FCPS 2024-2025 Math Unit Framework

Kentucky Academic Standards - Math 6-8

Unit 3 Title	**Estimated Time Frame**
Equations, Inequalities, and **Sampling**	**40 days**

Big Idea

Solve real-life and mathematical problems using algebraic equations and inequalities.
Use random sampling to draw inferences about a population.
Draw informal comparative inferences about two populations.

Essential Question(s)

How can you solve real-world and mathematical problems with numerical and algebraic equations and inequalities?
How are expressions, equations, inequalities, and graphs applied to real-world situations?
How can sampling be used to draw inferences about one or more populations?
What are some possible real-life situations to which there may be more than one solution?
Why is random sampling important when collecting data?
Why is it necessary to compare information about two populations?
How can data collection assist in making predictions about an event?
How can a model help me solve a statistical problem?

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 still have difficulty solving multi-step problems. Some common ways to assist include:

- Scaffold the problem by adding a question mid-way
- Display the first step of the problem
  - Allow students to find the answer
  - Present the next part that relies on the first part
  - Gradually remove the middle question as students get used to finding a middle question and identifying it for themselves

If students are showing signs of struggle with representing numbers in different forms such as 10% as 1/10, include additional practice. Be sure to use number lines, visuals such as bars, and hands-on materials instead of memorizing rules.

All students benefit from solving equations using a hands-on approach. (Algeblocks™, Hands-On Equations™, and Algebra Tiles™ can be helpful). All are available from the District Math Lab at the Teacher Resource Center.

Students reason for a solution to a real-life situation but may struggle with modeling the problems with an equation or inequality involving a variable. For example, “I buy 6 pencils and a $3 pen for a total of $12. How much did each pencil cost?” Students with an understanding of numbers but not the idea of a variable may create an equation of p = 12−3 6 = 1.50. Students who successfully model with mathematics understand the variable represents the cost of one pencil and use it appropriately, 6p + 3 = 12, which more accurately represents the problem presented.

Use number lines and visuals (i.e., bars and hands-on materials) instead of memorizing rules.

While graphing, students may need to be reminded that the same types of quantities need to be graphed on the same axis.

Make sure students understand that the circle graph focuses more on the relative values of the data clustering while the bar and pictographs add a quantity dimension.

To assist with the many new vocabulary words, use word walls, foldables, Frayer models, and graphic organizers to help students become fluent in using these words.

KAS Standards	Prerequisite Skill, Considerations, and Coherence	Samples of Learning Intentions and Success Criteria
Cluster: Solve real-life and mathematical problems using numerical and algebraic expressions and equations.		
KY.7.EE.4 Use variables to represent quantities in a real-world or mathematical problem and construct equations and inequalities to solve problems by reasoning about the quantities. ☐ **Conceptual** ☐ **Procedural** ☐ **Application** a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms. Graph the solution set of the equality and interpret it in the context of the problem. ☐ **Conceptual** ☐ **Procedural** ☐ **Application** *Supporting Standard KY.7.EE.3* b. Solve word problems leading to inequalities of the form $px + q > r$, $px + q < r$, $px + q \geq r$, $px + q \leq r$; where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. ☐ **Conceptual** ☐ **Procedural** ☐ **Application** **MP.2, MP.4, KILP.1, KILP.3, KILP.9** *Supporting Standard KY.7.EE.3*	**Considerations:** a. Interpret word problems in the form of the initial value as a one-time occurrence within the problem and the coefficient as the recurring event within the problem. Coherence KY.6.EE.7 → KY.7.EE.4 → KY.8.EE.7 b. Interpret word problems having one or more solutions that satisfy the conditions of the problem. Coherence KY.6.EE.8 → KY.7.EE.4	We are learning how to write and solve equations that represent real-life situations and interpret solutions. ● I can identify quantities in a real life situation. ● I can identify a variable in a real life situation. ● I can write an equation using variables that represent quantities in real-life situations. ● I can use inverse operations to solve equations. ● I can interpret what the solution means in context of the situation. We are learning to represent real life situations using an equation with the distributive property to solve problems. ● I can write an equation including the distributive property to represent real life situations. ● I can show the distributive property to create an equivalent equation. ● I can use inverse operations to solve equations. ● I can explain how to solve an equation. ● I can interpret the solution in terms of the context of the problem. We are learning to solve inequalities with rational numbers in word problems. ● I can identify quantities and variables within an inequality in a real-life situation. ● I can write inequalities using the symboles >, <, ≥, ≤. ● I can use inverse operations to solve inequalities. ● I can use inequality notation to graph a solution on a number line. ● I can tell what the solution means in the context of the problem. ● I can explain why to reverse the sign of the inequality when multiplying or dividing by a negative number.

