

12: Integers & Rational Numbers

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **3 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

The Integers and Rational Numbers Unit will allow students many opportunities to develop fluency with rational number arithmetic and solving multi-step problems (including those involving positive and negative rational numbers and word problems leading to one variable equations) throughout the school year. This unit builds on the students' understanding of rational number concepts presented in grade 6 to develop fluency with addition, subtraction, multiplication and division of rational numbers and to use these skills in a problem-solving context.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Objectives:

Rational Numbers:

- Develop an understanding that rational numbers consist of positive numbers, negative numbers, and zero
- Explore relationships between positive and negative numbers by modeling them on a number line
- Use appropriate notation to indicate positive and negative numbers
- Compare and order positive and negative rational numbers (integers, fractions, decimals, and zero) and locate them on a number line
- Recognize and use the relationship between a number and its opposite (additive inverse) to solve problems
- Relate direction and distance to the number line
- Use models and rational numbers to represent and solve problems

Operations With Rational Numbers:

- Develop understanding of operations with rational numbers and their properties
- Develop and use different models (number line, chip model) for representing addition, subtraction, multiplication, and division
- Develop algorithms for adding, subtracting, multiplying, and dividing integers
- Recognize situations in which one or more operations of rational numbers are needed
- Interpret and write mathematical sentences to show relationships and solve problems
- Write and use related fact families for addition/subtraction and multiplication/division to solve simple equations

- Use parentheses and the Order of Operations in computations
- Understand and use the Commutative Property for addition and multiplication
- Apply the Distributive Property to simplify expressions and solve problems

Essential Questions:

- Why does one need rational numbers?
- In what real-world contexts would negative numbers be used?
- When does one use decimal forms vs fractional forms of rational numbers?
- What is the difference between the opposite and the absolute value of a number?
- How are multiplication and division of integers related?
- How do you use the algorithms for operations with integers to solve order of operations problems?
- What information is useful to help you decide which operation to use to solve a problem?

Enduring Understandings:

- Rational numbers can be compared, ordered and located on a number line. They can also be used to indicate a distance or difference between points on a number line. Number lines are useful models for solving problems with rational numbers.
- Models facilitate understanding the meaning of addition, subtraction, multiplication, and division of positive and negative numbers, and improve understanding of the standard algorithms for these operations.
- Mathematical sentences, with or without variables, can model real-world problems. Sometimes rewriting a problem using a different operation can be helpful in finding the solution.
- Properties of operations extend to all rational numbers and understanding these properties is helpful in solving problems.

CONTENT AREA STANDARDS

6.NS

- A. Apply and extend previous understandings of multiplication and division to divide fractions by fractions**
- B. Compute fluently with multi-digit numbers & find common factors & multiples**
- C. Apply and extend previous understandings of numbers to the system of rational numbers**

6.EE

- A. Apply and extend previous understandings of arithmetic to algebraic expressions**

B. Reason about and solve one-variable equations and inequalities

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.7.NS	The Number System
MA.7.NS.A	Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.
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.K-12.8	Look for and express regularity in repeated reasoning.
MA.7.NS.A.1a	Describe situations in which opposite quantities combine to make 0.
MA.7.NS.A.1b	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.
MA.7.NS.A.1c	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.
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.NS.A.2b	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.
MA.7.NS.A.2c	Apply properties of operations as strategies to multiply and divide rational numbers.
MA.7.NS.A.2d	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.
MA.7.NS.A.3	Solve real-world and mathematical problems involving the four operations with rational numbers.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

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- 9.1.8.EG.4: Identify and explain the consequences of breaking federal and/or state employment or financial laws.
 - 9.1.8.EG.5: Interpret how changing economic and societal needs influence employment trends and

future education. • 9.1.8.EG.6: Explain the economic principle of the circular flow of money in different situations regarding buying products or services from a local or national business and buying imported or domestic goods.

WRK.K-12.P.2	Attend to financial well-being.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will:

- 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.
- Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$.
- 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.
- Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operation, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers.
- Know that the decimal form of a rational number terminates in 0s or eventually repeats.

Procedural Knowledge

Students will be able to:

- Apply properties of operations as strategies to add and subtract rational numbers.
- Apply properties of operations as strategies to multiply and divide rational numbers.
- Describe situations in which opposite quantities combine to make 0.
- Interpret products of rational numbers by describing real-world contexts.
- Interpret quotients of rational numbers by describing real-world contexts.
- Interpret sums of rational numbers by describing real-world contexts.
- Show that a number and its opposite have a sum of 0 (are additive inverses).
- 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.

- Solve real-world and mathematical problems involving the four operations with rational numbers
- Convert a rational number to a decimal using long division.

EVIDENCE OF LEARNING

Benchmark Assessments

- BOY Diagnostic Snapshot Assessment
- MP1 Quarterly Assessment
- MP2 Quarterly Assessment
- MP3 Quarterly Assessment
- MP4 Quarterly Assessment
- EOY Diagnostic Snapshot Assessment

Alternate Assessments

- Portfolios
- Verbal Assessment (instead of written)
- Multiple choice
- Modified Rubrics
- Performance Based Assessments

Formative Assessments

- MathXL Assignments
- Integers & Rational Numbers Proficiency Scale
- Do Now Check ins
- Formative Assessments - exit tickets, student-friendly proficiency scales, skill checklists ([Google Drive Folder](#))

Summative Assessments

- Summative Assessment [Google Drive Folder](#)
- OnCourse Assessments

RESOURCES (Instructional, Supplemental, Intervention Materials)

Instructional Materials:

- CMP3 - Accentuate the Negative ([Online link](#) - teacher and student resources)
- Resources for Unit 2 [Google Drive Folder](#)

Supplemental/Intervention Materials:

- [MathXL](#)
- [Khan Academy](#)
- [NCTM Illuminations](#)
- [Illustrative Math](#)
- [Illustrative Math Tasks](#)

INTERDISCIPLINARY CONNECTIONS

- Computations
- Financial/Economic/Business/Entrepreneurial Literacy

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.

