



# Chattanooga School for the Arts and Sciences

## Mini-PBL Unit Plan Template

Course Algebra II : All About Quads

### Mathematics

#### Standards (Learning Targets)

A2.N.Q.A.1 Identify, interpret, and justify appropriate quantities for the purpose of descriptive modeling.

A2.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.

A2.N.CN.B.3 Solve quadratic equations with real coefficients that have complex solutions.

A2.A.SSE.A.1 Use the structure of an expression to identify ways to rewrite it.

A2.A.APR.A.2 Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

A2.A.REI.A.1 Explain each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

A2.A.REI.A.2 Solve rational and radical equations in one variable, and identify extraneous solutions when they exist.

A2.A.REI.B.3 Solve quadratic equations and inequalities in one variable. a. Solve quadratic equations by inspection (e.g., for  $x^2 = 49$ ), taking square roots, completing the square, knowing and applying 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  $b$ .

A2.A.REI.D.6 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 equation  $f(x) = g(x)$ ; find the approximate solutions using technology.

A2.F.IF.A.1 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.

A2.F.IF.B.3 Graph functions expressed symbolically and show key features of the graph, by hand and using technology.

A2.F.IF.B.5 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions)

Grade Level	10th-11th	Unit Length	<u>3-6</u> Weeks
Mini-PBL Overview	The Unit is designed to introduce/reinforce the student's knowledge of quadratic functions. The unit will begin with PHET simulations on the characteristics of quadratic functions, applying their knowledge to track the path of the solar eclipse that is taking place August 21, 2017, and end with creating a catapult or enhancing something in Chattanooga.		
Mini-PBL Driving Question	How can we, as inventors, create or enhance objects or places in the area that use quadratic functions? A model will be made that will be accompanied by the data that corresponds to their creation.		
Hook Event	Quadratic Blindness: Students will be asked to collect data, they are required to take or record at least 10 sites/events that involve quadratics around them. If students have no idea what a quadratic is they may have to do a little research on their own first. Then students will report their findings and watch a video on how Quadratics are used in careers. Also students will take a closer look at the total solar eclipse taking place on August 21, 2017, which is a once in a lifetime event.		
Scaffolding Activities	<p><b>Class Activities</b></p> <ul style="list-style-type: none"> <li>• PHET simulations (at least 9 activities)</li> <li>• Investigating graphs of Quadratic Functions</li> <li>• Desmos- creating quadratic functions</li> <li>• Angry Birds- projection of an object</li> <li>• Spring Board textbook</li> </ul> <p><b>Station Activities</b></p> <ul style="list-style-type: none"> <li>• Solving real-world quadratic problems</li> <li>• Spot it: Pinterest activity</li> <li>• Foldable and flowcharts</li> <li>• Students will build a catapult to place a particular object into a specified area</li> </ul> <p><b>Workshops</b></p> <ul style="list-style-type: none"> <li>• These will be driven by using Nearpod and/or Educreation. Online/apps that can be used to address student learning, re-teaching components of how to solve quadratic function.</li> </ul> <p><b>Focus Groups</b></p> <ul style="list-style-type: none"> <li>• Question board</li> <li>• Assessment feedback – conference</li> </ul> <p><b>Mini-PBL Teams</b></p> <ul style="list-style-type: none"> <li>• Facilitator: Get the team started quickly and check to make sure everyone understands what to do and understands the math.</li> <li>• Recorder/Reporter: Make sure everyone and everything is labelled correctly, completed, and accurate.</li> <li>• Resource Manager: Collecting/gathering all materials needed, verify that area is cleaned before class is dismissed.</li> <li>• Team Captain: Make sure everyone is doing their job, ask questions to make sure everyone understands.</li> </ul> <p><b>Digital Resources</b></p> <ul style="list-style-type: none"> <li>• Excel</li> <li>• Students will have access to TI-84 calculators for all activities, assessments, and assignments, this is the only tool that students are allowed to use in class, on state assessments, and ACT.</li> </ul>		

Calendar Overview							
	Monday	Tuesday	Wednesday	Thursday	Friday		
	<p>Quadratic Blindness due</p>	<p>Video: Quadratics used in Careers</p> <p>PHET simulation</p>	<p>Textbook: Maximize the space</p>	<p>Factoring: lesson and sorting activity</p> <p>Quizlet App</p>	<p>Factoring: different types of methods</p> <p>Quizlet App</p>		
	<p>Solving Quadratics by factoring</p> <p>PHET Simulation</p>	<p>Completing the Square and taking the Square Root</p> <p>Quizlet App</p>	<p>Quadratic Formula and its solutions</p>	<p>Transformations on Quadratics:</p> <ol style="list-style-type: none"> <li>Desmos</li> <li>Quadratic Quest</li> </ol>	<p>Transformations on Quadratics:</p> <ol style="list-style-type: none"> <li>Desmos</li> <li>Investigating graphs</li> </ol>		
<p>Solar Ellipse: work on the 3 problems from NASA</p> <p>Quizlet App</p>	<p>PHET Simulation</p> <p>Create a flow chart using the key words (vertex, y-int, x-int, &amp; axis of symmetry)</p>	<p>PHET Simulation</p> <p>Key Features: Create a foldable on the 3 types of forms (vertex, standard, and intercept-Pinterest)</p>	<p>Nearpod: students will work on a how to video to teach others the components and how to solve quadratic functions. Share in google classroom</p>	<p>Engineering Project &amp; Cumulating Project due:</p> <ul style="list-style-type: none"> <li>Students will create a catapult to place an object into a specified area.</li> <li>Students will determine how they can enhance something in the city</li> </ul>			
Culminating Event	<p><b>Product</b></p> <ul style="list-style-type: none"> <li><b>Nearpod Presentations:</b> students will work on a how to video to teach others the components and how to solve quadratic functions. Share their findings in google classroom.</li> <li><b>Engineering Project:</b> Students will create a catapult to place an object into a specified area.</li> <li><b>Cumulating Project:</b> Students will determine how they can enhance something in the city.</li> </ul>						
Vocabulary	<table border="1" data-bbox="272 1583 1349 1932"> <tr> <td data-bbox="272 1583 716 1932">Content Area: Mathematics-Algebra I &amp; II</td> <td data-bbox="716 1583 1349 1932"> <ol style="list-style-type: none"> <li>Vertex</li> <li>Vertex Form</li> <li>Y-Intercept</li> <li>X-Intercept, Roots, Zeros</li> <li>Axis of Symmetry (AOS)</li> <li>Factors</li> <li>Factored Form</li> <li>Completing the square</li> <li>Discriminant</li> <li>Quadratic Regression</li> <li>Quadratic Equation</li> </ol> </td> </tr> </table>					Content Area: Mathematics-Algebra I & II	<ol style="list-style-type: none"> <li>Vertex</li> <li>Vertex Form</li> <li>Y-Intercept</li> <li>X-Intercept, Roots, Zeros</li> <li>Axis of Symmetry (AOS)</li> <li>Factors</li> <li>Factored Form</li> <li>Completing the square</li> <li>Discriminant</li> <li>Quadratic Regression</li> <li>Quadratic Equation</li> </ol>
Content Area: Mathematics-Algebra I & II	<ol style="list-style-type: none"> <li>Vertex</li> <li>Vertex Form</li> <li>Y-Intercept</li> <li>X-Intercept, Roots, Zeros</li> <li>Axis of Symmetry (AOS)</li> <li>Factors</li> <li>Factored Form</li> <li>Completing the square</li> <li>Discriminant</li> <li>Quadratic Regression</li> <li>Quadratic Equation</li> </ol>						

		12. Parabola	
--	--	--------------	--