

# South Amherst Middle School Grade 7 Mathematics

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## UNIT 1: The Number System - Rational Number Operations

**Time:** Approximate time frame 5 – 6 weeks

**Standard(s):** All Number System Standards

### **Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.**

7.NS.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.

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.

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.

c) Understand subtraction of rational numbers as adding 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.

d) Apply properties of operations as strategies to add and subtract rational numbers.

7. NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

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.

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  $-(p/1) = (-p)/q = p/(-q)$ . Interpret quotients of rational numbers by describing real-world contexts.

c) Apply properties of operations as strategies to multiply and divide rational numbers.

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.3 Solve real-world and mathematical problems involving the four operations with rational number.

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**Big Ideas:** *Students will understand that ...*

- Rational numbers use the same properties as whole numbers.
- Rational numbers can be used to represent and solve real-life situation problems.
- Rational numbers can be represented with visuals (including distance models), language, and real-life contexts.
- A number line model can be used to represent the unique placement of any number in relation to other numbers.
- There are precise terms and sequence to describe operations with rational numbers.

**Essential Questions:**

- How are rational numbers used and applied in real-life and mathematical situations?
- What is the relationship between properties of operations and types of numbers?

**Prerequisite Skills:**

*Students should already be able to:*

- Develop a conceptual understanding of positive and negative numbers. (6.NS.5-6)

**Skills:** Students will be able to ...

- Add and subtract rational numbers. (7.NS.1)
- Represent addition and subtraction on a horizontal or vertical number line diagram. (7.NS.1)
- Use words, visuals and symbols to describe situations in which opposite quantities combine to make 0. (7.NS.1)
- Represent addition of quantities with symbols, visuals and words by showing positive or negative direction from one quantity to the other. (7.NS.1)

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- Show that a number and its opposite have a sum of 0 using visuals, symbols, words and real-world contexts. (7.NS.1)
- Use the term “additive inverse” to describe 2 numbers whose sum is zero. (7.NS.1)
- Use commutative, distributive, associative, identity, and inverse properties to add and subtract rational numbers. (7.NS.1)
- Use the term “absolute value” to describe the distance from zero on number line diagram and with symbols. (7.NS.1)
- Multiply and divide rational numbers. (7.NS.2)
- Use the distributive property to multiply positive and negative rational numbers using symbols, visuals, words and real-life contexts. (7.NS.2)
- Interpret products of rational numbers by describing real-world contexts. (7.NS.2)

**Vocabulary:** Commutative Property, Distributive Property, Integers, Negative Numbers, Opposites, Positive Numbers, Income/Profit, Absolute Value, Additive Inverse, Associative Property, Expanding, Factoring, Quadrant I, II, III, IV, Order of Operations, Rational Numbers, Area, Coordinate Grid, Decimals, Expressions, Fact Family, Fractions, Mathematical Sentence, Number Line, Number Sentence, Operations, Ordered Pair, Variable

### Resources:

Textbook, ODE, Online Programs, Videos, Collaboration with Colleagues

### Assessments:

- **Formative:** Exit cards, online assignments, bell ringers, homework practice, observations, in-class practice, student self-reflection.
- **Summative:** Assessments, Quizzes, Projects