Cluster: Use random sampling to draw inferences about a population.		
KY.7.SP.1 Understand that statistics can be used to gain information about a population by examining a population sample; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. ☐ **Conceptual** ❑ Procedural ❑ Application **MP.3, MP.6, KILP.1, KILP.4, KILP.6**	**Considerations:** Recognize what makes a valid and non-valid sample of a population. Recognize the size of the sample holds importance to the accuracy of the sample. Coherence KY.6.SP.2→KY.7.SP.1→KY.HS.SP.9	We are learning to understand how examining a sample can be used to gain information about a population. ● I can describe a population and a sample size. ● I can describe valid sample strategies. ● I can describe non-valid sample strategies. ● I can describe ways to create a representative sample. ● I can connect the sample size to the validity. ● I can establish whether a sample is representative of a population.
KY.7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. ☐ **Conceptual** ☐ **Procedural** ☐ **Application** a. Generate multiple samples of categorical data of the same size to gauge the variation in estimates or predictions. b. To gauge the variation in estimates or predictions, generate multiple numerical data samples (or simulated samples). c. Gauge how far off an estimate or prediction might be related to a population character of interest. **MP.2, MP.3, MP.7, KILP.2, KILP.7, KILP.9**	**Considerations:** Emphasis is on the sample size and how this affects the validity of the estimate or prediction. Examples: a. Randomly sample 6th, 7th and 8th graders about who their favorite superhero is to generate samples of data that are roughly the same size, looking specifically at patterns, if any. b. Estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Coherence KY.6.SP.0→ 7.SP.2→ KY.HS.SP.12	We are learning to use data from a random sample to make inferences about a population. ● I can generate multiple samples of data to make predictions of the population. ● I can make qualitative and quantitative inferences from a data set. ● I can estimate a population based on a sample data set and assess whether inferences are valid. ● I can use data from random sampling to draw conclusions about a population. ● I can make qualitative and quantitative inferences from a data set. ● I can determine how far off an estimate or prediction is related to a population.

Cluster: Draw informal comparative inferences about two populations.		
KY.7.SP.3 Describe the degree of visual overlap (and separation) from the graphical representations of two numerical data distributions (box plots, dot plots) with similar variabilities with similar contexts (same variable), measuring the difference between the centers (medians or means) by expressing this difference as a multiple of a measure of variability (interquartile range when comparing medians or the mean absolute deviation when comparing means). ☐ **Conceptual** ☐ **Procedural** ❑ Application **MP.1, MP.5, MP.7, KILP.1, KILP.7, KILP.10** *Supporting Standard KY.7.SP.0*	**Considerations:** For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable. Coherence KY.6.NS.1→KY.7.SP.3→KY.HS.SP.13	We are learning to describe and compare two dot plots. ● I can compare visual overlap and/or separation of two data distributions. ● I can compare means. ● I can compare medians. ● I can use the mean absolute deviation to compare the variability of two data distributions. We are learning to describe and compare two box plots. ● I can compare visual overlap and/or separation. ● I can compare medians. ● I can use interquartile range (IQR) of datasets to compare the variability of two populations.
KY.7.SP.4 Calculate and use measures of center (mean and median) and measures of variability (interquartile range when comparing medians and **mean absolute deviation** when comparing means) for numerical data from random samples to draw informal comparative inferences about two populations. ❑ Conceptual ☐ **Procedural** ☐ **Application** **MP.2, MP.5, MP.7, KILP.2, KILP.3, KILP.8** *Supporting Standard KY.7.SP.0*	**Considerations:** For example, decide whether the words in a chapter of a grade seven science book are generally longer than the words in a chapter of a grade four science book.	We are learning to make comparative inferences about two populations from random samples. ● I can find similarities and differences in two different data sets (including mean, median, interquartile range, mean absolute deviation, etc.). ● I can calculate and use mean absolute deviation to make comparative statements. ● I can compare and draw conclusions from two populations based on their measures of center. ● I can make comparative inferences based on variability. ● I can make informal comparative inferences about two populations by examining samples.
Essential Vocabulary		

