

Common Core Standard	Major Topic	Skills	Chapters	Vocabulary	Essential Questions
<b>Module 3 cont.</b>					
<p><b>Pre-Requisite Skills from Module 1:</b>  Students need to know how to add, subtract, multiply and divide.  Students need to know what a variable and symbols are.  Students need to know how to model certain words with mathematical symbols  Students need to know what the opposite operations are of addition, subtraction, multiplication and division.  Students need to know order of operations  Students need to know inequality symbols and what they mean  Students need to know how to graph a simple inequality on a number line (i.e. <math>x &gt; 4</math>)  Students need to know the meanings of exponents (<math>2^4 = 2 \times 2 \times 2 \times 2</math>)</p> <p><b>Additional Pre-Requisite Skills:</b>  Equation substitution  Point-slope graphing  Tables  Inequalities  Solution sets  Tables and graphing with calculator  Solving a system of equation using tables</p> <p><b>Skills acquired from Module 1:</b>  Students need to know how to solve equations in terms of variables (i.e. <math>x</math> and <math>y</math>)  Students need to know how to calculate the slope from an equation, graph and table.</p> <p><b>Skills acquired from Module 3 Part 1:</b>  Students need to know what functions can be used to represent real-world situations.  Students need to know how to find the <math>y</math>-intercept of a graph and equation.  Students need to know how to compare graphs, tables and equations.  Students need to be able to describe variables in terms of context.  Students need to be able to identify/construct linear, exponential and <i>quadratics</i></p>					
Functions					
F-IF.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified	Rate of Change	Calculate the rate of change from an equation.  Calculate the rate of change from a graph		Rate of change Percent growth Percent decay Interval	

<p>interval. Estimate the rate of change from a graph.</p>		<p>Calculate the rate of change from a table</p> <p>Calculate the rate of change of an exponential function using percent growth/decay</p> <p>Calculate the rate of change for a given interval</p> <p>Estimate the rate of change from a graph</p> <p>Describe the rate of change in terms of the context of the situation</p>			
<p>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.</p>	<p>Key Features of Graphs</p>	<p>Identify the slope and y-intercept of a linear function</p> <p>Identify minimums and maximums of a function</p> <p>Identify intervals where a function is increasing or decreasing</p> <p>Identify roots of a graph</p> <p>Identify the x and y intercept.</p> <p>Identify symmetries and end behaviors for graphs</p>		<p>Minimum Maximum Increasing Decreasing Roots Symmetries x-intercept y-intercept relative maximum relative minimum end behavior symmetry slope</p>	

		<p>Sketch the key features of a function</p> <p>Describe the key features of a function</p> <p><b>(This focuses all on linear and exponential)</b></p>			
<p>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>F-IF.7.a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p>	<p>Graphing and Interpreting linear functions</p>	<p>Graph a linear function and identify the domain, range, intercepts, and rate of change.</p>			
<p>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.</p>	<p>Properties of functions</p>	<p>Compare characteristics of two different functions represented in two different forms (i.e. a table vs algebraically given a linear and exponential)</p> <p>Identify parts of a function algebraically, graphically and verbally</p>		<p>Algebraic representation</p>	
<p>F-LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.</p>	<p>Linear vs. Exponential</p>	<p>Describe the difference between a linear function and an exponential function.</p> <p>Explain the slope of a</p>		<p>Exponential Growth</p> <p>Exponential Decay</p>	

F-LE.1.a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.		linear function as the growth of equal differences over an equal interval.  Explain growth/decay of an exponential function			
F-LE.1.b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.	Linear Relationships	Identify when situations can be described by linear functions			
F-LE.1.c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	Exponential Relationships	Identify when situations can be described by exponential functions			
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.	Comparing growth of functions	Compare and contrast linear growth and exponential growth to <i>quadratic growth</i> from a graph or table  Explain why exponential models continue to grow/decay more rapidly than linear or <i>quadratic</i> models			
F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context.	Parameters of Functions	Find an ordered pair given a linear function or exponential function.  Describe the variables in linear functions in terms of a context (y-intercept is the initial value and	Parameters		

		<p>the slope is the rate of change)</p> <p>Describe the variables in exponential functions in terms of its context</p>			
<p>F-BF.3. Identify the effect on the graph of replacing <math>f(x)</math> by <math>f(x) + k</math>, <math>k f(x)</math>, <math>f(kx)</math>, and <math>f(x + k)</math> for specific values of <math>k</math> (both positive and negative); find the value of <math>k</math> 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.</p>	<p>Shifts of graph</p>	<p>Identify the parent function of a linear or exponential function.</p> <p>Identify the shift of the graph of a linear or exponential function.</p> <p>Graph the shift of a function as translated of the parent function.</p> <p>Explain the effects of the shifts of graphs using the calculator.</p> <p>Compare the parent function to the function that has been shifted.</p> <p>Identify the translation of a function from the graph and write the function algebraically.</p>		<p>Translation Inside (internal) tampering Outside(external) tampering Parent function shifts</p>	
Sequences					
<p>F-IF.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by <math>f(0) = f(1)</math></p>	<p>Sequences</p>	<p>Define an arithmetic sequence</p> <p>Define an arithmetic sequence as a linear function.</p> <p>Define a geometric sequence.</p>		<p>Arithmetic sequence Geometric sequence Recursive Explicit Fibonacci Subset</p>	

<p><math>= 1, f(n+1) = f(n) + f(n-1)</math> for <math>n</math> greater than or equal to 1.</p>		<p>Define a geometric sequence as an exponential function.</p> <p>Define an arithmetic or geometric sequence as a function, sometimes defined recursively.</p>			
<p>F-BF.1. Write a function that describes a relationship between two quantities. F-BF.1.a. Determine an explicit expression, a recursive process, or steps for calculation from a context.</p>	<p>Explicit and Recursive processes</p>	<p>Explain the steps to set up a linear, exponential, or <i>quadratic</i> functions</p> <p>Exponential function explicitly from a word problem</p> <p>Construct a linear function explicitly from a word problem</p> <p>Construct a linear function recursively from a word problem</p> <p><i>Construct a quadratic function explicitly and recursively from a word problem.</i></p>			
<p>F-LE.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).</p>	<p>Constructing linear and exponential sequences</p>	<p>Write a linear function or an arithmetic sequence from a graph, description or table.</p> <p>Write an exponential function or geometric sequence from a graph, description or table.</p>			



