

Algebra 2

[Implement Start Year (2013-2014)]

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Unit #2, Quadratic Functions

Stage 1 – Desired Results

Established Goals

2009 NJCCC Standard(s), Strand(s)/CPI #
(<http://www.nj.gov/education/cccs/2009/final.htm>)

Common Core Curriculum Standards for Math and English
(<http://www.corestandards.org/>)

Seeing Structure in Expressions A-SSE: 1, 1a, 1b, 2, 3a, 3b, 3c

- Interpret the structure of expressions.
- Write expressions in equivalent forms to solve problems.

Arithmetic with Polynomials and Rational Expressions A-APR: 3

- Understand the relationship between zeros and factors of polynomials.

Interpreting Functions F-IF: 5, 7, 7a, 8a, 9

- Interpret functions that arise in applications in terms of the context.
- Analyze functions using different representations.

Creating Equations A-CED: 2, 3

- Create equations that describe numbers or relationships.

Reasoning with Equations and Inequalities A-REI: 7

- Solve systems of equations.

21st Century Themes

(www.21stcenturyskills.org)

- ___ Global Awareness
- ._x_ Financial, Economic, Business and Entrepreneurial Literacy
- ___ Civic Literacy
- ._x_ Health Literacy
- ._x_ Environmental Literacy

21st Century Skills

Learning and Innovation Skills:

- ._x_ Creativity and Innovation
- ._x_ Critical Thinking and Problem Solving
- ._x_ Communication and Collaboration

Information, Media and Technology Skills:

- ._x_ Information Literacy
- ._x_ Media Literacy
- ._x_ ICT (Information, Communications and Technology) Literacy

Life and Career Skills:

- ._x_ Flexibility and Adaptability
- ._x_ Initiative and Self-Direction
- ___ Social and Cross-Cultural Skills
- ._x_ Productivity and Accountability
- ._x_ Leadership and Responsibility

<p>Enduring Understandings: <i>Students will understand that . . .</i></p> <p>EU1</p> <ul style="list-style-type: none"> the symbolic language of Algebra and algebraic modeling is used to communicate algebraically and graphically to analyze and generalize patterns and relationships in the real world <p>EU 2</p> <ul style="list-style-type: none"> symbolic statements can be manipulated to provide equivalent forms. <p>EU 3</p> <ul style="list-style-type: none"> critical vocabulary is necessary to communicate and understand mathematics in the real world 	<p>Essential Questions:</p> <p>EU 1</p> <ul style="list-style-type: none"> What real world phenomena can be represented with algebraic functions? How and why is Algebra used to model real world phenomena? <p>EU 2</p> <ul style="list-style-type: none"> Why is the approach to graphing a quadratic function correlated to the form of the equation given? <p>EU 3</p> <ul style="list-style-type: none"> How do critical points of quadratic functions provide information about the graph? What is the relationship between the critical vocabulary of the quadratic function and the information that it provides in the graph? What vocabulary is crucial to the various forms of a quadratic function?
<p>Knowledge: <i>Students will know . . .</i></p> <p>EU1</p> <p>quadratic functions can be...</p> <ul style="list-style-type: none"> graphed using ordered pairs. graphed using the zeros and vertex. transformed and reflected both graphically and algebraically. can model real-world situations <p>absolute value functions can be....</p> <ul style="list-style-type: none"> graphed using ordered pairs. graphed using the zeros and vertex. transformed and reflected both graphically and algebraically. can model real-world situations <p>EU2</p> <ul style="list-style-type: none"> quadratic functions can be written in various forms to provide different characteristics of the graph quadratic functions can provide real and complex solutions. <p>EU 3</p> <ul style="list-style-type: none"> the critical points provide information about real world phenomena. 	<p>Skills: <i>Students will be able to . . .</i></p> <p>EU1</p> <ul style="list-style-type: none"> graph a quadratic equation from standard, intercept, and vertex forms. graph and transform an absolute value function write the domain and range in interval notation of a quadratic and absolute value function simplify radical expressions (real and imaginary) find all zeros (real and complex) of a quadratic function by graphing, factoring, completing the square, using the quadratic formula, and using the TI-NSpire describe how changing the a, h, and k will affect the vertical and horizontal shift, reflection, as well as the width of the graph translate and solve quadratic functions to model real-world phenomena solve a system of quadratic and linear equations algebraically solve a system of quadratic and linear inequalities graphically <p>EU2</p> <ul style="list-style-type: none"> recognize the relationship of the roots of a quadratic function to the x-intercepts of the graph recognize the c-value as the y-intercept of standard form recognize the vertex of the quadratic function as the minimum or maximum point of the graph. recognize and understand the connection of the discriminant to the number and type of solutions <p>EU3</p> <ul style="list-style-type: none"> demonstrate the correct usage and application of critical vocabulary

Stage 2 – Assessment Evidence

Recommended Performance Tasks: EU1, EU2, EU3

Name _____

Quadratic Functions Performance Task



Andrew Bynum of the 76ers was injured in last night's game and he is going to be out for the season. The head coach of the 76ers has asked all new draftees to report to the gym at 8:00 tomorrow morning for try-outs. The try-out will consist of shooting the ball from any 3-point range, 2-point range, and a foul shot. Using this information, write 3 functions that model the path of the ball from the locations on the court. Determine how high to shoot the ball so it goes in the hoop.

