Unit 2 Title	**Estimated Time Frame**
Linear Equations (continued) and **Functions** and **Bivariate Data**	**Approximately 40 days**

Big Idea (s)

Define, evaluate, and compare functions.
Use functions to model relationships between quantities.
Investigate patterns of association in bivariate data.

Essential Question(s)

How can knowing the slope and y-intercept help me solve problems involving linear relationships?
What is a function?
How can you use functions to model linear relationships?
How is bivariate data used to help me solve math problems?
How can a model be used to help me represent and investigate relationships between varying quantities?
How can you represent the relationship between paired data and use the representation to make predictions?

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.

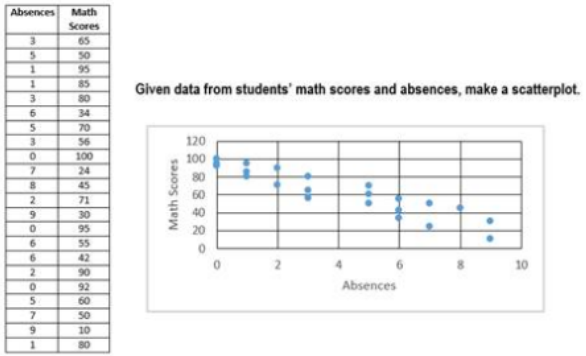
Kentucky Academic Standards - Math 6-8

Common Preconceptions/Misconceptions		
Slope - students get confused when plotting points (x first, then y) and graphing equations with slope (y first, then x). Slope Intercept Form- students often misinterpret slope and y-intercept in the y=mx+b equation. Graphing Slope Intercept Form- students often graph the y-intercept on the x-axis. Identifying Functions- Vertical Line Test (vertical vs horizontal) Distance Time Graphs - students confuse constant speed vs acceleration. Students misinterpret the meaning of the graph Scatter Plots- Nonlinear correlation vs. No Correlation Scatter Plot Terminology- Association/ Correlation/Relationship (make sure that students can recognize all three terms		
KAS Standards	**Prerequisite Skill, Considerations, and Coherence**	**Samples of Learning Intentions and Success Criteria**
Cluster: Understand the connections between proportional relationships, lines and linear equations.		
KY.8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. ☐ **Conceptual** ☐ **Procedural** ☐ **Application** **MP.2, MP.3, MP.4, KILP.2, KILP.3, KILP.9**	**Considerations:** Emphasis is on relating previous knowledge of unit rate to slope in tables, graphs, equations, and sets of ordered pairs and comparing the slopes of two different proportional relationships. Different ways the proportional relationships can be represented include tables, graphs, equations, or sets of ordered pairs. **Prerequisite Skills:** Reviewing a coordinate plane and graphing points. Be able to understand and compare ratios written in fraction form or from tables. Coherence KY.7.RP.2→ KY.8.EE.5→ KY.HS.A.23	We are learning to graph proportional relationships. ● I can graph a proportional relationship given a table, equation, or sets of ordered pairs. ● I can interpret the unit rate as the slope of a graph. We are learning to compare proportional relationships. ● I can represent proportional relationships using different representations, including graphs, tables, ordered pairs, and equations. ● I can compare proportional relationships represented in different ways. ● I can compare the slope of a line between two different proportional relationships.

