High School Algebra 2 FCPS 2025-2026 Math Unit Framework Topic 2

Algebra 2 Topic 2: Quadratic Functions and Equations	**Estimate Time Frame: 10 Block Days**
Essential Standards: F.1.c, F.8a, F.8.b, N.7, N.9, A.2, A.19, A.21 Assessment Resource: enVision Topic 2 and Formative Assessment Lesson: **FAL -** Representing Quadratic Functions Graphically	

FCPS Supporting Links	**Additional Supporting Links**
Pacing Guide enVision Algebra 2 Standards Crosswalk Resource FCPS P-12 Mathematics Guidance Document	Kentucky Academic Standards KSA Blueprint Achieve the Core Operations and Algebraic Thinking Progressions Target of the Standards - conceptual, procedural & application Three-Reads Routine Notice and Wonder Routine MILC Resources Topic 2 Quadratic Functions and Equations ***enVision Algebra 2 Teacher Guide: pages 58A to 58D for specific Topic 2 Focus-Coherence-Rigor***

Big Ideas
Students should be able to solve linear and quadratic equations algebraically and graphically. Students will apply these prerequisite skills to solve problems and analyze situations using one or more functions. Students will extend their previous understanding of quadratic functions. Students will identify different forms of quadratic functions and their key features. Students will explore complex numbers and solve problems with complex numbers. Students will learn different methods for solving quadratic equations.

Essential Questions	**Common Preconceptions/Misconceptions**
• How do you use quadratic functions to model situations and solve problems?	**Prerequisite Skills:** ● Equations, verbal descriptions, graphs, and tables

• What do you notice about functions written in vertex form? • How do you determine which method to solve a quadratic equation? • What relationships can you find between a quadratic function written in factored form and its graph?	• Construct functions with and without technology • Solve equations and inequalities • Transform linear functions • Absolute value **<u>Misconceptions:</u>** • Students may be confused about which way the inequality signs should face when finding the solution. • Students may treat the coefficient of *i* as 0 instead of 1. Students see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, recognizing it as a difference of squares factored as $(x^2 - y^2)(x^2 + y^2)$. Additionally, students see that there are three commonly used forms for a quadratic expression: **Standard, Factored, and Vertex,** and they can identify when one form might be more useful than another. Students utilize algebra techniques and graphical representations to determine points of intersection between lines and parabolas that indicate solution sets for a system of linear and quadratic equations. A linear-quadratic system consists of a linear equation and a quadratic equation. The solutions are the points of intersection. Students understand that the complex number system solves higher-degree equations. Students understand the complex conjugate as the pair of binomial complex factors (a + bi) (a-bi), whose product is a difference of squares: a^2+b^2, a real number. Students also understand that the denominator of a fraction can be resolved into an imaginary number by multiplying both the numerator and the denominator by the conjugate of the denominator.

	Students use the Quadratic Formula to solve for complex solutions. Students recognize that when a quadratic equation yields complex solutions, its graph does not cross the x-axis.
Standards for Mathematical Practices	**Kentucky Interdisciplinary Literacy Practices (KILP)**
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.** ***enVision Teacher Guide: page 58D for specific Math Practice suggestions***	1. Recognize that text is anything that communicates a message. 2. Employ, develop, and refine schemas to understand and create text. 3. View literacy experiences as transactional, interdisciplinary, and transformational. 4. Utilize receptive and expressive language arts to better understand self, others, and the world. **5. Apply strategic practices, with scaffolding and then independently, to approach new literacy tasks.** **6. Collaborate with others to create new meaning.** **7. Utilize digital resources to learn and share with others.** **8. Engage in specialized, discipline-specific literacy practices.** **9. Apply high-level cognitive processes to think deeply and critically about text.** 10. Develop a literacy identity that promotes lifelong learning. *Incorporating texts into math instruction fosters interdisciplinary learning for a more engaging educational experience.*

