



# Mathematics Curriculum Guide

## *Algebra 2*



**Topic 3: Quadratic Functions and Equations**

Transfer Goals						
1) Demonstrate perseverance by making sense of a never-before-seen problem, developing a plan, and evaluating a strategy and solution. 2) Effectively communicate orally, in writing, and using models (e.g., concrete, representational, abstract) for a given purpose and audience. 3) Construct viable arguments and critique the reasoning of others using precise mathematical language.						
<b>Essential Questions:</b> <ul style="list-style-type: none"> <li>• What are the advantages of a quadratic function in vertex and standard form?</li> <li>• How is any quadratic function related to the parent quadratic function <math>y=x^2</math>?</li> <li>• How are the real solutions of a quadratic equation related to the graph of the related quadratic function?</li> <li>• What is the purpose of factoring quadratic expressions?</li> <li>• How does completing the square help solve any quadratic equation?</li> <li>• In quadratic equations, what does a complex solution represent?</li> </ul>					<b>Standards:</b> F-IF 4, F-IF 6, A-SSE 1, A-SSE 2, A-APR 3, A-REI 4b, A-REI 11, A-CED 1, A-CED 2, F-IF 8, F-IF 9, F-BF 3, N-CN 1, N-CN 2, N-CN 7, N-CN 8  <b>Suggested Timeframe:</b> 17 days <b>Start Date:</b> Sept. 25, 2017 <b>Assessment Dates:</b> October 16-17, 2017	
Time	Lesson/ Activity	Focus Questions for Lessons	Understandings	Knowledge	Skills	Resources
1 day	<b>Opening Activity:</b> Introduction to the Common Core Performance Task p. 193 Refer to <i>Victor runs a small sandwich shop</i> on page 193 for questions					<b>Thinking Maps:</b> <i>Circle Map</i> for students to list things they already know about the upcoming unit
2 Days	<b>Lesson 4-1: Quadratic Functions and Transformations</b> SMP: 1,2,3,4,7 (pp. 194-201)  <b>Lesson 4-2: Standard Form of a Quadratic Function</b> SMP: 1,3,4 (pp. 202-208)  F-BF 3, A-CED 1, 2, F-IF 4, 6, F-IF 8, 9  <u>Prep for Performance Task</u> (Apply What You Have Learned) <ul style="list-style-type: none"> <li>• p. 208 (Lesson 4.2)</li> </ul>	<b>Focus Question</b> <b>4.1</b> How do you identify and graph quadratic functions?  <b>4.2</b> How do you graph quadratic functions written in standard form?  <b>Inquiry Questions:</b> <ul style="list-style-type: none"> <li>• Pg. 199 # 38 (can be for both sections)</li> <li>• Pg. 202 Solve it (4.2)</li> </ul>	<ul style="list-style-type: none"> <li>• Any quadratic function is a stretch, compression, reflection, and/or a translation of <math>y = x^2</math>.</li> <li>• Vertex form of a quadratic function shows the vertex of the parabola, <math>f(x) = a(x - h)^2 + k</math></li> <li>• Methods for graphing quadratic functions with and without graphing calculators, and their transformations.</li> </ul>	<b>Vocabulary:</b> parabola, quadratic function, standard form, vertex form, axis of symmetry, vertex of the parabola, minimum value, maximum value  <b>Concepts:</b> Methods for graphing quadratic functions.	<ul style="list-style-type: none"> <li>• Identify and graph transformations and translations of quadratic functions.</li> <li>• Write and graph quadratic equations in standard and vertex form.</li> </ul>	<b>Common Core Problems:</b> <b>4.1:</b> #4,5,6,38, 47,53  <b>4.2:</b> #6,7,37,44  <b>Thinking Maps:</b> <i>Flow Map</i> for process <i>Brace Map</i> for parts of the vertex form of a quadratic function

