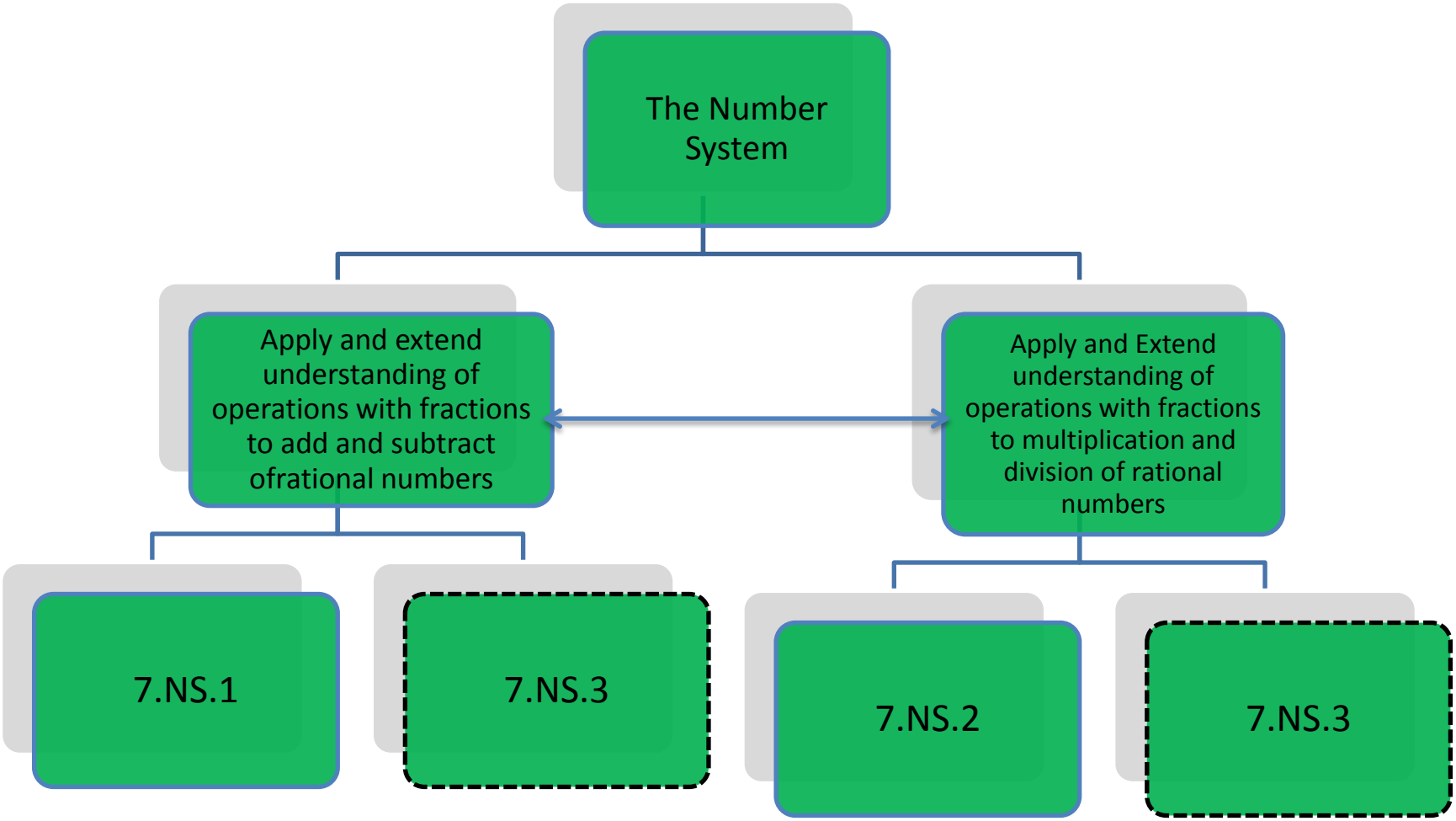
Common Core Math 7

Unit 2

The Number System: Operations to Add, Subtract, Multiply and Divide Rational Numbers



COMMON CORE MATH 7 – UNIT 2

The Number System: Operations to Add, Subtract, Multiply and Divide Rational Numbers

Critical Area: Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems.

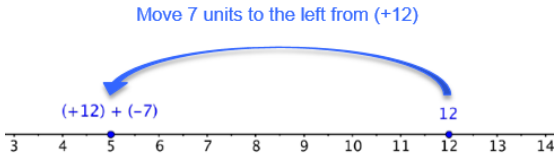
CLUSTER	COMMON CORE STATE STANDARDS
m[1] Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.	**7.NS.1** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition 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 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. d. Apply properties of operations as strategies to add and subtract rational numbers. **7.NS.2** Apply and extend previous understanding 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/q)=(-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 from 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 numbers.
MATHEMATICAL PRACTICES	LEARNING PROGRESSIONS
1. Make sense of problems and persevere in solving them. **2. Reason abstractly and quantitatively.** 3. Construct viable arguments and critique the reasoning of others. **4. Model with mathematics.** **5. Use appropriate tools strategically.** 6. Attend to precision. **7. Look for and make use of structure.** 8. Look for and express regularity in repeated reasoning.	http://commoncoretools.files.wordpress.com/2012/02/ccss_progression_nf_35_2011_08_12.pdf This cluster builds upon the understandings of rational numbers in Grade 6: • quantities can be shown using + or – as having opposite directions or values, • points on a number line show distance and direction, • opposite signs of numbers indicate locations on opposite sides of 0 on the number line, • the opposite of an opposite is the number itself, • the absolute value of a rational number is its distance from 0 on the number line, • the absolute value is the magnitude for a positive or negative quantity, and • locating and comparing locations on a coordinate grid by using negative and positive numbers. Learning now moves to exploring and ultimately formalizing rules for operations (addition, subtraction, multiplication and division) with integers. Using both contextual and numerical problems, students should explore what happens when negatives and positives are combined. Number lines present a visual image for students to explore and record addition and subtraction results. Students should be able to give contextual examples of integer operations, write and solve equations for real- world problems and explain how the properties of operations apply. Real-world situations could include: profit/loss, money, weight, sea level, debit/credit, football yardage, etc. CDE Progress to Algebra K-8 www.cde.ca.gov/be/cc/cd/documents/updateditem12catt3.doc

