Algebra 1 CP Unit 6: Quadratics Functions & Modeling

Unit #:	APSDO-00018613	Duration:	5.0 Week(s)	Date(s):	

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Grades:
9
Subjects:
Mathematics

Unit Focus

In this unit, students will identify and compare linear, exponential, and quadratic tables, graphs and equations. They will graph quadratic equations in standard form and identify the axis of symmetry, vertex, min/max, and x- and y- intercepts. They will find x-intercepts using the zero-product property and the quadratic formula. Students will graph a quadratic equation in vertex form and identify the direction of opening, vertex, axis of symmetry, min/max and x- and y- intercepts. They will write equations given a vertex and a coordinate, and solve modeling problems using projectile motion. Students will understand the vertex and standard form characteristics and how they affect the graph, the difference between identifying whether there is a max/min and the actual max/min value. They will understand associated terminology and apply domain/range. Summative assessments may include projects, labs, and tests. Primary instructional materials for this unit include Algebra I, Glencoe/McGraw Hill, 2014.

Stage 1: Desired Results - Key Understandings

Established Goals	Transfer
Common Core *Mathematics: 8* • Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9),	**T1** (T50) Based on an understanding of any problem, initiate a plan, execute it and evaluate the reasonableness of the solution. **T2** (T53) Articulate how mathematical concepts relate to one another in the context of a problem or in the theoretical sense. **T3** (T51) Examine alternate methods to accurately and efficiently solve problems. **T4** (T52) Use appropriate tools strategically to deepen understanding of mathematical concepts. **T5** (T24) Classify, interpret, and compare functions or equations. **T6** (T23) Use functions or equations to model relationships among quantities. **T7** (T22) Describe and/or solve problems using algebraic expressions, equations, inequalities, and functions.

which are not on a straight line. *CCSS.MATH.CONTENT.8.F.A.3*
- Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. *CCSS.MATH.CONTENT.8.F.B.5*

Mathematics: 9

- Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. *CCSS.MATH.CONTENT.HSA.CED.A.1*
- Factor a quadratic expression to reveal the zeros of the function it defines. *CCSS.MATH.CONTENT.HSA.SSE.B.3.A*
- Graph linear and quadratic functions and show intercepts, maxima, and minima. *CCSS.MATH.CONTENT.HSF.IF.C.7.A*
- Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x). *CCSS.MATH.CONTENT.HSF.IF.A.1*
- 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. *CCSS.MATH.CONTENT.HSF.IF.C.8.A*
- Create equations in two or more

Meaning	
Understandings	**Essential Questions**
U1 (U206) A function can represent how quantities in the real world relate to one another. **U2** (U207) Recognition of predictable mathematical patterns supports the analysis of functional relationships and the prediction of data. **U3** (U530) Every problem belongs to a category of problems that has a similar structure and set of characteristics; which means it can be solved using a similar model. **U4** (U550) Attention to detail, such as specifying units of measure and labeling, leads to clarity in expressing mathematical information.	**Q1** (Q205) How can I represent this relationship as a function or equation? (Gr. 6-12) **Q2** (Q206) How do I evaluate this function or solve the equation? (Gr. 6-12) **Q3** (Q207) How do I classify, interpret, and compare functions or equations? (Gr. 8-12) **Q4** (Q208) What function best models the data? How do its characteristics help me make predictions? (Gr. 8-12) **Q5** (Q530) Is this problem similar to a problem I have solved before? **Q6** (Q532) Which model best represents this problem? **Q7** (Q533) How do I use the model to solve other problems? **Q8** (Q551) How precise do my quantities need to be for my calculations to be accurate? **Q9** (Q552) Does my solution make sense? **Q10** (Q550) Did I use clear language (symbols, labels, terms, units of measure and significant digits) to explain my reasoning to others?
Acquisition of Knowledge and Skill	
Knowledge	**Skills**
	S1 Identify and compare linear, exponential, quadratic from tables, graphs, and equations **S2** Graph a quadratic equation in standard form using a table of values and identify the axis

variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. *CCSS.MATH.CONTENT.HSA.CED.A.2* • Solve quadratic equations by inspection (e.g., for x2 = 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 +/- bi for real numbers a and b. *CCSS.MATH.CONTENT.HSA.REI.B.4.B* • Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. *CCSS.MATH.CONTENT.HSF.IF.C.7.C* • Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. *CCSS.MATH.CONTENT.HSF.LE.A.3* • 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. *CCSS.MATH.CONTENT.HSF.IF.B.4* • Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum. *CCSS.MATH.CONTENT.HSF.IF.C.9* • Attend to precision. *CCSS.MATH.MP.6* • Model with mathematics. *CCSS.MATH.MP.4*	of symmetry, vertex, minimum/maximum, and x-and y-intercepts **S3** Find x-intercepts by using the zero-product property **S4** Graph a quadratic equation in vertex form and identify the direction of opening, vertex, axis of symmetry, minimum/maximum, and x- and y- intercepts. **S5** Write equations given a vertex and coordinate **S6** Solve modeling problems using projectile motion and optimization **S7** Understand the vertex and standard form characteristics and how it affects the graph **S8** Understand the difference between identifying whether there is maximum or minimum and the actual maximum/minimum value of a quadratic function **S9** Understand associated terminology (zeros, roots, x- intercepts, etc.) **S10** Understand the application of domain and range

Stage 3: Learning Plan

Coding	Code	Description of Learning Activity

Report produced by Eduplanet21 on: Fri, August 03, 2018 at 8:27 AM