Stage 1 Desired Results

ESTABLISHED GOALS (CCSS)

N.RN.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

F.IF.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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★

F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.★

F.IF.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★

F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★

a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. 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. b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)t, y = (0.97)t, y = (1.01)12t, y = (1.2)t/10, and classify them as representing exponential growth or decay.

F.IF.9 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.

F.BF.1 Write a function that describes a relationship between two quantities.★

a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine

Transfer

Students will be able to independently use their learning to…

to anticipate the graph of a quadratic function by interpreting various forms of quadratic expressions, finding the zeros and understanding that they may be real or imaginary but a solution does exist.

Meaning

UNDERSTANDINGS

Students will understand that…

- *the issues of domain and range and the usefulness in functions*
- *once the roots are known by the relationships between coefficients and roots, a quadratic equation can be factored*
- *the difference between rational and irrational numbers*
- *the key characteristics of quadratic functions to those of linear and exponential functions*

ESSENTIAL QUESTIONS:

What are the characteristics of a quadratic function?

How can you solve a quadratic function?

Acquisition

Students will know…

- ✓ *the properties of rational and irrational numbers*
- ✓ *how to construct and compare linear, quadratic and exponential models and solve problems*

Students will be skilled at…

- ✓ building a function that models a relationship between two quantities
- ✓ building new functions from existing functions
- ✓

standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. **F.BF.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 algebraic expressions for them. **F.BF.4** Find inverse functions. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, $f(x) = 2x^3$ or f(x) = (x+1)/(x-1) for $x \neq 1$. **F.LE.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.		

Stage 2 Evidence

Evaluative Criteria	Assessment Evidence
PERFORMANCE TASKS	**CURRICULUM EMBEDED PERFOMANCE ASSESSMENT (PERFORMANCE TASKS):** • Solve • Use a table to complete each part • Solve. Show work and explain you steps
	OTHER EVIDENCE: • Use of fundamental math facts • Use of technology • Use of properties •
CLAIMS	**CLAIM 1** **CLAIM 2** **CLAIM 3** **CLAIM 4**
DEPTH OF KNOWLEDGE LEVELS	**DOK 1** **DOK2** **DOK 3** **DOK4**
ACHIEVEMENT LEVEL DESCRIPTORS	**ALD 1** **ALD 2** **ALD 3** **ALD 4**

Stage 3 Learning Plan

Summary of Key Learning Events and Instruction

Lesson 5a	