KY Math Standards

Unit 1 Title	**Estimated Time Frame**
Solving Equations and Inequalities / Linear Equations	**40 days or 20 blocks**

Big Idea (s)

Build upon experiences with operations with integers and fractions.
Build upon experiences of solving linear equations and inequalities.
Analyze and explain the process of solving an equation.
Interpret functions given graphically, numerically, symbolically, and verbally.
Translate between representations and understand the limitations of various functions.
Work with functions given by graphs and tables.

Essential Question(s)

What general strategies can you use to solve simple equations?
How can we solve for an unknown quantity or find an unknown in a real-world situation?
How can linear functions be used to model situations and solve problems?

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

- Some students may miscalculate the slope. Remind students that the slope is measuring the steepness of a line, so the change in height comes first when you read slope as a fraction.

- Some students may incorrectly use (2,0) instead of (0,2) when interpreting the value of *b.* Have students check whether the equation is valid for the coordinate they use to represent the y-intercept.
- Some students often reverse the independent variable and the dependent variable y when given data.
- Students not only simplify problems, but they will also need to use vocabulary, such as terms, coefficients, and degrees, appropriately as they describe their process.
- Students will need to describe the meaning of parts of an expression, such as a particular term or coefficient, and also explain the meaning of the full expression).
- Students will fluently manipulate expressions into equivalent forms based on patterns they have noticed across problems Using Algebra Tiles, and Algeblocks is recommended.

KAS Standards	Considerations	Samples of Learning Intentions and Success Criteria
Cluster: Create equations that describe numbers or relationships.		
KY.HS.A.12 Create equations and inequalities in one variable and use them to solve problems. **MP.1, MP.4, KILP.1, KILP.2, KILP.6** *Supporting Standard: KY.HS.N.3 (+), KY.HS.N.4, KY.HS.A.13* ☐ *Conceptual* ☐ *Procedural* ☐ *Application*	**Considerations:** Students use the addition, subtraction, multiplication and division properties for both equations and inequalities to solve problems. *These equations may arise from linear and quadratic functions and simple rational and exponential functions.* **Mathematical Practices Application:** ● Verify and interpret the solutions to equations and inequalities in the context of the problem.	I am learning to write equations and inequalities. ● I can create accurate equations and inequalities to represent given situations. ● I can solve equations and inequalities in one variable using algebraic methods. ● I can explain that each step in solving a linear equation follows from the equality in the previous step.
KY.HS.A.15 Rearrange formulas to solve a literal equation, highlighting a quantity of interest, using the same reasoning as in solving equations. **MP.2, MP.7, KILP.1, KILP.6, KILP.9** *Supporting Standard: KY.HS.N.4* ❑ *Conceptual* ☐ *Procedural* ❑ *Application*	**Considerations:** Students encounter scenarios where they rewrite formulas/equations for variables different from the commonly used formulas. An example may include, but not being limited to, students rearranging the area of a rectangle (A = bh) to highlight the base value b, rather than the total area. **Mathematical Practices Application:** ● Apply mathematical reasoning to justify the steps taken in rearranging formulas and solving literal equations.	I am learning to rearrange formulas using variables and numbers to solve literal equations. ● I can identify literal equations and understand their components. ● I can rearrange formulas by applying inverse operations to isolate the desired variable. ● I can solve literal equations accurately to find the specified quantity of interest. ● I can use formulas and equations to solve problems and interpret the solutions.
Cluster: Understand solving equations as a process of reasoning and explain the reasoning.		

KY.HS.A.16 Understand each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. **MP.1, MP.3, KILP.1, KILP.6, KILP.9** ☐ *Conceptual* ❑ *Procedural* ❑ *Application*	**Considerations:** Students reason with and about collections of equivalent expressions to see how all the expressions in the collection are linked together through the properties of operations. **Mathematical Practices Application:** ● Critique the solution methods proposed by others, identifying any errors in reasoning and suggesting alternative approaches if necessary.	I am learning to justify equivalence in each step of solving a simple equation. ● I can identify the steps involved in solving a simple equation and understand the logical progression from one step to the next. ● I can solve an equation and apply the properties of equality to justify each step in the solution process. ● I can construct clear and coherent arguments to justify my chosen solution method, explaining how each step logically leads to the next.
Cluster: Solve equations and inequalities in one variable.		
KY.HS.A.18 Solve linear equations and inequalities in one variable, including literal equations with coefficients represented by letters. **MP.2, MP.7, KILP.2, KILP.5, KILP.9** *Supporting Standards: KY.HS.N.4, KY.HS.N.6, KY.HS.A.1* ☐ *Conceptual* ☐ *Procedural* ☐ *Application*	**Considerations:** Students use all properties of both equations and inequalities to solve for one variable. **Literal equations could be taught prior to solving basic level equations to reinforce ideas from Intro to Physics.* **Mathematical Practices Application:** ● Verify solutions by substituting them back into the original equation or inequality to ensure their accuracy. (Reinforces every input 'x' has an output 'y') ● Apply mathematical reasoning to justify each step taken in solving linear equations and inequalities.	I am learning to solve literal equations where coefficients are represented by letters. ● I can manipulate literal equations by isolating the desired variable using inverse operations. ● I can solve literal equations with coefficients represented by letters by applying the same reasoning as in solving equations. I am learning to solve equations and inequalities in one variable, ● I can identify linear equations and inequalities in one variable and understand their components. ● I can apply algebraic methods to solve linear equations and inequalities. ● I can interpret solutions to inequalities within the context.
Cluster: Interpret functions that arise in applications in terms of the context.		
KY.HS.F.3 Understand average rate of change of a function over an interval. a. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval.	**Considerations:** The rate of change over an interval is equivalent to the slope between the endpoints of the interval. For linear functions, the rate of change is constant, over all intervals. However, for nonlinear functions, the average	I am learning to understand the average rate of change of a function over an interval. ● I can define the rate of change in relation to slope.