KY.8.EE.6 Use similar triangles to explain why the slope, m, is the same between any two distinct points on a non-vertical line in the coordinate plane; Know the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b. ☐ **Conceptual** ❑ Procedural ❑ Application **MP.3, MP.4, MP.7, KILP.1, KILP.8**	**Considerations:** Using the properties of similar triangles, demonstrate the slope between any two pairs of points on a non-vertical line create the same rise-run ratio when simplified. Understand y=mx and y=mx+b differ in that y=mx only has the possibility of 0 being the y-intercept and that y=mx+b has infinite possibilities, including 0, for the y-intercept depending on the value of b. Coherence KY.7.RP.2→ KY.8.EE.6→ KY.HS.A.23	We are learning about the slope of a line. ● I can identify characteristics of similar triangles. ● I can use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane. ● I can find the slope of a line. We are learning to understand how different forms of linear equations are created. ● I can determine the y-intercept of a line. ● I can analyze patterns for points on a line that pass through the origin. ● I can derive an equation of the form y = mx for a line through the origin. ● I can analyze patterns for points on a line that do not pass through or include the origin. ● I can derive an equation of the form y=mx + b for a line intercepting the vertical axis at b (the y-intercept).
Cluster: Define, evaluate and compare functions.		
KY.8.F.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. ☐ **Conceptual** ❑ Procedural ❑ Application **MP.7, MP.8, KILP.7, KILP.8**	**Considerations:** Students understand the reasoning that not all relations are functions. ***Function notation is not required in grade 8.** **Prerequisite Skills:** Substituting values and simplifying expressions. Identifying x and y, understanding the meaning of input and output. Coherence KY.8.F.1→ KY.HS.F.1	We are learning to understand what a function is and is not. ● I can define a function. ● I can identify functions using diagrams. ● I can identify functions using input/output tables. ● I can identify functions using graphs. ● I can recognize a relation as a function if each input only has one output. ● I can recognize a relation that is not a function.

KY.8.F.3 Understand the properties of linear functions. a. Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line b. Identify and give examples of functions that are not linear. ☐ **Conceptual** ☐ **Procedural** ❑ Application **MP.7, KILP.7, KILP.8**	**Considerations:** a. For example, the equation $c = 3g + 5$ models the linear function for the total cost, c, of bowling, where g represents the number of games played and shoe rental is $5. b. For example, the function A = s^2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line. Coherence KY.7.EE.4→ KY.8.F.3→ KY.HS.F.11	We are learning about the properties of linear functions. ● I can identify a linear function in the form y = mx + b. ● I can interpret an equation in the form y=mx + b ● I can classify examples as functions or not. ● I can give examples of functions that are not linear.
KY.8.F.2 Compare properties of two functions, each represented differently (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. ☐ **Conceptual** ❑ Procedural ☐ **Application** **MP.1, MP.2, MP.4, KILP.2, KILP.5, KILP.8**	**Considerations:** Given a linear function represented using one method listed and another linear function represented by a different method listed, determine which function has the greater or lesser rate of change or greater or lesser initial value. Coherence KY.7.RP.2→ KY.8.F.2→ KY.HS.F.1	We are learning to compare linear functions. ● I can compare the constant rate of change in two functions represented differently. ● I can compare the initial value of two functions represented differently.

Cluster: Use functions to model relationships between quantities.		
KY.8.F.4 Construct a function to model a linear relationship between two quantities. ☐ **Conceptual** ☐ **Procedural** ❑ Application a. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. ☐ **Conceptual** ☐ **Procedural** ❑ Application b. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. ☐ **Conceptual** ☐ **Procedural** ❑ Application **MP.4, MP.5, MP.8, KILP.1, KILP.3, KILP.9**	**Considerations:** Examining a relationship between two quantities yields a function rule. This function rule can be described using its initial value and rate of change, from a variety of representations, including tables, graphs, equations, and verbal descriptions. Coherence KY.7.RP.2→ KY.8.F.4→ KY.HS.F.3	We are learning to construct functions to model linear relationships. ● I can determine the rate of change from a description, two (x,y) values, table,or a graph. ● I can determine the y-intercept from a description, two (x,y) values, table,or a graph. ● I can write a function in the form y = mx + b from two values and from a graph. ● I can interpret the rate of change in terms of the situation, graph, or a table of values. ● I can interpret the initial value in terms of the situation, graph, or a table of values.
KY.8.F.5 Use graphs to represent functions. a. Describe the functional relationship between two quantities qualitatively by analyzing a graph. b. Sketch a graph that exhibits the qualitative features of a function that has been described verbally. ☐ **Conceptual** ❑ Procedural ☐ **Application** **MP.3, MP.7, KILP.7, KILP.10**	**Considerations:** Students describe whether a function is increasing or decreasing and linear or nonlinear. Function examples are described in contexts as well as in symbols. Coherence KY.7.RP.2→ KY.8.F.5→ KY.HS.F.4	We are learning to describe the functional relationship between two quantities by analyzing a graph. ● I can determine the input variable, output variables, and intervals of a graph. ● I can describe the intervals of a graph as increasing, decreasing, or constant. ● I can analyze the relationship between the two variables from the graph. We are learning to sketch functions from verbal descriptions. ● I can sketch and label a graph to represent the behavior of the function.