Time	Lesson/ Activity	Focus Questions for Lessons	Understandings	Knowledge	Skills	Additional Resources
2 days	<p><b>Lesson 4.4: Factoring Quadratic Functions</b>  <b>SMP: 1,3,4</b>  (pp. 216-223)</p> <p><b>A-SSE 2</b></p> <p><b>Lesson 4.5: Quadratic Equations</b>  <b>SMP: 1,2,3,4,5,8</b>  (pp. 226-231)</p> <p><b>A-CED 1, A-SSE 1, A-APR 3</b></p> <p><i>Prep for Performance Task  (Apply What You Have Learned)</i></p> <ul style="list-style-type: none"> <li>p. 231 (Lesson 4.5)</li> </ul>	<p><b>Focus Question:</b></p> <ul style="list-style-type: none"> <li>How are the real solutions of a quadratic equation related to the graph of the related quadratic function?</li> <li>What is the purpose of factoring quadratic expressions?</li> </ul> <p><b>Inquiry Question:</b>  Pg. 222 # 56 (4.4)  Pg. 226 Solve it (4.5)  Pg. 230 # 37 (4.5)</p>	<ul style="list-style-type: none"> <li>Many Quadratic trinomials (<math>ax^2 + bx + c</math>) can be factored into products of two binomials.</li> <li>The Distributive Property or FOIL method can be used to multiply two binomials. FOIL can be used in reverse to factor.</li> <li>The real solutions of a quadratic equation show the zeros of the related quadratic function and the x-intercepts of its graph.</li> <li>Methods of solving quadratic equations.</li> </ul>	<p><b>Vocabulary:</b>  factoring, greatest common factor (GCF) of an expression, perfect square trinomial, difference of two squares</p> <p><b>Concepts:</b></p> <ul style="list-style-type: none"> <li>There is a similarity between factoring numbers and expressions.</li> </ul>	<ul style="list-style-type: none"> <li>Find common and binomial factors of quadratic expressions.</li> <li>Factor special quadratic expressions.</li> <li>Solve quadratic equations by factoring and by graphing.</li> </ul>	<p><b>Common Core Problems:</b>  <b>4.4:</b> #11,12,13,56, 71,81,82</p> <p><b>4.5:</b> #6,7,8,37,40, 41,54-56</p> <p><b>Thinking Maps:</b>  <i>Tree Map</i> to show different methods of solving quadratic equations</p>
2 days	<p><b>Lesson 4.6 Completing the square</b>  <b>SMP: 1,3,4</b>  (pp. 233-239)</p> <p><b>A-REI 4a, A-REI 4b</b></p>	<p><b>Focus Question:</b></p> <ul style="list-style-type: none"> <li>How does completing the square help solve any quadratic equation?</li> </ul> <p><b>Inquiry Question:</b>  Pg. 238 # 52</p>	<ul style="list-style-type: none"> <li>Completing a perfect square trinomial allows the completed trinomial to be factored as the square of a binomial</li> <li>The real solutions of a quadratic equation show the zeros of the related quadratic function and the x-intercepts of its graph.</li> <li>Methods of solving quadratic equations. <math>y=x^2</math></li> </ul>	<p><b>Vocabulary:</b>  completing the square</p> <p><b>Concepts:</b></p> <ul style="list-style-type: none"> <li>Solving an Equation by Completing the Square</li> </ul>	<ul style="list-style-type: none"> <li>Solve equations by completing the square.</li> <li>Rewrite functions by completing the square.</li> </ul>	<p><b>Common Core Problems:</b>  <b>4.6:</b> #9,11,52</p> <p><b>Thinking Maps:</b>  <i>Flow Map</i> for process</p>

Time	Lesson/ Activity	Focus Questions for Lessons	Understandings	Knowledge	Skills	Additional Resources
2 days	<b>Lesson 4.7: The Quadratic Formula</b> SMP: 1,2,3,4,8 (pp. 240-247) A-REI 4b	<b>Focus Question:</b> • In quadratic equations, how does the discriminant determine real or imaginary solutions?  <b>Inquiry Question:</b> Pg. 240 Solve it	<ul style="list-style-type: none"> <li>• A quadratic equation <math>ax^2 + bx + c = 0</math> can be solved by a formula that gives values of x in terms of a, b, and c.</li> <li>• The real solutions of a quadratic equation show the zeros of the related quadratic function and the x-intercepts of its graph.</li> <li>• The quadratic formula can be used to solve any quadratic equation</li> <li>• Methods of solving quadratic equations. <math>y = x^2</math></li> </ul>	<b>Vocabulary:</b> quadratic formula, discriminant  <b>Concepts:</b> • The quadratic formula is derived by completing the square to solve for x in terms of a, b, and c in the literal equation $ax^2 + bx + c = 0$	<ul style="list-style-type: none"> <li>• Solve quadratic equations to find real solutions.</li> <li>• Use the determinant to distinguish the number and type of solutions of a quadratic equation.</li> </ul>	<b>Common Core Problems:</b> 4.7: #8,9,10,39, 40,67  <b>Thinking Maps:</b> <i>Tree Map</i> for Discriminants and Solutions of Quadratic Equations
2 days	<b>Lesson 4.8: Complex Numbers</b> SMP: 1,3,4 (pp. 233-239) N-CN 1, 2, 7, 8	<b>Focus Question:</b> • How are the real solutions of a quadratic equation related to the graph of the related quadratic function? • What is a quick way to identify whether a quadratic equation has complex solution? • What does a complex solution represent?  <b>Inquiry Question:</b> Pg. 254 # 56	<ul style="list-style-type: none"> <li>• Every quadratic equation has complex number solutions that sometimes are real numbers and imaginary numbers.</li> <li>• The imaginary unit is the complex number whose square is -1 (<math>i^2 = -1</math>, <math>i = \sqrt{-1}</math>).</li> <li>• The real solutions of a quadratic equation show the zeros of the related quadratic function and the x-intercepts of its graph</li> <li>• Methods of solving quadratic equations <math>y = x^2</math>.</li> </ul>	<b>Vocabulary:</b> imaginary unit, imaginary number, complex number, pure imaginary number, complex number plane, absolute value of complex number, complex conjugates  <b>Concepts:</b> • The set of complex numbers includes imaginary and real numbers	<ul style="list-style-type: none"> <li>• Identify, graph, and perform operations with complex numbers.</li> <li>• Find complex number solutions of quadratic equations.</li> </ul>	<b>Common Core Problems:</b> 4.8: #6,7,46,56, 72  <b>Thinking Maps:</b> <i>Tree Map</i> to sort equations into the types of solutions (two real, one real, two imaginary)
1 Day	<b>Topic 3 Performance Task</b> (p. 266 Completing the Performance Task & On Your Own)					
2 Days	<b>Review Topic 3 Concepts &amp; Skills</b> Use Textbook Resources and/or Teacher Created Items					
2 Days	<b>Topic 3 Assessment</b> (Created and provided by PUSD)					

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