

OVERVIEW

The units in this instructional framework emphasize key standards that assist students to develop a deeper understanding of numbers. They learn to express different representations of rational numbers (e.g., fractions, decimals, and percents) and interpret negative numbers in everyday context (e.g., sea level change). The big ideas that are expressed in this unit are integrated with such previous knowledge as estimation, mental and basic computation. All of these concepts need to be reviewed throughout the year.

Take what you need from the tasks and modify as required. These tasks are suggestions, something that you can use as a resource for your classroom.

STANDARDS FOR MATHEMATICAL PRACTICE

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council’s report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately) and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy).

1. Make sense of problems and persevere in solving them.

Students explain and demonstrate rational number operations by using symbols, visuals, words, and real life contexts. Students demonstrate perseverance while using a variety of strategies (number lines, manipulatives, drawings, etc).

2. Reason abstractly and quantitatively.

Students demonstrate quantitative reasoning by representing and solving real world situations using visuals, numbers, and symbols. They demonstrate abstract reasoning by translating numerical sentences into real world situations.

3. Construct viable arguments and critique the reasoning of others.

Students will discuss rules for operations with rational numbers using appropriate terminology and tools/visuals. Students apply properties to support their arguments and constructively critique the reasoning of others while supporting their own position.

4. Model with mathematics. Students model understanding of rational number operations using tools such as algebra tiles, counters, visuals, and number lines and connect these models to solve problems involving real-world situations.

5. Use appropriate tools strategically. Students demonstrate their ability to select and use the most appropriate tool (paper/pencil, manipulatives, and calculators) while solving problems with rational numbers.

6. Attend to precision. Students demonstrate precision by using correct terminology and symbols and labeling units correctly. Students use precision in calculation by checking the reasonableness of their answers and making adjustments accordingly.

7. Look for and make use of structure. Students look for structure in positive and negative rational numbers when they place them appropriately on the number line. They use this structure in calculation when considering the position of numbers on the number line. In addition, students recognize the problem solving structures of word problems and use this awareness to aid in solving them.

8. Look for and express regularity in repeated reasoning. Students will use manipulatives to explore the patterns of operations with rational numbers. Students will use these patterns to develop algorithms. They can use these algorithms to solve problems with a variety of problem solving structures.

(Adapted from Illinois' Curriculum Model)

STANDARDS FOR MATHEMATICAL CONTENT

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

MGSE7.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.

MGSE7.NS.1a Show that a number and its opposite have a sum of 0 (are additive inverses). Describe situations in which opposite quantities combine to make 0. *For example, your bank account balance is -\$25.00. You deposit \$25.00 into your account. The net balance is \$0.00.*

MGSE7.NS.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. Interpret sums of rational numbers by describing real world contexts.

MGSE7.NS.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.

MGSE7.NS.1d Apply properties of operations as strategies to add and subtract rational numbers.

MGSE7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

MGSE7.NS.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.

MGSE7.NS.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.

MGSE7.NS.2c Apply properties of operations as strategies to multiply and divide rational numbers.

MGSE7.NS.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.

MGSE7.NS.3 Solve real-world and mathematical problems involving the four operations with rational numbers.

BIG IDEAS

- Computation with positive and negative numbers is often necessary to determine relationships between quantities.
- Models, diagrams, manipulatives and patterns are useful in developing and remembering algorithms for computing with positive and negative numbers.
- Properties of real numbers hold for all rational numbers.
- Positive and negative numbers are often used to solve problems in everyday life.

ESSENTIAL QUESTIONS

- What strategies are most useful in helping develop algorithms for adding, subtracting, multiplying, and dividing positive and negative rational numbers?
- What are the steps to converting a rational number to a repeating or terminating decimal?

CONCEPTS AND SKILLS TO MAINTAIN

- Use of number lines to order whole number integers.
- Addition, subtraction, division and multiplication of whole numbers.

Addition, subtraction, division and multiplication of fractions.

FLUENCY

It is expected that students will continue to develop and practice strategies to build their capacity to become fluent in mathematics and mathematics computation. The eventual goal is automaticity with math facts. This automaticity is built within each student through strategy development and practice. The following section is presented in order to develop a common understanding of the ideas and terminology regarding fluency and automaticity in mathematics:

Fluency: Procedural fluency is defined as skill in carrying out procedures flexibly, accurately, efficiently, and appropriately. Fluent problem solving does not necessarily mean solving problems within a certain time limit, though there are reasonable limits on how long computation should take. Fluency is based on a deep understanding of quantity and number.