


Interpret quadratic functions that arise in applications in terms of a context (F.IF.4-6)	
<p>Standard II.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. <i>Key features include intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> </p>	
Concepts and Skills to Master	
<ul style="list-style-type: none"> • Build on work from Secondary Math I to interpret key features of functions, including quadratic, piece-wise, and absolute value functions. • Interpret key features using multiple representations (tables, graphs, equations, and verbal descriptions). • Use key features to sketch a graph of the function. 	
Related Standards: Current Course	Related Standards: Future Courses
II.F.IF.6 , II.F.IF.7 , II.F.IF.9 , II.F.LE.3	III.F.IF.4 , III.F.IF.6 , III.F.IF.7

Support for Teachers

Critical Background Knowledge
<ul style="list-style-type: none"> • Interpret key features of graphs and tables (I.F.IF.4) • Find the average rate of change on a specified interval (I.F.IF.6) • Graph functions and identify key features (I.F.IF.7) • Compare functions using key features (I.F.IF.9)
Academic Vocabulary
increasing, decreasing, interval, intercept, maximum, minimum, symmetry, end behavior, quadratic, vertex
Resources
Curriculum Resources : http://www.uen.org/core/core.do?courseNum=5620#71473

Interpret quadratic functions that arise in applications in terms of a context (F.IF.4-6)	
Standard II.F.IF.5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. Focus on quadratic functions; compare with linear and exponential functions. <i>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.</i>	
Concepts and Skills to Master	
<ul style="list-style-type: none"> Identify domain of a function from any representation. Focus on quadratic functions; compare with linear and exponential functions from Secondary Mathematics I. Relate the domain to context, explaining restrictions as a result of the context. 	
Related Standards: Current Course	Related Standards: Future Courses
II.A.CED.2 , All functions standards (domain is used throughout high school mathematics courses)	III.A.CED.2 , All functions standards (domain is used throughout high school mathematics courses)

Support for Teachers

Critical Background Knowledge
<ul style="list-style-type: none"> Relate the domain of a function to the relationship it describes (I.F.IF.5) Familiarity with function notation and domain (I.F.IF.2) Understand the definition of function (8.F.1 and I.F.IF.1) Independent, dependent variables and input/output (8.F.1)
Academic Vocabulary
domain, function, independent variable, dependent variable, discrete, continuous
Resources
Curriculum Resources : http://www.uen.org/core/core.do?courseNum=5620#71473

Interpret quadratic functions that arise in applications in terms of a context (F.IF.4-6)	
Standard II.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.▢	
Concepts and Skills to Master	
<ul style="list-style-type: none"> Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Focus on quadratic, absolute value, and piece-wise defined functions. Estimate the rate of change from a graph. 	
Related Standards: Current Course	Related Standards: Future Courses
II.F.IF.6 , II.F.IF.9 , II.LE.3 , II.G.C.2	III.F.IF.6 , III.F.IF.9 , III.LE.3

Support for Teachers

Critical Background Knowledge
<ul style="list-style-type: none"> Calculate and interpret the rate of change of a linear or exponential function (I.F.IF.6). Determine the rate of change from a description of a relationship or from two (x,y) values and interpret its meaning (8.F.4)
Academic Vocabulary
average rate of change, interval, secant line (connected to II.G.C.2)
Resources
Curriculum Resources : http://www.uen.org/core/core.do?courseNum=5620#71473

Analyze functions using different representations (F.IF.7-9)	
<p>Standard II.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.☒</p> <p>a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> <p>b. Graph piecewise-defined functions and absolute value functions. Compare and contrast absolute value and piecewise-defined functions with linear, quadratic, and exponential functions. Highlight issues of domain, range, and usefulness when examining piecewise-defined functions.</p>	
Concepts and Skills to Master	
<ul style="list-style-type: none"> Given an equation of a linear, exponential, or quadratic function, graph with or without technology, and show key features (intercepts, end behavior, maxima, and/or minima). Graph and find key features of piecewise-defined functions, including absolute value functions. Graph absolute value of linear, quadratic, and exponential functions and recognize they can be defined as piecewise functions. Compare and contrast the graph of $f(x)$ to $f(x)$, including the changes in domain and range. 	
Related Standards: Current Course	Related Standards: Future Courses
II.A.CED.2 , II.F.IF.4 , II.F.BF.3	III.A.CED.2 , III.F.IF.4 , III.F.BF.3

