

Unit C - Quadratic Equations and Parabolas

Overview

The purpose of this unit is to move beyond linear functions and to learn strategies to solve quadratic equations. Students should understand that the power of 2 creates a specific shaped graph (parabola). Students should also learn the importance of the complex number system, and should be taught about the history of complex numbers not being all that different from the history of negative numbers.

21st Century Capacities: Analyzing

Stage 1 - Desired Results

<p>ESTABLISHED GOALS/ STANDARDS</p> <p>MP 1 Make sense of problems and persevere in solving them MP2 Reason abstractly and quantitatively MP6 Attend to precision MP7 Look for and make use of structure</p> <p>CCSS.MATH.CONTENT.HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. Perform arithmetic operations with complex numbers. CCSS.MATH.CONTENT.HSN.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. CCSS.MATH.CONTENT.HSN.CN.A.2 Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. CCSS.MATH.CONTENT.HSN.CN.C.7 Solve quadratic equations with real coefficients that have complex solutions. CCSS.MATH.CONTENT.HSA.SSE.A.1.B Interpret complicated expressions by viewing one or more of their parts as a single entity. CCSS.MATH.CONTENT.HSA.SSE.A.2 Use the structure of an expression to identify ways to rewrite it. CCSS.MATH.CONTENT.HSA.SSE.B.3</p>	<p style="text-align: center; background-color: #D3D3D3; margin-bottom: 5px;">Transfer:</p> <p><i>Students will be able to independently use their learning in new situations to...</i></p> <ol style="list-style-type: none"> 1. Manipulate equations/expressions or objects to create order and establish relationships. (Analyzing) 2. Draw conclusions about graphs, shapes, equations, or objects. (Analyzing) <p style="text-align: center; background-color: #D3D3D3; margin-bottom: 5px;">Meaning:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top; padding: 5px;"> <p>UNDERSTANDINGS: <i>Students will understand that:</i></p> <ol style="list-style-type: none"> 1. Mathematicians examine relationships to discern a pattern, generalizations, or structure. 2. Mathematicians continually evaluate their process and the reasonableness of the intermediate results. 3. Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions. </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> <p>ESSENTIAL QUESTIONS: <i>Students will explore & address these recurring questions:</i></p> <ol style="list-style-type: none"> A. How can I use symbols to communicate? B. What is another way that this problem could be solved? C. What math tools/models/strategies can I use to solve the problem? </td> </tr> </table>	<p>UNDERSTANDINGS: <i>Students will understand that:</i></p> <ol style="list-style-type: none"> 1. Mathematicians examine relationships to discern a pattern, generalizations, or structure. 2. Mathematicians continually evaluate their process and the reasonableness of the intermediate results. 3. Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions. 	<p>ESSENTIAL QUESTIONS: <i>Students will explore & address these recurring questions:</i></p> <ol style="list-style-type: none"> A. How can I use symbols to communicate? B. What is another way that this problem could be solved? C. What math tools/models/strategies can I use to solve the problem?
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Algebra II Level 3 Curriculum

<p>Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* CCSS.MATH.CONTENT.HSA.SSE.B.3.A Factor a quadratic expression to reveal the zeros of the function it defines. CCSS.MATH.CONTENT.HSA.SSE.B.3.B Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. CCSS.MATH.CONTENT.HSA.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. CCSS.MATH.CONTENT.HSA.REI.B.4 Solve quadratic equations in one variable. CCSS.MATH.CONTENT.HSA.REI.B.4.A Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x-p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. CCSS.MATH.CONTENT.HSA.REI.B.4.B Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, 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 $a \pm bi$ for real numbers a and b. CCSS.MATH.CONTENT.HSA.REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). CCSS.MATH.CONTENT.HSF.IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.* CCSS.MATH.CONTENT.HSF.IF.C.7.A Graph linear and quadratic functions and show intercepts, maxima, and minima. CCSS.MATH.CONTENT.HSF.BF.A.1 Write a function that describes a relationship between two quantities.*</p>	Acquisition:	
<p><i>Students will know...</i></p> <ol style="list-style-type: none"> 1. The meaning of the imaginary number i 2. That an equation must be in standard form before attempting to use the quadratic formula to solve it 3. A parabola is symmetric 4. A quadratic equation may have 0, 1 or 2 solutions (real or imaginary) 5. $-b/2a$ gives the x value of the vertex of a parabola 6. The leading coefficient of a quadratic tells you if the graph opens up or down 7. Quadratic equations model parabolic situations 8. Vocabulary: roots, zeros, solutions, imaginary, vertex 	<p><i>Students will be skilled at...</i></p> <ol style="list-style-type: none"> 1. Simplifying square roots 2. Combining complex numbers 3. Solving quadratic equations using isolating x^2, factoring, graphing and the quadratic formula 4. Multiplying binomials 5. Factoring trinomials where $a=1$ 6. Sketching graphs of quadratic equations 7. Working with quadratic functions in context 	