box plot - Method of visually displaying a distribution of data values by using median, quartiles, and extremes. A box shows the middle 50% of the data.
clusters - Small group or bunch of something resulting from a "natural" grouping evident in a data set.
data display - An organized way to display data Ex: tables, charts, tally tables, pictographs, bar graphs, circle graphs, line plots, and Venn Diagrams.
data set - Numeric information, usually gathered for analysis.
dot plot - A visual displaying a distribution of data values where each value is shown as a dot or mark above a number line. Also known as a line plot.
inference – The process of drawing conclusions from data that are subject to random variation, for example, observational errors or sampling variation; systems of procedures that can be used to draw conclusions from data sets arising from systems affected by random variation.
maximum value - The highest/largest value of a given data set.
mean - A measure of center in a set of numerical data, computed by adding the values in a list and then dividing by the number of values in the list.
EX: *For the data set {1, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the mean is 21.*
mean absolute deviation - The average distance of a set of numbers from the mean of the set.
measure of center - A calculation resulting in a central value for a set of data; a mean, median, or mode.
median - The middle value in a set of data when the data is ordered from the greatest to least; EX: *The median of 13,7,6,4,2,2,1 is 4.*
observed frequency - The number of measurements in an interval of a frequency distribution.
outcome - In probability, a possible result of an experiment.
outliers - extreme data points.
random sample - A sample in which every element in the population has an equal chance of being selected.
range - The difference between the largest and smallest number in a data set; EX: *The range of 13,7,6,5,4,2,2,1 is 12 (13-1 = 12.*
sample space - In a probability model for a random process, a list of the individual outcomes that are to be considered.
statistical thinking - A mode of thinking that includes logical and analytical reasoning.
third quartile - For a set of data with a median M, the third quartile is the median of the data values greater than M. Example: *For the data set {2, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the third quartile is 15.*

Supporting Standards

KY.7.EE.3 Solve real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools, strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate, and assess the reasonableness of answers using mental computation and estimation strategies. **MP.1, MP.4, MP.6**
Considerations: Students solve multi-step real-world and mathematical problems containing integers, fractions, and decimals, using previously acquired skills around converting fractions, decimals, and percentages and using properties of operations to find equivalent forms of expressions when needed. Students solidify understanding by checking their solutions for reasonableness using estimation strategies such as rounding, compatible numbers and benchmark numbers.

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

KY.7.SP.0 Create displays, including **circle graphs** (pie charts) and bar graphs, to compare and analyze categorical data distributions from matching and different-sized samples. **MP.2, MP.3, MP.6**
Considerations: Circle graphs are new and connected to the grade 7 focus on percentages.
Students are comparing two distributions. Circle graphs lend to comparing different-sized samples because circle graphs are based on percentages.

❑ Conceptual ☐ **Procedural** ❑ Application

Coherence KY.6.SP.O→KY.7.SP.4

Benchmark Assessment

Resources
Standard Resource Pages Hyperlinked to Each Standard **enVision Crosswalk Unit 3** **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.