FCPS 2023-2024 Math Unit Framework

Kentucky Academic Standards - Math 6-8

Unit 1 Title	**Estimated Time Frame**
The Number System and Proportional Relationships	**45 days**

Big Idea (s)

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.
Analyze proportional relationships and use them to solve real-world and mathematical problems.

Essential Question(s)

How do operations with integers relate to the same operations with rational numbers?
How can you determine the correct operation to use to solve problems?
How do models help solve math problems?
How does the ongoing use of fractions and decimals apply to real-life situations?
How can you recognize and represent proportional relationships and use them to solve problems?
How can percentages show proportional relationships between quantities and be used to solve problems?
What are situations in life that depend on or require the application of ratios and proportional reasoning?

Standards for Mathematical Practice (MP.) - The practice standards in bold describe expertise to be intentionally developed in this unit.	**Kentucky Interdisciplinary Literacy Practices (KILP.) -** The practice standards in bold describe expertise to be intentionally developed in Mathematics.
MP.1. Make sense of problems and persevere in solving them. **MP.2. Reason abstractly and quantitatively.** **MP.3. Construct viable arguments and critique the reasoning of others.** **MP.4. Model with mathematics.** **MP.5. Use appropriate tools strategically.** MP.6. Attend to precision. **MP.7. Look for and make use of structure.** **MP.8. Look for and express regularity in repeated reasoning.**	KILP.1 Recognize that text is anything that communicates a message. KLIP.2 Employ, develop, and refine schema to understand and create text. KILP.3 View literacy experiences as transactional, interdisciplinary and transformational. KILP.4 Utilize receptive & expressive language arts to better understand self, others, and the world. KILP.5 Apply strategic practices, with scaffolding & then independently, to approach new literacy tasks. **KILP.6 Collaborate with others to create new meaning.** **KILP.7 Utilize digital resources to learn and share with others.** **KILP.8 Engage in specialized, discipline specific literacy practices.** **KILP.9 Apply high level cognitive processes to think deeply and critically about text.** KILP.10.Develop a literacy identity that promotes lifelong learning.

Common Preconceptions/Misconceptions

Students may understand that one positive and one negative make zero but have difficulty understanding that this is also true for *all equal amounts* of positives and negatives, such as 5 positives and 5 negatives. One way to make this clear is to start with one positive and one negative counter. As

soon as the student establishes that this is zero, add another pair. When the student recognizes that you have just added another zero to the first zero, repeat. Repeat until the student has developed the concept.

KAS Standards	Prerequisite Skill, Considerations, and Coherence	Samples of Learning Intentions and Success Criteria
KY.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. b. Understand $p + q$ as the number located at 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. **MP.2, MP.4, MP.7**	**Considerations:** ● a. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged. ● b. The sum of numbers is a directional movement from one number to another for a specified amount of spaces on the number line. The sum of opposites is 0 because opposites have equivalent absolute values. ● c. Subtracting a positive number is the same as adding the positive number's opposite. Coherence KY.6.NS.7→ KY.7.NS.1	We are learning about the relationship between integers and their opposites. **(Lesson 1-1)** ● I can explain how an integer and its opposite are the same distance from 0. ● I can describe the sum of an integer and its opposite as 0. We are learning to perform operations with integers. **(Lessons 1-3 and 1-4)** ● I can use a number line to model adding and subtracting integers. ● I can use the additive inverse to subtract integers. ● I can choose the appropriate sign (+ or -) for the sum or difference of integers. We are learning to perform operations with rational numbers. **(Lesson 1-5)** ● I can use properties of operations to add and subtract rational numbers. ● I can use a number line to model adding and subtracting rational numbers. ● I can use the additive inverse to subtract rational numbers. ● I can choose the appropriate sign (+ or -) for the sum or difference of rational numbers.
KY.7.NS.2 Apply and extend previous understandings of multiplication and division and	**Considerations:** a. Emphasis is on exploring and understanding how the rules for multiplying and dividing with negative	We are learning to identify rational numbers and write them in decimal form. **(Lesson 1-2)** ● I can write fractions as terminating or repeating decimals.

