

# Unit 1: Rational Number Arithmetic

## Grade 7 Math

18 Class Meetings

*Revised October 2025*

### 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

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### 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.

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### 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

#### Interdisciplinary Connection:

- Language Arts – Word Problems
- Science – Word Problems

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### Daily Learning Objectives with *TWPS* Activities

#### Students will be able to...

- Compare and order rational numbers on vertical and horizontal number lines.
  - *TWPS – What number doesn't belong (9, 16, 25, or 43)? Explain using mathematical reasoning.*
- Understand the absolute value of a number is equal to the distance that number is away from zero.
  - *TWPS – How would you describe the location of positive and negative numbers on a vertical and horizontal number line? Where do the numbers go on a number line? Explain using mathematical reasoning.*
- Model and explain adding and subtracting of signed numbers on a number line.
  - *TWPS – Which of the following numbers is the smallest? Which number is the largest? Decimals and Fractions. Explain using mathematical reasoning.*
- Compose and solve word problems involving positive and negative numbers and where two quantities add to make a sum of zero (opposites).
  - *TWPS – Would You Rather Flip Coin or Roll Dice Edition. Explain using mathematical reasoning.*
- Demonstrate the rules for adding and subtracting positive and negative numbers. \*
  - *TWPS – Would You Rather Cookie Edition. Explain using mathematical reasoning.*
  - *TWPS – Which number doesn't belong? Fractions Edition (1/2, 5/3, 2/10, and 2/5). Explain using mathematical reasoning.*
- Demonstrate the rules for multiplying and dividing positive and negative numbers.
  - *TWPS – Find the error in the student's work for solving a problem using order of operations (PEMDAS). Explain using mathematical reasoning.*
- Apply long division to convert from rational numbers to decimals and identify a repeating or terminating decimal.
  - *TWPS – Which of the three statements is a lie? Burger, Fries, and Noodles Edition. Explain using mathematical reasoning.*
- Evaluate rational expressions involving fractions (Day 1) and decimals (Day 2) to find their sums. \*
  - *TWPS – Identify the error in the student's work (adding fractions). Explain using mathematical reasoning.*
  - *TWPS – Which of the three statements is the lie? Adding ~~Decimals~~ with Integers Edition. Explain using mathematical reasoning.*
- Solve problems involving multiplying and dividing fractions (dividing by a whole number is the same as multiplying by its reciprocal - multiplicative inverse).
  - *TWPS – What are some real-life examples of where you would have to multiply or divide fractions? Explain using mathematical reasoning.*
- Solve word problems involving fractions.
  - *TWPS – Which statement is the lie? Dividing Fractions Edition. Explain using mathematical reasoning.*

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- Compare and contrast the properties of rational numbers
  - TWPS – Which number doesn't belong? Explain using mathematical reasoning.
- Evaluate expressions using order of operations (PEMDAS).
  - TWPS – What does each letter mean in PEMDAS? Does the order matter? Explain using mathematical reasoning.
- Solve word problems using order of operations (PEMDAS).
  - TWPS - Which of the three statements is the lie? Halloween Pumpkin, Mummy, and Witch Hat Edition. Explain using mathematical reasoning

### Instructional Strategies/Differentiated Instruction

- TWPS
- 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

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### Assessments

#### **FORMATIVE ASSESSMENTS:**

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

#### **SUMMATIVE ASSESSMENTS:**

- Pear Assessment Quiz 1 - EU 1
- Pear Assessment Quiz 2 – EU 2
- Unit 1 Test – EU 1 & 2
- 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 Performance Task Assessment Rubric

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### Unit Resources

- Worksheets
- Calculator
- Laptops
- SBAC Prep Online
- Pear Assessment
- Blooket
- Individual Whiteboards
- 2 Truths & One Lie
- State Common Core Standards Transition Tasks
- Online resources

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