

Mathematics

Unit/Timeframe: Quadratic Functions and Equations / 24 days	Grade Level: 9, 10, 11, 12
Content Standards	2017 MA Literacy Framework
All.N-CN.A.1 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. All.N-CN.A.2 Use the relation $i^2 = -1$ and the Commutative, Associative, and Distributive properties to add, subtract, and multiply complex numbers. All.N-CN.C.7 Solve quadratic equations with real coefficients that have complex solutions. (+) All.N-CN.C.8 Extend polynomial identities to the complex numbers. (For example, rewrite $x^2 + 4$ to $(x+2i)(x-2i)$) All.A-SSE.A.1 Interpret expressions that represent a quantity in terms of its context. All.A-SSE.A.1.a. Interpret parts of an expression, such as terms, factors, and coefficients. All.A-SSE.A.2 Use the structure of an expression to identify ways to rewrite it. (For example see $x^4 - y^4$ as a difference of squares and factor as $(x^2+y^2)(x^2-y^2)$ and further factored as $(x+yi)(x-yi)(x+y)(x-y)$.) All.A-CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from simple root and rational functions and exponential functions. All.A-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. All.A-CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. All.A-REI.D.11 Explain why the x-coordinates of the points where the graphs of the equations $y=f(x)$ and $y=g(x)$ intersect are the solutions of the equations $f(x)=g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are polynomial, rational, and logarithmic functions. All.F-IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end	Speaking and Listening Standard: Comprehension and Collaboration 2. Reason abstractly and quantitatively 3. Construct viable arguments and respond to the reasoning of others. Writing Standard: Text, type and purposes 1C. Use words, phrases and clauses with precision.

behavior; and periodicity. All.F-IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. All.F-IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. All.F-IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. All.F-IF.C.8.a Use the process of factoring in a polynomial function to show zeros, extreme values, and symmetry of the graph and interpret these in terms of a context.	
Essential Questions	Skills/Knowledge
What are the advantages of a quadratic function in vertex form? How is any quadratic function related to the parent quadratic function $y=x^2$? How are the real solutions of a quadratic equation related to the graph of the related quadratic function?	Students will be able to identify and graph quadratic functions from the vertex form Students will be able to graph quadratic functions written in standard form. Students will be able to model data with quadratic functions. Students will be able to find common and binomial factors of quadratic expressions and to factor special quadratic expressions. Students will be able to solve quadratic equations by factoring and by graphing. Students will review solving equations by completing the square and will rewrite functions by completing the square. Students will review solving quadratic equations by using the Quadratic Formula. Students will determine the number of solutions by using the discriminant. Students identify, graph, and perform operations with complex numbers and with find complex number solutions of quadratic equations. Students will be able to solve and graph systems of linear and quadratic equations and systems quadratic inequalities.
Common Resources	Common Assessments
Algebra II text and available resources	Quiz 1: Quadratic functions and transformations, vertex form, standard form of quadratic functions, modeling with quadratic functions and factoring quadratic functions. Quiz 2: Solving quadratic equations by factoring, completing the square and by the quadratic formula and determining number of solutions.

	Quiz 3: Complex numbers and Quadratic systems Unit 4 Test
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Vocabulary	
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Tier II: axis of symmetry
factoring
greatest common factor
maximum value
minimum value
zero of a function
zero product property

Tier III: absolute value of a complex number
completing the square
complex conjugate
complex number
complex number plane
difference of two squares
discriminant
imaginary number
imaginary unit
parabola
perfect square trinomial
pure imaginary number
quadratic formula
quadratic function
standard form of a quadratic function
vertex form of quadratic function
vertex of a parabola

Additional Notes	
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