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 a 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. **MP.2, MP.7, MP.8**	numbers are connected to properties for the operations, rather than thinking of them as arbitrary rules. They explain that 4 times (-3) could be four days of golfing 3 under par and, therefore, having an overall score of - 12. The remaining operations are based on applying properties. b. Emphasis is on the equivalence relationship provided by the movement of one negative sign among the numerator, denominator, or in front of the entire fraction. Coherence KY.6.NS.1→ KY.7.NS.2 → KY.8.NS.1	● I can describe the differences between terminating and repeating decimals. We are learning to multiply positive and negative integers. **(Lesson 1-6)** ● I can multiply integers with the same sign. ● I can multiply integers with different signs. ● I can understand that the signs of the factors affect the signs of the product. We are learning to multiply with rational numbers. **(Lesson 1-7)** ● I can use a number line to multiply rational numbers. ● I can convert rational numbers when multiplying so that both numbers are decimals or fractions. ● I can choose the appropriate sign for the product of rational numbers. We are learning to divide integers. (**Lesson 1-8)** ● I can use a number line to divide integers. ● I can use properties of operations to divide integers. ● I can choose the appropriate sign for the quotient. We are learning to divide rational numbers. **(Lesson 1-9)** ● I can use a number line to divide rational numbers. ● I can use the multiplicative inverse (reciprocal) to divide rational numbers involving fractions and mixed numbers. ● I can convert rational numbers when dividing so that both numbers are decimals or fractions.
KY.7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths,	**Considerations:** For example, if a person walks ½ mile in each ¼ hour, compute the unit rate as the complex fraction ½/¼ miles per hour,	We are learning to connect unit rates and ratios. (**Lesson 2-1)** ● I can write equivalent ratios in tables to solve

areas, and other quantities measured in like or different units. **MP.2, MP.6**	equivalently 2 miles per hour. Coherence KY.6.RP.3→ KY.7.RP.1	problems that involve quantities measured in like or different units. ● I can use unit rates to compare the relationship between quantities. We are learning to compute unit rates with ratios of fractions. (**Lesson 2-2)** ● I can make a table of equivalent ratios to find the unit rate and use it to solve problems. ● I can find and apply a unit rate involving fractions to solve real-world problems.
KY.7.RP.2 Recognize and represent proportional relationships between quantities. a. Decide whether two quantities represent a proportional relationship. b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. c. Represent proportional relationships by equations. d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r), where r is the unit rate. **MP.1, MP.2, MP.3**	**Considerations:** a. Students test for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. b. Students understand finding the unit rate in a table or graph is equivalent to the constant of proportionality in an equation or verbal description. Coherence KY.6.RP.3a →KY.7.RP.2b →KY.8.EE.6 c. If total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$. Coherence KY.7.RP.2c → KY.8.EE.5 d. Students describe points (x, y) in terms of the labels of the x and y-axes; students understand in a proportional relationship (0, 0) is a valid point and (1, r) represents the unit rate and the constant of proportionality for the relationship between the quantities.	We are learning to represent proportional relationships between quantities. **(Lesson 2-3)** ● I can show a proportional relationship by using a table. We are learning to analyze the graph of a proportional relationship. (**Lesson 2-3)** ● I can decide if quantities have a proportional relationship by determining if the ratios between the quantities are equivalent. ● I can make a table to find the constant of proportionality. We are learning to describe proportional relationships using the constant of proportionality. **(Lesson 2-4)** ● I can write an equation ($y=kx$) to represent a proportional relationship. ● I can recognize k in the equation y = kx as the constant of proportionality. (k = y/x). ● I can solve problems using the equation y = kx. We are learning to determine if two quantities are proportional by graphing. **(Lessons 2-5 and 2-6)** ● I can graph data to recognize proportionality. ● I can recognize the graph of a proportional relationship as a straight line through the

		origin. • I can identify the constant of proportionality from a graph. • I can interpret a point on a graph of a proportional relationship.