Support for Teachers

Critical Background Knowledge
<ul style="list-style-type: none"> Understand absolute value as a distance from 0 on a number line (6.NS.7c) and solve absolute value equations (8.EE.7c). Graph linear and exponential functions showing key features (I.F.IF.7). Interpret key features of a graph (I.F.IF.4). Identify and use transformation of functions (I.F.BF.3).
Academic Vocabulary
piecewise, step function, axis of symmetry, absolute value, $ x $
Resources
Curriculum Resources : http://www.uen.org/core/core.do?courseNum=5620#71473

Analyze functions using different representations (F.IF.7-9)	
<p>Standard II.F.IF.8: Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.</p> <p>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.</p> <p>b. Use the properties of exponents to interpret expressions for exponential functions. <i>Forexample, 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.</i></p>	
Concepts and Skills to Master	
<ul style="list-style-type: none"> Factor quadratics and complete the square (with II.A.SSE.3) to find intercepts, extreme values, and symmetry of the graph. Transition between different forms of quadratic functions and identify the advantages of each. Recognize equivalent forms of the same exponential function and determine whether the function represents growth or decay. For example, $f(x) = \left(\frac{1}{2}\right)^x$ is equivalent to $f(x) = 2^{-x}$ and both represent exponential decay. 	
Related Standards: Current Course	Related Standards: Future Courses
II.A.SSE.1 , II.A.SSE.2 , II.A.SSE.3 , II.A.REI.4 , II.A.REI.7	III.A.SSE.1 , III.A.SSE.2 , III.A.APR.3 , III.A.APR.6 , III.F.IF.8 , III.F.IF.9 , P.F.IF.7d

Support for Teachers

Critical Background Knowledge
<ul style="list-style-type: none"> Identify when two expressions are equivalent (6.EE.4); understand that rewriting an expression in different forms can shed light on problem and how quantities are related (7.EE.2); Use percent increase or decrease to solve problems (7.RP.3) Apply properties of integer exponents to generate equivalent numerical expressions (8.EE.1) Perform operations with numbers expressed in scientific notation (8.EE.4) Understand exponential growth or decay as the constant percent rate per unit interval (I.F.LE.1c) key features of a quadratic function (II.F.IF.7)
Academic Vocabulary
binomial, trinomial, perfect square trinomial, completing the square, zero, extreme values (maximum and minimum), vertex, axis of symmetry
Resources
Curriculum Resources : http://www.uen.org/core/core.do?courseNum=5620#71473

Analyze functions using different representations (F.IF.7-9)	
Standard II.F.IF.9: Compare properties of two functions, each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.</i>	
Concepts and Skills to Master	
<ul style="list-style-type: none"> • Compare properties of two functions, keeping the following in mind: <ul style="list-style-type: none"> ○ properties include rate of change, intercepts, end behavior, maxima and minima ○ function pairs include any combination of linear, exponential, and quadratic ○ representations include algebraically, graphically, numerically in tables, or by verbal descriptions 	
Related Standards: Current Course	Related Standards: Future Courses
II.F.IF.4 , II.F.IF.7 , II.F.LE.3	III.F.IF.4 , III.F.IF.7 , III.F.LE.3

Support for Teachers

Critical Background Knowledge
<ul style="list-style-type: none"> • Compare properties of two functions (linear to linear), each represented in a different way (8.F.2) • Compare properties of two functions in different representations (I.F.IF.9) • Find intercepts, rates of change, and end behavior (I.F.IF.4)
Academic Vocabulary
intercepts, rates of change, end behavior, extreme values, symmetry
Resources
Curriculum Resources : http://www.uen.org/core/core.do?courseNum=5620#71473