Unit 1 Title	**Estimated Time Frame**
Real Numbers and **Linear Equations**	**63 days (Election Day)**

Big Idea (s)

Know that there are numbers that are not rational, and approximate them by rational numbers.
Work with integer exponents.
Analyze and solve linear equations.
Understand the connections between proportional relationships, lines, and linear equations.

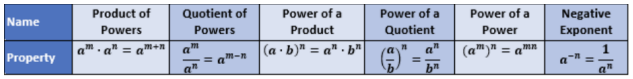
Essential Question(s)

What are real numbers? How are real numbers used to solve problems?
How can approximations of irrational numbers be used to compare the size of irrational numbers?
Where do rational numbers and irrational numbers belong within *the entire* Number System? What is their importance?
Where in real life do we use very large and very small numbers?
How can I use a model to determine one solution, infinitely many solutions, or no solutions with equations?
What is a proportional relationship?
How can I use a model to find the slope of a line?
How can I use a model to represent linear functions?

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

- Encourage students having difficulty making comparisons to work with one relationship at a time.
- Use graph paper larger than 1 cm for students to see the unit rate easier.

KAS Standards	Prerequisite Skill, Considerations, and Coherence	Samples of Learning Intentions and Success Criteria
KY.8.NS.1 Understand informally that every number has a decimal expansion; the rational numbers are those with decimal expansions that terminate in 0s or eventually repeat. Know that other numbers are called irrational. **MP.2, MP.6, MP.7**	**Considerations:** Emphasis is placed on how all rational numbers can be written as an equivalent decimal. The end behavior of the decimal determines the classification of the number. Coherence KY.7.NS.2→ KY.8.NS.1→ KY.HS.N.3	We are learning to understand real numbers. **(Lessons 1-1 and 1-2)** ● I can determine if a decimal is terminating or repeating. ● I can determine if a square is perfect or imperfect. ● I can identify whether a number is rational or irrational.
KY. 8.NS.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π2). **MP.2, MP.7, MP.8**	**Considerations:** For example, by shortening the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. Coherence KY.8.NS.2→ KY.HS.N.3	We are learning to compare and order real numbers. **(Lesson 1-3)** ● I can approximate irrational numbers. ● I can plot rational and irrational numbers on a number line. ● I can compare and order rational and irrational numbers.
KY.8.EE.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. **MP.3, MP.7, MP.8**	 Coherence KY.8.EE.1→ KY.HS.N.1	We are learning about the properties of exponent integers. **(Lessons 1-6, 1-7)** ● I can use properties of exponents to write equivalent expressions. ● I can use the Product of Powers Property when multiplying powers with the same base. ● I can use the Power of Products Property when multiplying exponential expressions with the same exponent and different bases. ● I can simplify and evaluate expressions with negative and zero exponents.

KY.8.EE.2 Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. **MP.5**	**Considerations:** Students do not prove these are the only solutions, but rather use informal methods, such as guessing and checking. Coherence KY.8.EE.2→ KY.HS.A.12	We are learning to evaluate square roots and cube roots. **(Lesson 1-4)** ● I can find the square root by finding the factor whose square is equal to that number. ● I can find the cube root by finding the factor whose cube is equal to that number. We are learning to solve equations using square roots and cube roots. **(Lesson 1-5)** ● I can use square roots to solve equations involving squares (x^2). ● I can use cube roots to solve equations involving cubes (x^3).
KY.8.EE.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities and to express how many times as much one is than the other. For example, estimate the population of the United States as 3 times 108 and the population of the world as 7 times 109, and determine that the world population is more than 20 times larger. **MP.3, MP.5, MP.6**	**Considerations:** Students conceptualize why a number could be written in scientific notation and the benefits of doing so and connect exponent rules learned earlier to the methods of writing a quantity in scientific notation. Coherence KY.8.EE.3→ KY.HS.N.6	We are learning how to use powers of 10 to estimate and write quantities. **(Lessons 1-8, and 1-9)** ● I can estimate very large and very small quantities by rounding. ● I can write the rounded number as a single digit times a power of 10. ● I can use scientific notation to write very large or very small quantities in real-world situations. ● I can convert numbers written in scientific notation to standard form.
KY.8.EE.7 Solve linear equations in one variable. b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. **MP.2, MP.3, MP.7**	**Considerations:** Building upon skills from grade 7, students combine like terms on the same side of the equality and use the distributive property to simplify the equation when solving. The emphasis in this standard is also on using rational number coefficients. Solutions of certain equations may elicit infinitely, many, or no solutions. Coherence KY.7.EE.1→ KY.8.EE.7→ KY.HS.A.18	We are learning how to solve linear equations. **(Lessons 2-1, 2-2, 2-3)** ● I can use inverse operations to move all variable terms to one side of the equation and constant terms to the other. ● I can combine like terms to solve equations. ● I can use inverse operations to isolate the variable. ● I can use the Distributive Property to expand equations with parentheses.