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS	KEY VOCABULARY
1. Computation with positive and negative numbers is often necessary to determine relationships between quantities. 2. Models, diagrams, manipulatives, number lines, and patterns are useful in developing and remembering algorithms for computing with positive and negative numbers.	1. When should we use additive inverse or multiplicative inverse? 2. How do we use a number line to show addition and subtraction of rational numbers? 3. What is the result of (what happens when) adding a number and its inverse or	• Absolute Value • Additive Inverse • Associative Property • Commutative Property • Distributive Property • Divisor

3. Properties of real numbers hold for all rational numbers. 4. Positive and negative numbers are often used to solve problems in everyday life. 5. Demonstrate that a number and its opposite have a sum of 0. 6. A positive quantity and negative quantity of the same absolute value add to make 0.	multiplying a number and its inverse? 4. How is the identity related to its inverses? 5. What is the relationship between addition and subtraction? 6. What is the relationship between multiplication and division? 7. How are the operations applied in real-world contexts? 8. How do the properties of operation help us compute with rational numbers? 9. Is it always true that multiplying a negative factor by a positive factor always produces a negative product?	• Factor • Integers • Multiplicative Inverse • Opposite • Product • Quotient • Rational Numbers • Repeating Decimal • Terminating Decimal • Zero Pair

m^1 Major Clusters – area of intensive focus where students need fluent understanding and application of the core concepts.

RESOURCES	INSTRUCTIONAL STRATEGIES	ASSESSMENT
NLVM http://nlvm.usu.edu/ **NCTM Illuminations activities** 7.NS.3 Comparing Freezing Points 7.NS.1a Distances on the Number Line 2 7.NS.3 Operations on the number line **California Draft Mathematics Framework:** http://www.cde.ca.gov/be/cc/cd/draftmathfwchapters.asp. **LAUSD Adopted Textbooks:** • California Mathematics • College Preparatory Mathematics • Go Math Click on each list above for Textbook Alignment **Engage New York Common Core Curriculum** Module 2 – Rational Numbers	1. Help students to gain a general understanding regarding adding integers on a number line that the sum p+q is the number found when moving a total of |q| units from p to the right if q is positive, and to the left if q is negative. 2. Use Number line model for operation with integers 3. Use of chips model (positive/negative numbers) for creating 0-pairs. 4. Use a foldable for integer rules. 5. Show that $\|a+b\| \neq \|a\| + \|b\|$ 6. For example show that (+12) + (-7) on a number line. 	**Formative Assessment** SBAC - http://www.smarterbalanced.org/ Item #'s Items: 2959, 43022, 43023, 43026, 43047, 43053 **LAUSD Periodic Assessment** District assessments are under development. More information to come soon. **State Assessment** California will be administering the SMARTER Balance Assessment as the end of course for grades 3-8 and 11. The 11th grade assessment will include ítems from Algebra 1, Geometry, and Algebra 2 standards. For examples, visit the SMARTER Balance Assessment at: SBAC - http://www.smarterbalanced.org/

LANGUAGE GOALS for **low achieving, high achieving, students with disabilities and English Language Learners**
• Students will describe situations in which opposite quantities will combine to make 0 or 1. *Example*: To add -5 and 5, I_____. The resulting sum will be_____, because _____. • Students will explain how they will use the properties of operations to compute with rational numbers. *Example*: In performing operations with rational numbers, I will _____. • Students will create/write real-world problems representing operations with rational numbers. *Example*: If the temperature is 40^0F in the morning and increases by 10^0 F by noon, the new temperature will be_____ because _____.
PERFORMANCE TASKS
Mathematics Assessment Project 7. NS.1 and 7.NS.3 Using Positive and Negative Numbers in Context 7NS.2 and 7.NS.3 Increasing and Decreasing Quantities by a Percent

DIFFERENTIATION 🕮		
UDL/ FRONT LOADING	ACCELERATION	INTERVENTION
• Have students construct number lines and show how they would get zero by determining how many points they would move from point 3 to 6 and back. • Use the amount they owe their friend to show that when they pay the debt, that there will be zero amount left. • Explain absolute value by using the distant they travel to school each way (to and fro). That distance is always positive. • Introduce integer concept using chips, manipulatives, number line or modeling virtually.	Acceleration for high achieving students: • Show students on a number line that the absolute value of a and absolute value of b will equal the magnitude of |a| and |b| |a| + |b| = a + b • Have students prove the following: Are there any rectangles whose area and perimeter have the same numerical value? • Can you write 12 as the sum of two "unit fractions"? 1⁄2= 1/a + 1/b. • Have students write multiplication problem or fraction division problem that can be modeled using area or linear model.	Intervention for low achieving students and students with disabilities: • Use manipulative to reteach integer such as red and blue chips. • Provide number line strips to pairs of students and give them different integer problems. • Show students how to solve problems involving fractions with unlike denominators using a picture. Have them solve it using numbers and words. • Use Algebra tiles and fraction bars to reinforce learning.

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