Essential Standards	**Sample Learning Intentions & Success Criteria**	**HQIR/Resource Considerations**
Cluster: Understand the concept of a function and use function notation.		
KY.HS.F.1 Understand properties and key features of functions and the different ways functions can be represented. **c.** For a function that models a relationship between two quantities,	We are learning how to interpret key features of functions. • I can recognize the definition of a function and understand its role in	• Topic 2-1 • Topic 2-2 **Key features**

interpret key features of graphs and tables in terms of the amounts and sketch graphs showing key features given a verbal description of the relationship. □ Conceptual ❑ Procedural ❑ Application *Supporting Standard(s): KY.HS.F.3, KY.HS.F.4*	modeling relationships between two quantities. • I can identify key features of graphs and tables representing functions, including intercepts, slope, maxima, minima, and inflection points. • I can interpret key features of graphs and tables in the context of the modeled quantities, understanding how changes in one quantity affect the other. We are learning how the domain relates to the quantitative relationship described by the function. • I can understand the concept of the domain of a function as the set of all possible input values. • I can determine which input values are valid for the function in the domain. • I can relate a function's domain to the specific quantitative relationship it describes, recognizing how the domain constraints reflect real-world constraints or conditions.	**include, but are not limited to,** intercepts, intervals where the function is increasing, decreasing, or remaining constant, relative maxima and minima, symmetries, end behavior, and periodicity. 2-1 Desmos: Vertex Form Exploration MILC: Real-life Parabolas Mario MILC: Key Features BUMP game to review
Cluster: Build new functions from existing functions.		
KY.HS.F.8 Understand the effects of transformations on the graph of a function. a. Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. b. Experiment with cases and illustrate an explanation of the effects on the graph using technology.	We are learning about the effects of transformations on the graph of a function. • I can understand transformations that can be applied to a function graph, including translations, reflections, stretches, and compressions. • I can understand how translations affect the graph horizontally and vertically,	• Topic 2-1 Mastery of this standard includes recognizing even and odd functions from their graphs and algebraic

MP.3, MP.5, KILP.5, KILP.7, KILP.9 *Supporting Standard(s): KY.HS.F.4* ☐ Conceptual ☐ Procedural ❑ Application	shifting the function left, right, up, or down. • I can comprehend how reflections across the x-axis and y-axis change the orientation of the graph. • I can identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. • I can use technology to support my understanding and explain the effects of transformation.	expressions.
Cluster: Interpret the structure of expressions.		
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, KILP.2, KILP.6** *Supporting Standard(s): KY.HS.A.3, KY.HS.A.7* ☐ Conceptual ☐ Procedural ❑ Application	We are learning to use the structure of an expression to identify ways to rewrite it in equivalent forms. • I can determine key features of a quadratic function • I can write an equation for a parabola given a graph. • I can write quadratic equations in standard form. • I can analyze the structure of an expression to identify opportunities for rewriting it in simpler or more useful forms.	• Topic 2-3 FAL - Representing Quadratic Functions Graphically Quiz AFTER 2-1 through 2-3
Cluster: Perform arithmetic operations with complex numbers.		
KY.HS.N.7 Understanding properties of complex numbers. a. Know there is a complex number i such that	We are learning how to use properties of complex numbers to solve equations. • I can understand the concept of complex	• Topic 2-4

$i^2 = -1$, and every complex number has the form a + bi with a, and b real. Students understand that the complex number system solves the equation $x^2 + 1 = 0$ and higher-degree equations. b. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. c. (+) Find the conjugate of a complex number and use it to find the quotient of complex numbers. Students understand the complex conjugate as the pair of binomial complex factors, (a + bi) (a – bi), whose product is a difference of squares: $a^2 + b^2$, a real number. Students understand that the denominator of a fraction can be resolved into an imaginary number by multiplying both the numerator and the denominator by the conjugate of the denominator. + **MP.7, MP.8, KILP.3, KILP.8** ❑Conceptual ❑Procedural ❑ Application	numbers and understand their representation in the form a + bi. • I can use the relation $i^2 = -1$ and its relationship with real numbers and the complex number system. • I can write the square root of a negative number in terms of i. • I can perform operations with complex numbers (add, subtract, and multiply complex numbers). • I can use complex numbers to represent numbers not on the real number line.	
Cluster: Use complex numbers in polynomial identities and equations.		
KY.HS.N.9 Solve quadratic equations with real coefficients that have complex solutions. **MP.1, MP.2, KILP.2, KILP.7, KILP.9** ❑Conceptual ❑Procedural ❑ Application	We are learning how to solve equations with complex solutions. • I can solve quadratic equations using the quadratic formula. • I can identify the number of real solutions. • I can interpret the discriminant. • I can recognize that a quadratic equation with complex solutions will have a graph	• Topic 2-5 • Topic 2-6 MILC: Quadratic Turnover Cards

