FCPS 2024-2025 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
Cluster: Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers.		
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. ☐ **Conceptual** ☐ **Procedural** ❑ Application a. Describe situations in which opposite quantities combine to make 0. ☐ **Conceptual** ❑ Procedural ❑ Application 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. ☐ **Conceptual** ❑ Procedural ❑ Application	**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.	We are learning about the relationship between integers and their opposites. ● I can model an opposite situation on a number line. ● 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 add rational numbers in mathematical and real-world contexts. ● I can use a number line to model adding rational numbers. ● I can use the additive inverse to add rational numbers. ● I can choose the appropriate sign (+ or -) for the sum of rational numbers.

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. ☐ **Conceptual** ❑ Procedural ❑ Application d. Apply properties of operations as strategies to add and subtract rational numbers. ☐ **Conceptual** ☐ **Procedural** ❑ Application **MP.2, MP.4, MP.7, KILP.1, KILP.2, KILP.10** *Supporting Standard: KY.7.NS.3*	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 to subtract rational numbers in mathematical and real-world contexts. ● I can use a number line to model subtracting rational numbers. ● I can use the additive inverse to subtract rational numbers. ● I can choose the appropriate sign (+ or -) for the difference of rational numbers. We are learning to perform operations with rational numbers. ● 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 of fractions to multiply and divide rational numbers. ☐ Conceptual ☐ Procedural ❑ Application 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. ☐ **Conceptual** ❑ Procedural ❑ Application	**Considerations:** a. Emphasis is on exploring and understanding how the rules for multiplying and dividing with negative 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.	We are learning to multiply integers. ● I can use properties of operations to understand how to multiply integers. ● I can explain how to multiply integers. ● I can understand that the signs of the factors affect the signs of the product. We are learning to multiply with rational numbers. ● I can describe a real-world context represented with multiplication of rational numbers. ● I can multiply rational numbers. ● I can interpret what the product means in a real-world context. ● I can choose the appropriate sign for the product of rational numbers. We are learning to divide integers. ● I can use properties of operations to

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. ☐ **Conceptual** ❑ Procedural ❑ Application c. Apply properties of operations as strategies to multiply and divide rational numbers. ☐ **Conceptual** ☐ **Procedural** ❑ Application **MP.2, MP.7, MP.8, KILP.1, KILP.2, KIP.5** *Supporting Standard: KY.7.NS.3*	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	understand how to divide integers. ● I can explain how to divide integers. ● I can choose the appropriate sign for the quotient. We are learning to divide rational numbers. ● I can describe a real-world context represented with division of rational numbers. ● I can interpret what the quotient means in a real-world context. ● I can divide rational numbers. ● I can use the multiplicative inverse (reciprocal) to divide rational numbers. ● I can create equivalent fractions by moving the negative sign.
Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems.		
KY.7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas, and other quantities measured in like or different units. ❑ Conceptual ☐ **Procedural** ❑ Application **MP.2, MP.6, KILP.2, KILP.8**	**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, equivalently 2 miles per hour. Coherence KY.6.RP.3→ KY.7.RP.1	We are learning to compute unit rates with ratios of fractions. ● I can make a table of equivalent ratios to find the unit rate and use it to solve problems. I can calculate a unit rate involving fractions. ● I can use a unit rate involving fractions to solve real-world problems.

KY.7.RP.2 Recognize and represent proportional relationships between quantities. ☐ **Conceptual** ☐ **Procedural** ❑ Application a. Decide whether two quantities represent a proportional relationship. ☐ **Conceptual** ☐ **Procedural** ❑ Application b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. ☐ **Conceptual** ❑ Procedural ❑ Application c. Represent proportional relationships by equations. ☐ **Conceptual** ☐ **Procedural** ❑ Application 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. ☐ **Conceptual** ❑ Procedural ❑ Application **MP.1, MP.2, MP.3, KILP.2, KILP.3, KILP.7**	**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 determine if two quantities represent a proportional relationship. ● I can show a proportional relationship using a table. ● I can determine if the ratios between the quantities are equivalent. ● I can graph coordinates on a coordinate plane to determine if the graph is a straight line through the origin. ● I can analyze the graph to determine if the quantities represent a proportional relationship. We are learning to identify the constant of proportionality in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. ● I can describe how to find the unit rate in a proportional relationship. ● I can define constant of proportionality. ● I can describe the constant of proportionality in a table, graph, equation, diagram, or verbal description. We are learning to represent proportional relationships as equations using the constant of proportionality. ● I can write an equation (in the form $y=kx$) 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 explain what points on a proportional graph mean in terms of a situation. ● I can identify the constant of proportionality from a graph (1,r). ● I can tell what the constant of proportionality means in terms of the situation. ● I can tell what the point (0,0) means in terms of the situation. ● 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.
complex fraction - Has a fraction in the numerator, the denominator, or both.
constant of proportionality (slope) - The constant multiple that relates proportional quantities *x* and *y*. It is the value of the ratio y/x and is represented by *k*. It is the ratio of the change in y to the change in x.
integers – The set of numbers containing zero, the natural numbers, and all the negatives of the natural numbers. In other words, whole numbers and their opposites.
multiplicative inverse (reciprocal) - Two numbers whose product is 1.
proportional relationship - If all ratios relating to quantities are equivalent, they are in a proportional relationship.
rate of change - How one quantity changes in relation to another.
ratio - A pair of numbers that compares different types of units.
repeating decimal - Has a decimal expansion that repeats the same digit, or block of digits, without end.
subtract - Subtracting a number is the same as adding its opposite.
terminating decimal - A decimal that has digits that end.
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**

❑ Conceptual ☐ **Procedural** ☐ **Application**

Benchmark Assessment

Resources
Standard Resource Pages Hyperlinked to Each Standard **enVision Crosswalk Unit 1** **enVision Language Support Handbook** **Three Reads Routine** **Notice and Wonder Routine** **MILC Resources**

*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.