Essential Vocabulary

approximation - An inexact representation of something that is still close enough to be useful.
cubic root – A cube root of a number, denoted $\sqrt[3]{x}$ or x^1/3, is a number such that a^3 = x.
irrational numbers - A number that cannot be expressed as the ratio of two integers.
rational numbers - A number that can be expressed as the ratio of two integers.
real number - The combined set of rational numbers and irrational numbers.
repeating decimals - 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.
square root - The square root of x is the number that, when multiplied by itself, gives the number, x.
terminating decimals - A decimal is called terminating if its repeating digit is 0. 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.
base - The bottom of a plane figure or three-dimensional figure.
exponent - A number that indicates the operation of repeated multiplication.
integer - The set of numbers containing zero, the natural numbers, and all the negatives of the natural numbers.
integer exponents - Exponents who only have integer values.
powers - A number that indicates the operation of repeated multiplication.
scientific notation - A method for writing extremely large or small numbers in which the number is shown as the product of two factors.
distributive property - a(b + c) = a * b + a * c
equation - A mathematical statement that says that two expressions have the same value; any number sentence with an =. *EX: 4+2=3+3*
solution - The value of a variable that makes an equation true.
variable - A letter used to represent a number value in an expression or an equation. Ex: "x" in x+2=4
linear functions - A function defined by f(x) = mx + b.
proportionality - The relationship of two variables whose ratio is constant.
rate of change - The speed at which a variable changes over a specific period of time. Also the same as the slope of a function.
slope- A constant rate of change.
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.8.EE.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. **MP, 2, MP.5, MP.6** *Choose appropriate units for real-life situations.*

KY.8.EE.7a Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of form x = a, a = a, or a = b results (where a, and b are different numbers). **MP.2, MP.3, MP.7**

Common Assessment

Common Assessment Unit 1 Grade 8 Math

Anchor Resources

enVision Topic 1 -Real Numbers	**enVision Topic 2 - Analyze and Solve Linear Equations**
MILC - MILC Topic 1 Resources https://bit.ly/2w6usPo Before lesson 1-5 discuss inverse operations. Solve one and two-step equations. Merge lessons 1-8 and 1-9 with increased focus on 1-9 **3-ACT Math Task: Hard Working Organs** (one per unit) ● Teaching Tools: Number Lines **FAL** (one per semester): ● Estimating Length Using Scientific Notation ● Applying Properties of Exponents ● Translating Between Repeating Decimals and Fractions **I can** statements for enVision Topics 1-4 (Volume One) **I can** statements for Math Practices	**MILC - MILC Topic 2 Resources** https://bit.ly/30qTQNH ***Two Mini Units:*** ● 2.1-2.4Combining Like Terms ● 2.5-2.9 Solving Equations Before Topic 2 review fractions, equations, and Distributive Property Before Lesson 2-5 discuss ordered pairs and how to read a graph. Lesson 2-6 several days Lesson 2-8 (1)day **3-ACT Math Task: Powering Down** (one per unit) ● Manipulatives: Algebra tiles Represent lines on graphing calculator and Desmos in Lessons 2.8 and Lesson 2.9 **FAL** (one per semester) **-** ● Solving Linear Equations in One Variable Comparing Lines and Linear Equations ● Matching Situations, Graphs, and Linear Equations

*****Disclaimer: Success Criteria is the evidence students must produce to demonstrate learning. This example is not comprehensive.

** Mathematical Practices (MP.1- 8) should be evidenced at some point throughout.

*** 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.