b. Estimate the rate of change from a graph. ★ **MP.2, MP.4, KILP.3, KILP.9** *Supporting Standards: KY.HS.A.23* ☐ *Conceptual* ☐ *Procedural* ❑ *Application*	rate of change may vary depending on the interval. **Mathematical Practices Application:** ● Apply my understanding of average rate of change effectively, in writing, using appropriate mathematical language and terminology	● I can calculate the average rate of change from different representations: tables, graphs, and a set of points. ● I can interpret the average rate of change of a function, understanding its significance in describing the function's behavior over the interval. ● I can estimate the rate of change of a function from a graph.
Cluster: Create equations that describe numbers or relationships.		
KY.HS.A.13 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **MP.2, MP.5, KILP.7, KILP.9** *Supporting Standards: KY.HS.A.23* ☐ *Conceptual* ☐ *Procedural* ☐ *Application*	**Considerations:** Students solve systems of equations with two or more variables to solve problems in the real world setting. ***Introduce 'point-slope form' before 'y-intercept form' to emphasize lines starting with a point and moving along a slope.* ***KY.HS.A.25 Graphing linear inequalities: (Savvas 4-4) Could be taught with graphing linear equations in all forms to provide practice before graphing systems of inequalities.* **Mathematical Practices Application:** ● Analyze the graphed equations to identify patterns, trends, and key features in order to make predictions and solve problems.	I am learning to create equations in two or more variables to represent relationships between quantities and graph them. ● I can identify relationships between quantities that can be represented by equations (in two or more variables). ● I can create accurate equations to represent given relationships. ● I can ● I can graph equations on coordinate axes **with labels and scales.** ● I can interpret the meaning of the slope and intercepts in the context of the graphed equation.

Supporting Standards

KY.HS.N.3 (+) Justify why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. **MP.3, MP.6**

KY.HS.N.4 Use units in context as a way to understand problems and to guide the solution of multi-step problems; ★ **MP.5, MP.6**
a. Choose and interpret units consistently in formulas;
b. Choose and interpret the scale and the origin in graphs and data displays.

KY.HS.N.5 Define appropriate units in context for the purpose of descriptive modeling. ★ **MP.1, MP.6**

KY.HS.N.6 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities**.** ★ **MP.2, MP.6**

KY.HS.A.1 Interpret expressions that represent a quantity in terms of its context. ★ a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions, given a context, by viewing one or more of their parts as a single entity. **MP.2, MP.6**

KY.HS.A.23 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane. **MP.1, MP.4**

KY.HS.F.5 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. **MP.3, MP.6**

KY.HS.SP.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. **MP.1, MP.2**

Essential Vocabulary

equation - A mathematical statement that says that two expressions have the same value; any number sentence with an =. EX: 4+2=3+3
expression - A finite combination of symbols that are well-formed according to the rules applicable in the context at the end.
coefficient – A constant that multiplies a variable.
variable – A letter used to represent a number value in an expression or an equation. EX: "x" in x+2=4.
inequality - A mathematical expression that shows that two quantities are not equal.
slope - a constant rate of change

Standards Benchmark Assessment #1

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Anchor Resources

enVision Algebra 1 Crosswalk
enVision Language Support Handbook
Three Reads Routine
Notice and Wonder Routine
MILC Resources

FAL - Interpreting Algebraic Expressions
FAL - Solving Linear Equations in One Variable
FAL - Solving Linear Equations in Two Variables
3 ACT Math Task Collecting Cans / How Tall is Tall?
STEM - *Solar Panels* Suggested

*Disclaimer: Success Criteria is the evidence students must produce to demonstrate learning. These examples are not comprehensive.

** Mathematical Practices (A.MP.1- 8) should be evidenced at some point throughout each unit, depending on the explored tasks. 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.