ACC Quadratic Equations

Content Area: **Mathematics**
Course(s): **Algebra**
Time Period: **March**
Length: **12 Days**
Status: **Published**

Unit Summary

In this unit, students consider quadratic functions with extensions to the absolute value function family. They begin by identifying the key characteristics of quadratic functions (while making comparisons to linear functions and other function families). Students learn to anticipate the graph of a quadratic function by interpreting how the information imbedded in the algebraic representation connects to transformations on the parent equation. They also learn how to manipulate standard form into vertex form to reveal additional information about a given quadratic function. Topics covered include determining the vertex of a quadratic function, how to use the discriminant to determine the number of solutions, how to identify the real solutions of a quadratic equation as the zeros of a related quadratic function using the quadratic formula, and analyzing end behavior. Students apply this knowledge to real world situations involving simple projectile motion problems that connect math and physics.

Standards

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.F-IF.C	Analyze functions using different representations
MA.K-12.7	Look for and make use of structure.
MA.F-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.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.F-IF.C.7a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
MA.F-IF.C.7c	Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
MA.A-APR.B	Understand the relationship between zeros and factors of polynomials
MA.F-IF.C.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
MA.A-APR.B.3	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.
MA.F-IF.C.8a	Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
MA.F-IF.C.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
MA.A-CED.A	Create equations that describe numbers or relationships
MA.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
MA.A-REI.B	Solve equations and inequalities in one variable

MA.A-REI.B.4	Solve quadratic equations in one variable.
MA.A-REI.B.4a	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.
MA.A-REI.B.4b	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.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
TECH.8.1.8.A.CS1	Understand and use technology systems.
TECH.8.1.8.A.CS2	Select and use applications effectively and productively.
TECH.8.1.8.D.CS2	Demonstrate personal responsibility for lifelong learning.

Student Learning Objectives

- Students will learn to graph quadratic functions of the form y = ax^2, y = ax^2 + c, and y= ax^2 + bx +c.
- Students will learn to solve quadratic equations by graphing and using square roots.
- Students will learn to solve quadratic equations by completing the square.
- Students will learn to solve quadratic equations using the quadratic formula.
- Students will learn to find the number of solutions to a quadratic equation.
- Students will learn to identify the characteristics of a quadratic function from an equation and graph.
- Students will learn to graph absolute value equations.
- Students will learn to recognize linear, quadratic, and exponential models from data.

Essential Questions

- Where are curves found in real-world situations?
- What types of relationships can be modeled by a curved line?
- What is the language of quadratic models?
- How can real-life situations be represented by quadratic functions?

Enduring Understandings

- Students will understand that quadratic models allow us to understand the present and communicate predictions about the future.
- Students will understand that quadratic models describe objects in motion.

Application

- Students will be able to independently use their learning to identify the shape and characteristics of a quadratic function.

- Students will be able to independently use their learning to identify the characteristics of a graph of linear, quadratic, cubic, absolute value, square root, exponential, and reciprocal functions.

- Students will be able to independently use their learning to use the discriminant formula to find the number of solutions to a quadratic equation.

- Students will be able to independently use their learning to use the quadratic formula to find the solutions to a quadratic equation.

- Students will be able to independently use their learning to relate the solution of the equation to the graph of a parabola.

- Students will be able to independently use their learning to model real world projectile motion problems.

Skills

Students will be skilled at:

- Graphing a parabola from the equation of a quadratic function.

- Graphing an absolute value graph from the equation of a quadratic function.

- Applying the discriminant and quadratic formulas in the appropriate situations.

- Converting between standard form and vertex form (complete the square)