Algebra Concepts and Connections Unit 4: Analyzing & Modeling Quadratic Functions

Overview:

In this unit, students will analyze quadratic functions. Students will:

- Investigate key features of graphs
- Solve quadratic equations by taking square roots, factoring ($x^2 + bx + c$ AND $ax^2 + bx + c$), completing the square, and using the quadratic formula
- Compare and contrast graphs in standard, vertex, and intercept forms, only working with real number solutions

Learning Targets:

In Unit 4, students will:

- Interpret quadratic expressions
- Interpret parts of a quadratic expression that represent quantities in a context
- Fluently choose an equivalent form of a quadratic expression to reveal and explain properties of quantities in the expression
- Fluently produce an equivalent form of a quadratic expression (standard, vertex, and factored form)
- Multiply polynomials
- Create and solve quadratics by taking square roots, factoring, completing the square, and quadratic formula
- Analyze and explain zeros in context
- Represent constraints of quadratic equations
- Interpret data points as possible or not possible in the context of a quadratic equation
- Build, evaluate, and interpret quadratic functions using function notation
- Interpret domains given a function numerically, algebraically, and graphically
- Identify the effect on the graph generated by a quadratic function when replacing f(x) with f(x) + k, kf(x), f(kx), and f(x + k) for specific values of k (positive and negative)
- Find the value of k given quadratic graphs
- Graph quadratic functions
- Analyze the key characteristics of quadratic functions in their contexts (domain, range, intercepts, intervals increase/decrease, positive/negative, relative max/min, symmetries, and end behavior) expressed in interval and set-builder notation using inequalities
- Connect the domain and range of a quadratic function to its graph in context
- Connect a quadratic function to the quantitative relationship it describes
- Rewrite a quadratic function to revel its minimum or maximum value in context
- Interpret a quadratic function's minimum or maximum in context
- Create two-variable quadratic functions to represent relationships between quantities
- Graph quadratic functions on coordinate axes with labels and scales
- Estimate, calculate, and interpret the average rate of change of a quadratic function
- Make comparisons between average rates of change in linear and quadratic functions
- Write quadratic functions in different forms
- Use a variety of strategies (factoring, completing the square, quadratic formula, graphing, and taking square roots) to make sense of the properties of quadratics
- Compare characteristics of two functions each represented in a different way

Key Vocabulary: (linked to GA DOE Interactive Glossary)

Axis of Symmetry	Degree	Horizontal Shift	Minimum	Quadratic Equation	Representation	Vertex Form
Completing the Square	Difference of Two Squares	Increasing	Parabolic	Quadratic Expression	Root	Vertical Shift
Concavity	Discriminant	Leading Coefficient	Prefect Square Trinomial	Quadratic Function	Standard Form	Zeros
Decreasing	Function	Maximum	Quadratic	Representation	Vertex	

Supporting Resources:

http://ctlslearn.cobbk12.org/

GAVirtual - Factoring and Solving Quadratic Equations

GAVirtual - Graphing Quadratic Functions

Completing the Square

Forms & features of quadratic functions

Solve a Quadratic Equation by Using the Quadratic Formula