Essential Vocabulary

absolute value – The distance of a number from zero.
additive inverse – Two numbers whose sum is 0. Example: 3/4 and -3/4 are additive inverses of one another because they equal 0.
Associative Property of Addition - A property for addition that means you can add three numbers in any order and get the same result; EX: 1+(2+3) = (1+2)+3; (3x4)x2 = 3(4x2); (a + b) + c = a + (b + c).
Associative Property of Multiplication – A property for multiplication that means you can multiply three numbers in any order and get the same result; EX: 1+(2+3) = (1+2)+3; (3x4)x2 = 3(4x2); (a x b) x c = a x (b x c).
Commutative Property of Addition – A property for addition that means you can add two numbers in any order and get the same result; EX: 50+25=25+50 and 3x4=4x3; a + b = b + a.
Commutative Property of Multiplication – A property for multiplication that means you can multiply two numbers in any order and get the same result; EX: 50+25=25+50 and 3x4=4x3; a x b = b x a.
convert – To change (something) into another form of equal value.
finite (terminating) decimals – When a common fraction is written as a decimal by dividing the numerator by the denominator, the result is a finite decimal if the remainder is zero. See also terminating decimal.
Integers – The set of numbers containing zero, the natural numbers, and all the negatives of the natural numbers.
repeating decimal – When a common fraction is written as a decimal by dividing the numerator by the denominator, the result is a repeating decimal if a digit or block of digits repeats endlessly as the remainder. Also called: non-terminating, unending, infinite, periodic.
percent - A fraction, or ratio, in which the denominator is assumed to be 100. The symbol % is used for percent.
proportion - An equation of fractions in the form: a/b = c/d.
rate of change - How one quantity changes in relation to another.
ratio - A pair of numbers that compares different types of units.
scale factor - A number that multiplies some quantity; the ratio of any two corresponding lengths in two similar geometric figures.
slope – Ratio of the change in y to the change in x.
unit rate - The cost for one unit of a given item; a rate simplified so that it has the denominator of 1.

Supporting Standards

KY.7.NS.3 Solve real-world and mathematical problems involving the four operations with rational numbers. **MP.1, MP.2, MP.4**

Common Assessment
Common Assessment Unit 1 Grade 7 Math

Anchor Resources

enVision Topic 1 - Integers and Rational Numbers	**enVision Topic 2 - Analyze and Use Proportional Relationships**
MILC - MILC Topic 1 resources MILC - Integer and Rational Number Resources **3-ACT Math Task: Win Some Lose Some** (one per unit) Two-color counters/integer chips Number Lines Coordinate Grids Thermometers Teaching Tools: • Number Lines TT8 • Positive Negative Tiles TT 15-16 • Grid Paper TT13-14 **I can** statements for Content Standards- enVision Topics 1-4 (Volume 1) **I can** statements for Math Practices **FAL** (one per semester): • Using Positive and Negative Numbers in Context • Adding and Subtracting Directed Numbers	**MILC -** MILC Topic 2 resources MILC Analyze and Use Proportional Relationships **3-ACT Math Task: Mixin' It Up** (one per unit) Teaching Tools: Function Tables TT7 and Double Number Lines TT9 **FAL** (one per semester) **-** Comparing Strategies for Proportion Problems **I can** statements - enVision Topics 1-4 (Volume 1) **I can** statements for Math Practices

*Disclaimer: Success Criteria is the evidence students must produce to demonstrate learning. This example is not comprehensive.
** Mathematical Practices (A.MP.1- 8) should be evidenced throughout each unit, depending on the tasks explored.
It is important to note that MP. 2 should support learning in every lesson.
*** Modeling Standards: Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol sometimes appears on the heading for a group of standards; in that case, it should be understood to apply to *all* standards in that group.