	that does not cross the x-axis.	
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. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b. 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 exact 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(s): KY.HS.A.3, KY.HS.A.7, KY.HS.A.13, KY.HS.A.17* ❑Conceptual ❑Procedural ❑ Application	We are learning how to solve quadratic equations. • I can solve quadratic equations using the quadratic formula. • I can identify the number of real solutions • I can interpret the discriminant • I can solve quadratic equations by: o factoring o square roots o the quadratic formula o (+) Completing the square • I can recognize the number and type of solutions. • I can recognize when the quadratic formula gives complex solutions.	• Topic 2-5 • Topic 2-6
Cluster: Solve systems of equations.		
KY.HS.A.21 Solve a simple system consisting of a linear and quadratic equation in two variables, algebraically and graphically. **MP.3, MP.6, KILP.6, KILP.7** *Supporting Standard(s): KY.HS.A.3 & KY.HS.A.20, KY.HS.A.22(+), KY.HS.N.14, KY.HS.N.15* ❑Conceptual ❑Procedural ❑ Application	We are learning how to find solutions to quadratic-linear systems. • I can find the solutions to linear systems algebraically and graphically. • I can use a variety of tools to solve quadratic-linear systems of equations. • I can interpret the points between lines and parabolas that indicate solution sets for a system of linear and quadratic equations.	• Topic 2-7
Attending to the Standards for Mathematical Practice		

Students analyze the structure of a quadratic equation to determine an efficient strategy to find a solution (MP.7).
Students use various methods to solve systems of equations, understanding that tables and graphs may produce estimates rather than exact solutions (MP.6).
Students construct a viable argument to justify their solution(s) in a system of equations. (MP.3)
Students not only simplify problems but also use appropriate vocabulary, such as terms, coefficients, and degrees, as they describe their process (MP.6).

Supporting Standards

KY.HS.A.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. ★
a. Write the standard form of a given polynomial and identify the terms, coefficients, degree, leading coefficient, and constant term.
b. Factor a quadratic expression to reveal the zeros of the function it defines.
c. Use the properties of exponents to rewrite exponential expressions.
d. (+) Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. **MP.5, MP.7**

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

KY.HS.A.12 Create equations and inequalities in one variable and use them to solve problems**. MP.1, MP.4**

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.17 Solve and justify equations in one variable. Justify the solutions and give examples showing how extraneous solutions may arise. a. Solve rational equations written as proportions in one variable. b. Solve radical equations in one variable. **MP.3, MP.5, MP.7**

KY.HS.A.20 Solve systems of linear equations in two variables.
a. Understand that a system of two equations in two variables has the same solution as a new system formed by replacing one of the original equations with an equivalent equation.
b. Solve systems of linear equations with graphs, substitution, and elimination, focusing on pairs of linear equations in two variables. **MP.3, MP.6**

KY.HS.F.3 Understand the average rate of change in a function over an interval.

KY.HS.F.4 Graph functions expressed symbolically and show key features of the graph, with and without using technology (computer, graphing calculator). ★
f. (+) Graph piecewise functions, including step functions.

KY.HS.F.6 Write a function that describes a relationship between two quantities**.** ★ **MP.4, MP.7**
b. Combine standard function types using arithmetic operations.

KY.HS.N.7 Understanding properties of complex numbers.
a. Know there is a complex number i such that $i^2 = -1$ and every complex number has the form a + bi with a and b real.
b. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
c. (+) Find the conjugate of a complex number and use it to find the quotient of complex numbers.
MP.7, MP.8

Vocabulary

average rate of change, interval notation, minimum, maximum, zero of a function compression, reflection, transformation, translation, absolute value function, domain, peicewise-defined function, step function, internal, intercept, point of intersection, system of linear equations, system of linear inequalities, solution of a system of linear equations,

*****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, 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.