Unit 5: Quadratics
Algebra II
18 Class Meetings – Revised June 2016

Essential Questions

- How do quadratic equations model real world problems and situations?
- What do quadratic solutions mean in terms of the problem?
- What are the advantages of a quadratic function in vertex form and in standard form?

Enduring Understandings with Unit Goals

EU #1: Any quadratic function in vertex form can be converted to standard form and vice versa. In standard form, the values of a, b, and c provide key information about its graph.
- Analyze quadratic functions for key information and apply this information to real world situations.

EU #2: To find the zeros of a quadratic function, you must set the equation equal to zero. The x-intercepts tell what the zeros are because this is where y=0. There are many ways to solve a quadratic equation.
- Solve quadratic equations by graphing, factoring, and using the quadratic formula.

EU #3: A basis for the complex numbers is a number whose square is -1. Every quadratic equation has complex number solutions; some of these solutions may involve imaginary numbers.
- Evaluate a quadratic equation with complex and imaginary solutions.

Standards

Common Core State Standards/College and Career Readiness Anchor Standards:

- **CCSS.Math.Content.HSA.CED.A.2** – Create equations in two or more variables to represent relationships between quantities.
- **CCSS.Math.Content.HSA.SSE.A.2** – Use the structure of an expression to identify ways to rewrite it.
- **CCSS.Math.Content.HSA.APR.B.3** – Identify zeros of polynomials when suitable factorizations are available.
- **CCSS.Math.Content.HSA.REI.B.4.B** – Solve quadratic equations by using the quadratic formula. Recognize when the quadratic formula gives complex solutions and write them as $a±bi$ for real numbers $a$ and $b$.
- **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 relations $i^2=-1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
Unit 5: Quadratics
Algebra II
18 Class Meetings

MSMHS 21st Century Learning Expectations

Competency 1: Read and write effectively for a variety of purposes.
Competency 3: Make decisions and solve problems independently and collaboratively.
Competency 5: Contribute to a positive learning environment with respect and responsibility.

Unit Content Overview

1. Standard Form of a Quadratic Function
   - Standard form (include graphing from standard form)
   - Converting standard form to vertex form
   - Interpreting a quadratic graph

2. Quadratic Equations
   - Solving by factoring
   - Solving by graphing

3. The Quadratic Formula
   - Using the quadratic formula
   - Using the discriminant

4. Complex Numbers
   - Imaginary unit
   - Simplifying using $i$
   - Complex numbers (adding, subtracting, multiplying, dividing)
   - Rationalizing using complex conjugates
   - Finding imaginary solutions

Learning Objectives

Students will be able to…
- Graph a quadratic function in vertex form.
- Explain how to graph quadratic functions in standard form.
- Convert quadratic functions from standard form to vertex form.
- Factor all types of quadratic functions.
- Solve quadratic equations by factoring and graphing.
- Apply the quadratic formula to solve quadratic equations.
- Evaluate algebraic expressions using imaginary units.
- Identify, graph, and perform operations with complex numbers.
- Analyze complex solutions and utilize a conjugate to rationalize the denominator.
**Unit 5: Quadratics**  
**Algebra II**  
18 Class Meetings

<table>
<thead>
<tr>
<th>Assured Learning Experiences</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Differentiated Instruction/Instructional Strategies</strong></td>
</tr>
<tr>
<td>• Lecture with notes</td>
</tr>
<tr>
<td>• Guided notes</td>
</tr>
<tr>
<td>• Accountable talk</td>
</tr>
<tr>
<td>• Student-led instruction</td>
</tr>
<tr>
<td>• Flipped classroom videos</td>
</tr>
<tr>
<td>• Student notes</td>
</tr>
<tr>
<td>• Independent problem-solving</td>
</tr>
<tr>
<td>• Collaborative problem-solving</td>
</tr>
</tbody>
</table>
| • Which Way and Why? Performance Task (practical application)  
  o Rubric 3: Problem Solving |
| • Cross-curricular problem solving (independent and collaborative) |
| • Homework |
| **Interdisciplinary Connections** |
| • Language Arts - Word problems |
| • Marine Science – Word problems |

<table>
<thead>
<tr>
<th>Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FORMATIVE ASSESSMENTS:</strong></td>
</tr>
<tr>
<td>• Warm ups (SAT)</td>
</tr>
<tr>
<td>• ABCD Cards</td>
</tr>
<tr>
<td>• Whiteboards</td>
</tr>
<tr>
<td>• Mid-class check-ins</td>
</tr>
<tr>
<td>• Exit Slips</td>
</tr>
<tr>
<td>• Student-led instruction</td>
</tr>
<tr>
<td>• Homework</td>
</tr>
<tr>
<td>• Rubric 5: Civic and Social Responsibility</td>
</tr>
</tbody>
</table>
| • Which Way and Why? Performance Task  
  o Rubric 3: Problem Solving |
| **SUMMATIVE ASSESSMENTS:** |
| • Quiz 1 - Vertex/Standard Form – EU #1 |
| • Quiz 2 - Solving Quadratic Equations (factoring, graphing, quadratic formula) – EU #2 |
| • Unit 5 Test |
| • Which Way and Why? Project |
Unit Task

**Unit Task Name:** Which Way and Why?

**Description:** Students will use information learned in this unit about how quadratic functions in vertex form can be converted to standard form (EU #1), how in order to find the zeros of a quadratic function, you must set the equation equal to zero (EU #2), and how every quadratic equation has complex number solutions and that some of them may involve imaginary numbers (EU #3) in order to make a decision. They will be able to recognize when they are faced with a quadratic equation and will be able to make a decision about how they can solve the equation. Students will create a product (multimedia, video, poster, book etc.) that explains how to solve quadratics in each of the three ways we have learned (factoring, graphing, and quadratic formula) and will evaluate each method. They will discuss when and why each way is useful and what types of problems would require certain methods. Students will present their findings in small groups.

**Evaluation:** Rubric 3: Problem Solving

Unit Resources

- Textbook
- MSMHS School-wide Rubrics
- Flipped Classroom Videos
- Worksheets
- Graphing Calculator
- Laptops
- SAT Prep Online