Cluster: Investigate patterns of association in bivariate data.		
8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association ☐ **Conceptual** ☐ **Procedural** ❑ Application **MP.2, MP.6, MP.7, KILP.2, KILP.3, KILP.10**	**Considerations:** For example, given the data and scatter plot below, students explain the  relationship between students' absences and math scores shows a negative, linear association and has no obvious outliers **Prerequisite Skills:** Choosing correct scale and label axis Coherence KY.8.SP.1→ KY.HS.SP.8	We are learning to construct and interpret scatterplots. ● I can determine ordered pairs for a set of data. ● I can plot ordered pairs on a coordinate grid ● I can describe patterns such as clustering or outliers. ● I can describe the association of a scatter plot as positive, negative, linear or nonlinear. ● I can explain the relationship between the two quantities of data.
8.SP.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. ☐ **Conceptual** ❑ Procedural ❑ Application **MP.2, KILP.7, KILP.8**	**Considerations:** Students are informally fitting a line to data; they judge whether or not a given line is a good fit for the data and describe needed adjustments. Recognizing some scatter plots cannot be described by a line. Coherence KY.8.SP.2→ KY.HS.SP.8	We are learning to understand why straight lines are used to model relationships between two quantitative variables. ● I can determine whether the paired data has a linear association, nonlinear association, or no association. ● I can draw a trend line to determine if the linear association is positive or negative. ● I can determine if the data has a strong or weak association by judging the closeness of the data points on the scatter plot to the line of "Best Fit" (trend line).

8.SP.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. ❑ Conceptual ❑ Procedural ☐ **Application** **MP.2, MP.4, KILP.5, KILP.8**	**Considerations:** For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height and an initial value of 4 cm means the plant was 4 cm tall when measuring began. Coherence KY.8.SP.3→ KY.HS.SP.7	We are learning to use the equation of a linear model to solve problems in the context of bivariate measurement data. ● I can interpret the slope (rate of change) in context of the bivariate measurement data. ● I can interpret the y-intercept in context of the bivariate measurement data.

Essential Vocabulary

bivariate data- Involves two variables and deals with causes or relationships. Major purpose of bivariate data analysis is to explain.
categorical data- Data separable into categories that are mutually exclusive, for example, age groups.
clusters- Small group or bunch of something resulting from a "natural" grouping evident in a data set.
data set - Numeric information, usually gathered for analysis.
frequency- The number of times a particular item appears in a data set.
frequency table- A table used to show frequencies for two different variables within the same population.
function - A correspondence between two sets, the domain, and range, that assigns to each member of the domain exactly one member of the range.
input - The number substituted for the variable in a function or rule machine.
linear association- Having a strong resemblance or relation to a line; points that are clustered close to a line.
linear function - A function defined by f(x) = mx + b.
negative association- Large values of one tend to occur with small values of the other and vice versa.
non-linear - Not on a line.
non-linear association- Not having a resemblance to a line.
output - The number that is the result of a function or rule machine.
positive association- Large values of one variable tend to occur with large values of another; small values of one tend to occur with small values.
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.
relative frequency - The proportion of all given values in an interview; the frequency of the event/value divided by the number of data points.
trend line (line of best fit)- used to represent the pattern of the data and to make predictions

***Association/ Correlation/Relationship (make sure that students can recognize all three terms)**

Benchmark Assessment

Anchor Resources
Standard Resource Pages Hyperlinked to Each Standard **enVision Crosswalk Unit 2** **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 at some point throughout each unit.

*** 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.