Unit 4 Title	**Estimated Time Frame**
Solving Quadratic Equations and **Statistics**	**40 days or 20 block days**

Big Idea (s)

Students will extend their previous understanding of quadratic functions.
Students will learn different methods for solving quadratic equations.
Students will interpret categorical and quantitative data and make inferences and justify conclusions.

Essential Question(s)

How do you use quadratic functions to model situations and solve problems?
When would each method of solving quadratic equations be best?
Given the graph of a quadratic, how do you write the equation in factored form?
What is the relationship between factoring and multiplying?
How many solutions can a quadratic have? How can this be determined from the discriminant?
How can you write a quadratic equation that models a situation?
How can a model help me represent and investigate relationships between varying quantities?
Why is it important to interpret standard deviation with a set of data in real-world situations?

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 in 8th-grade Algebra may struggle when completing the square when they approach it from a purely symbolic, algorithmic approach. Using area models, including Algeblocks and algebra tiles, is one way to give students another approach to this process. Skills Previously Taught: • simplifying square roots when the radicand is a perfect square • solving quadratics by taking the square root when the radicand is a perfect square Review from 6th Grade, creating stem plots, dot plots, histograms, and box plots. When creating histograms, students have difficulty in interval and scale creation. Teachers should emphasize the difference between histograms as plots of continuous data and bar graphs as categorical data displays.		
KAS Standards	**Considerations**	**Samples of Learning Intentions and Success Criteria**
Cluster: Analyze functions using different representations.		
KY.HS.F.4 Graph functions expressed symbolically and show key features of the graph, with and without using technology (computer, graphing calculator). ★ a. Graph linear and quadratic functions and show intercepts, maxima and minima. **MP.4, MP.5** *Supporting Standard: KY.HS.A.13* ☐ *Conceptual* ☐ *Procedural* ❑ *Application*	Within a family, the functions often have commonalities in the shapes of their graphs and in the kinds of features important for identifying and describing functions. This standard indicates the function families in students' repertoires, detailing which features are required for several key families. Students demonstrate fluency with linear, quadratic and exponential functions, including the ability to graph without using technology. In other function families, students graph simple cases without technology and more complex ones with technology.	I am learning to graph linear and quadratic functions expressed symbolically and demonstrate key features of the graph, including intercepts, maxima, and minima ● I can graph linear functions and identify intercepts. ● I can graph quadratic functions and identify intercepts. ● I can use technology to graph functions and check accuracy. ● I can locate and label maxima and minima on function graphs. ● I can explain the significance of intercepts, maxima, and minima. ● I can analyze linear and quadratic function graphs effectively.
Cluster: Write expressions in equivalent forms to solve problems.		
KY.HS.A.3 Choose and produce an equivalent form of an expression to reveal and explain the properties of the quantity represented by the expression. ★	Students recognize the connection between the zero product property and solving a quadratic in one variable by setting factored expressions equal to zero.	I am learning to factor a quadratic equation to reveal the zeros of the function it defines. **(Lesson 9-2)** ● I can factor a quadratic expression to

b. Factor a quadratic expression to reveal the zeros of the function it defines. **MP.5, MP.7, KILP.1, KILP.2, KILP.6** *Supporting Standard: KY.HS.A.2, KY.HS.A.7* ☐ *Conceptual* ☐ *Procedural* ❑ *Application*		produce an equivalent form of the original expression. ● I can explain the connection between the factored form of a quadratic expression and the zeros of the function it defines. ● I can explain the connection between the factored form of a quadratic expression and the zeros of the function it defines. ● I can choose and produce an equivalent form of a quadratic expression to reveal and explain the properties of the quantity represented by the original expression.
Cluster: Solve equations and inequalities in one variable.		
KY.HS.A.19 Solve quadratic equations in one variable. **a.** Solve quadratic equations by taking square roots, the quadratic formula, and factoring, as appropriate, to the initial form of the equation. **b. (+)** Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x – p) 2 = q with the same solutions. Derive the quadratic formula from this form. **c. (+)** Solve quadratic equations by completing the square. **MP.1, MP.8, KILP.6, KILP.7** *Supporting Standard: KY.HS.A.7* ☐ *Conceptual* ☐ *Procedural* ☐ *Application*	Students observe that methods for solving quadratic equations are interrelated and certain situations may more appropriately call upon one method as opposed to the other methods. b & c. (+) Students understand completing the square involves factoring and the quadratic formula is nothing more than an encapsulation of the method of completing the square. While all students are not required to be able to use completing the square as a method for solving quadratic equations, exposure to this method is needed to explain how the quadratic formula is derived. **STEM (one per semester) T-shirt Launcher** Note: Relate every method back to 9.1 where the x-intercepts	I am learning to solve quadratic equations in one variable. **(Lessons 9-2, 9-4, Quadratics FAL, 9-6)** ● I can solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula, and factoring. ● I can determine appropriate strategies (see first knowledge target listed) to solve problems involving quadratic equations, as appropriate, to the initial form of the equation. ● I can recognize when the quadratic formula gives complex solutions.
Cluster: Summarize, represent and interpret data on a single count or measurement variable.		
KY.HS.SP.1 Represent data distributions with plots on the real number line (stem plots, dot plots, histograms, and box plots).	Students create appropriate graphical representations to compare differences in the shape, center, spread, and presence of outliers	I am learning to represent data with plots on the real number line. **(Lesson 11-0, 11-1)** ● I can display data by creating dot plots,