Other Recommended Evidence:

- Ticket to Leave: Explain how changing the numbers before, inside, and after parentheses affects the graph of a quadratic or absolute value function.
- Perfect 10 Completing the Square Activity
- Quiz on Graphing and Transforming Quadratics from Standard and Vertex Form (give out Factoring Review HW)
- Test on Factoring, Factoring to Solve, and each method to graph a quadratic function
- Test on All Ways of Solving & Graphing (give out Quadratic Functions Performance Task)
- Quiz on Graphing Quadratic Inequalities & Solving Systems
- Cumulative Benchmark after MP1

Stage 3 – Learning Plan

Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: Consider the *WHERE TO* elements. Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer.

- Activity #1 – Quadratic Functions FOOTBALL Activity HOOK(M)
- Activity #2 – Graphing Calculator Pass the Page Transformation Activity (M)
- Activity #3 – Ticket to Leave: Explain how changing the numbers before, inside, and after parentheses affects the graph of a quadratic or absolute function. (T)
- Activity #4 – TI-Nspire Activity: An Application of Parabolas (M)
<http://education.ti.com/calculators/timath/US/Activities/Detail?sa=1010&id=13364>
- Activity #5 – Jigsaw Puzzle Factoring Review (A)
- Activity #6 – Perfect 10 Completing the Square Activity (A)

The following is the suggested sequence of learning activities and number of days for the Algebra 2 L2 class. Adjustments should be made accordingly for other levels.

Approximately 23 days for completion of unit

YWBAT transform quadratic and absolute value functions using a graphing calculator (M, T)

- HOOK – Activity #1 - The quadratic function $h(x) = -0.01x^2 + 1.18x + 2$ models the height of a punted football. The horizontal distance in feet from the point of impact with the kicker's foot is x , and h is the height of the football in feet. What information would be helpful for the kicker to know?
- Graph $f(x) = x^2$ parent functions using a table of values (one transformation per problem)
- Activity #2 - TI-NSPIRE Graphing Calculator Pass the Page Transformation Activity (include quadratic and absolute value functions)
- Identify the vertex, axis of symmetry, if it has a min or max
- Activity# 3 - Ticket to Leave: Explain how changing the numbers before, inside, and after parentheses affects the graph of a quadratic or absolute value function.

YWBAT graph quadratic and absolute value functions from vertex form (A)

- Warm-Up: Given vertex form, state all 3 transformations based on what you learned yesterday
- Introduce Vertex Form (multiple transformations per problem)
- Define the vertex (h, k) , axis of symmetry as $x = h$, and min/max as k .
- Identify domain and range in interval notation

YWBAT graph from standard form (A)

- Warm-Up: Given a quadratic in vertex form, FOIL and combine like terms to put in standard form
- Define standard form, define axis as $x = -b/2a$, plug in to get vertex, define c as y -intercept

YWBAT complete Activity #4 - Nspire Activity (depending on level) (M)

YWBAT solve equations by factoring and write the solutions as zeros $(x,0)$ (A)

- Sample Transfer Homework: Solve by factoring and then type in the original quadratic into your graphing calculator. How do the number of solutions relate to the graph? What do you notice about the placement of the axis of symmetry with relation to the zeros? (T)

YWBAT graph from intercepts (A)

YWBAT solve for real and imaginary solutions by square roots (A)

YWBAT solve by completing the square (A)

*Do not tell them how to turn standard form into vertex form by completing the square (going to be the transfer learning on the performance task)

YWBAT complete the square - Activity #6 – Perfect 10 (Graded) (A)

YWBAT solve and find the zeros using the quadratic formula & the discriminant (A)

YWBAT solve a system of linear and quadratic equations (A)

YWBAT graph quadratic inequalities (A)

YWBAT solve a system of quadratic and linear inequalities (A)

Critical Vocabulary:

Axis of symmetry	Binomial	Coefficient	Complete the Square	Complex Number
Critical Point	Degree	Discriminant	Domain, Range	Factor Completely
Intercept Form	Imaginary	Maximum, Minimum	Monomial	Parabola
Parent Quadratic Function	Perfect Square	Polynomial	Quadratic Equation	Quadratic Formula
Quadratic Function	Roots, Solutions	Standard Form	Trinomial	Vertex
Vertex Form	X-Intercept	Y-Intercept	Zeros	