluate and prove that the distance between two rational numbers is equal to the absolute value of their difference.
    - Find GCF, LCM, unit rate and write a ratio
- Model and explain adding and subtracting of signed numbers on a number line. *
    - Ratio and rate reasoning
    - Evaluate expressions with exponents & read, write and evaluate expressions with variables
- Compose problems where two quantities add to make a sum of zero (opposites).
    - Apply properties with exponents & identify equivalent expressions
- Evaluate rational expressions involving decimals and fractions to find their sums.
    - KCF and understand positive and negative integers
- Manipulate subtracting rational numbers to adding the opposite value (additive inverse). *
    - Understand rational numbers on a coordinate plane
    - Compare and order rational numbers on a number line
- Demonstrate the rules for multiplying rational numbers.
    - Determine if the equation/inequality is true with substitution and solve 1-step equations with variables
- Identify the parts of powers and evaluate exponential expressions using multiplication.
    - Solve equations with variables and solve and graph inequalities
- Solve problems involving fractions (dividing by a whole number is the same as multiplying by its reciprocal - multiplicative inverse).
    - Independent and dependent variables & area of polygons
- Compare and contrast the relationship between multiplication and division to develop the rules for dividing rational numbers.
    - Volume of rectangular prisms & draw polygons on a coordinate plane
- Apply long division to convert from rational numbers to decimals and identify a repeating or terminating decimal.
    - Represent 3-D figures with nets & find surface area using nets
- Compare and contrast the properties of rational numbers
    - Find the mean and median & recognize statistical questions
- Evaluate expressions using order of operations (PEMDAS). *
    - Box-and-whisker plot and mean
    - Create a line plot & create a stem-and-leaf plot

Unit 1: Rational Number Arithmetic
Grade 7 Math
20 Class Meetings

Revised June 2022

- Apply order of operations to analyze and explain errors in expressions.
    - Describe situations that make zero & add rational numbers on a number line
- Apply the properties of rational numbers to simplify expressions with rational numbers.
    - Solve real-world problems with rational numbers & add rational numbers on a number line
- Solve real world problems involving all four operations with rational numbers. *
    - Describe situations that make zero, add rational numbers on a number line & solve real-world problems with rational numbers *

Instructional Strategies/Differentiated Instruction

- Whole group instruction
- Guided notes
- Graphic Organizers
- Student-led instruction
- Small group instruction
- Independent problem-solving
- Collaborative problem-solving
- Cross-curricular problem solving (independent and collaborative)
- Accountable Talk
- Manipulatives
- Homework
- Highlighted words
- Fill in the blanks
- Access to multiplication chart
- Access to calculator
- Color coded notes
- Pre-teaching/Reteaching

EL DIFFERENTIATED INSTRUCTION:

- Word Walls with visuals
- TWPS (Think, Write, Pair, Share)
- Pre-reading strategies
- Culturally responsive teaching
- Explicit Modeling
- Key Vocabulary
- Graphic Organizers
- Strategic Grouping
- Non-verbal Assessments

Unit 1: Rational Number Arithmetic
Grade 7 Math

20 Class Meetings

Revised June 2022

Assessments

FORMATIVE ASSESSMENTS:

- Warm-ups (SBAC)
- Whiteboards
- Mid-class check-ins
- Exit Slips
- Accountable Talk Discussions
- Do Now
- Student-led instruction
- Manipulatives
- Homework
- Performance Task: A Day Out
    - Future Rubric Assessment in 2021-2022

SUMMATIVE ASSESSMENTS:

- Quiz 1 - EU 1 (Edulastic)
- FIAB: Number System
- Unit 1 Test (Edulastic)
- Performance Task: A Day Out

Unit Task

Unit Task Name: A Day Out Performance Task

Description: Students will use information learned in this unit to analyze the results of a survey for a school trip. Based on the information given on the class vote for first and second choices, students will decide what field trip the class will go on and provide a written explanation. Then, students will apply the operations of rational numbers (EU 1 & EU 2) to solve how much each person will need to pay to go on the trip they have chosen and justify their answer.

Evaluation: Summative Assessment and Future Rubric in 2021-2022 school year

Unit 1: Rational Number Arithmetic
Grade 7 Math

20 Class Meetings

Revised June 2022

Unit Resources
● Match FishTank ● Illustrative Mathematics ● Khan Academy ● Solveme Mobiles ● Flipped Google Classroom Videos ● Worksheets ● Calculator ● Laptops ● SBAC Prep Online ● Performance Task: A Day Out ● Edulastic ● Blooket ● 99math.com ● Legends of Learning