MP.4, MP.5, KILP.1, KILP.8, KILP.9 ☐ *Conceptual* ☐ *Procedural* ☐ *Application*	and other unusual features of comparable data sets.	histograms, and box plots. ● I can compare differences in the shape, center, spread, and presence of outliers and other unusual features of comparable data sets.
KY.HS.SP.2 Use statistics appropriate to the shape of the numerical data distribution to compare the center (median, mean) and spread (interquartile range when comparing medians and standard deviation when comparing means) of different data distributions. **MP.2, MP.6, KILP.1, KILP.2, KILP.6** *Supporting Standard: KY.HS.SP.6* ☐ *Conceptual* ☐ *Procedural* ☐ *Application*	Students use raw data and data from graphical representations to compare differences in shape, center, spread, and presence of outliers and other unusual features of comparable data sets.	I am learning to use measures of center to interpret and compare data sets. **(Lesson 11-0, 11-2)** ● I can choose the appropriate measure for the center (mean, median) and spread (interquartile range, standard deviation) based on the shape of data distribution. ● I can use appropriate statistics for the center and spread to compare two or more data sets.
KY.HS.SP.3 Interpret differences in shape, center, and spread in the context of the numerical data distributions, accounting for the presence and possible effects of extreme data points (outliers). **MP.1, MP.7** ☐ *Conceptual* ☐ *Procedural* ☐ *Application*	Students analyze contextual situations as they interpret differences in the shape, center, spread, and presence of outliers and other unusual features of comparable data sets.	I am learning to interpret differences in shape, center, and spread in the context of data sets. **(Lesson 11-3)** ● I can interpret the shapes of data displays, including dot plots, histograms, and box plots. ● I can relate the shape of data displays to mean, median, and MAD measures. ● I can describe the possible effects of outliers in a data set can have on shape, center, and spread in the context of the data sets.
Cluster: Summarize, represent and interpret data on two categorical and quantitative variables.		
KY.HS.SP.5 Summarize categorical data for two or more categories in frequency tables. Calculate and interpret joint, marginal, and conditional relative frequencies (probabilities) in the data context, recognizing possible associations and trends in the data. **MP.2, MP.7**	Students use frequency tables to both calculate probabilities, as well as determine relationships between the variables represented in those tables.	I can organize and summarize categorical data by creating two-way frequency tables. **(Lesson 11-5)** ● I can calculate relative frequencies, including joint, marginal, and conditional relative frequencies. ● I can interpret relative frequencies in the context of the data.

☐ *Conceptual* ☐ *Procedural* ☐ *Application*		• I can recognize and identify possible associations and trends in the data.

Supporting Standards

KY.HS.A.2 Use the structure of an expression to identify ways to rewrite it and consistently look for opportunities to rewrite expressions in equivalent forms. **MP.7, MP.8**

KY.HS.A.7 Identify roots of polynomials when suitable factorizations are available. These roots become the zeros (x-intercepts) for the corresponding polynomial function. **MP.2, MP.5, MP.7**

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**

KY.HS.A.21 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. **MP.3, MP.6**

KY.HS.N.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents. **MP.7**

KY.HS.F.13 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. **MP.7, MP.8**

KY.HS.SP.6 Represent data on two quantitative variables on a scatter plot and describe how the explanatory and response variables are related.
a. Calculate an appropriate mathematical model, or use a given mathematical model, for data to solve problems in context. **MP.3, MP.4, MP.5**

Essential Vocabulary

Quadratics Vocabulary: Vertex, Parabola, Quadratic function, Vertex form of a quadratic function, Standard form of a quadratic function, Zero of a function, Zero product property, Perfect square trinomial, Completing the square, Radicand, Discriminant, Quadratic Formula

Statistics Vocabulary: normal distribution, standard deviation, stem plot, dot plot, histogram, box plot, measures of center, spread, outlier, variance, mean, median, interquartile range, range, mode, skew

Standards Benchmark Assessment #4

March 2025

Anchor Resources

enVision Topic 9 Solving Quadratic Equations MILC - MILC Topic 9
MILC - MILC Topic **MILC Statistics Resources for Algebra I**

STEM (one per semester) T-Shirt Launcher Suggested
Note: Relate every method back to 9.1 where the x-intercepts

FAL (one per semester): **Quadratics FAL** *Can be done at any time in unit*

- **Quadratics FAL - HIGHLY recommend!!** *** Quadratics FAL is suggested as the 2nd semester Algebra 1 FAL *** In addition to the card sort, see the following options for Quadratics FAL, including a Google slide deck using the FAL digitally.
- **Quadratics FAL - Digital Option**

Screencastify for Quadratics FAL

enVision Topic 11 Statistics **MILC Statistics Unit**

The links for the New York Daily Graph and all the slide decks with enVision snips for each topic in PowerPoints ready to go on MILC.

*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 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.