UbD: Algebra 1 - Introduction to Quadratic Functions

<table>
<tr><td>Time Frame: 17 Lessons</td><td>Unit 6: Introduction to Quadratic Functions</td><td>Course Name: Algebra 1</td></tr>
<tr><td colspan="3">Stage 1: Desired Results</td></tr>
<tr><td>Established Goal(s)</td><td colspan="2">Transferable Skills</td></tr>
<tr><td rowspan="3">Competencies Addressed:
Introduction to Quadratic Functions

Standards:
HSA-SSE.A.1 Interpret expressions that represent a quantity in terms of its context.
HSA-SSE.A.2 Use the structure of an expression to identify ways to rewrite it..
HSA-SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
HSF-BF.A.1 Write a function that describes a relationship between two quantities.
HSF-BF.A.1.a Determine an explicit expression, a recursive process, or steps for calculation from a context.
HSF-BF.B.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and</td><td colspan="2">Students will be able to independently use their learning to...

● look at patterns which grow quadratically and contrast them with linear and exponential growth.
● examine other quadratic relationships via tables, graphs, and equations, gaining appreciation for some of the special features of quadratic functions and the situations they represent.
● develop clear and effective communication.
● increase self-direction.
● develop creative and practical problem-solving.
● develop informed and integrative thinking.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td><u>Understandings</u>
Students will understand that...
● not all change is linear.
● expressing some relationships of change will require a quadratic function.
● quadratic relationships are evident in real life phenomena.
● quadratic expressions come in a variety of forms and the different forms lend themselves to different forms of the same solutions.
● they can identify features of graphs of quadratic functions.</td><td><u>Essential Questions</u>

● How can I develop previous algebra skills so I can be successful in solving quadratic equations?
● How are quadratic functions used to model, analyze and interpret mathematical relationships?
● Why is it advantageous to know a variety of ways to solve and graph quadratic functions?</td></tr>
</table>

UbD: Algebra 1 - Introduction to Quadratic Functions

	Acquisition	
algebraic expressions for them. **HSF-IF.A.2** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. **HSF-IF.B.4** 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. **HSF-IF.B.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. **HSF-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. **HSF-IF.C.7.a** Graph linear and quadratic functions and show intercepts, maxima, and minima. **HSF-IF.C.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. **HSF-IF.C.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal	*Students will know...* • how to create drawings, tables, and graphs that represent the area of a garden. • choose a domain that makes sense in a revenue situation. • model revenue with quadratic functions and graphs. • relate the vertex of a graph and the zeros of a function to a revenue situation. • rewrite quadratic expressions in different forms by using an area diagram or the distributive property. • rewrite quadratic expressions given in factored form in standard form using either the distributive property or a diagram. • the difference between "factored form" and "standard form." • explain the meaning of the intercepts on a graph of a quadratic function in terms of the situation it represents. • how the numbers in the factored form of a quadratic expression relate to the intercepts of its graph. • graph a quadratic function given in factored form. • how to find the vertex and -intercept of the graph of a quadratic function in factored form without graphing it first. • explain how *a* and the *c* in $y=ax^2+bx+c$ affect the graph of the equation. • understand how graphs, tables, and equations that represent the same quadratic function are related. • explain how the *b* in $y=ax^2+bx+c$ affects the graph of the equation. • match equations given in standard and	*Students will be able to...* • recognize a situation represented by a graph that increases then decreases. • describe how a pattern is growing. • tell whether a pattern is growing linearly, exponentially, or quadratically. • an expression with a squared term is called quadratic. • recognize quadratic functions written in different ways. • use information from a pattern of shapes to write a quadratic function. • that, in a pattern of shapes, the step number is the input and the number of squares is the output. • explain using graphs, tables, or calculations that exponential functions eventually grow faster than quadratic functions. • explain the meaning of the terms in a quadratic expression that represents the height of a falling object. • use tables, graphs and equations to represent the height of a falling object. • create quadratic functions and graphs that represent a situation. • relate the vertex of a graph and the zeros of a function to a situation. • that the domain of a function can depend on the situation it represents. Mathematical Practices: • make sense of problems and persevere in solving them. • reason abstractly and quantitatively. • construct viable arguments and critique the reasoning of others.

UbD: Algebra 1 - Introduction to Quadratic Functions

descriptions). **HSF-LE.A.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). **HSF-LE.A.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. .	• explain how a quadratic equation and its graph relate to a situation. • recognize the "vertex form" of a quadratic equation. • relate the numbers in the vertex form of a quadratic equation to its graph. • graph a quadratic function given in vertex form, showing a maximum or minimum and the -intercept. • how to find a maximum or a minimum of a quadratic function given in vertex form without first graphing it. • describe how changing a number in the vertex form of a quadratic function affects its graph.	• model with mathematics. • use appropriate tools strategically. • attend to precision. • look for and make use of structure. • look for and express regularity in repeated reasoning.