Mathematics Curriculum

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Topic C:

Inverse Functions

F-BF.B.4b, F-BF.B.4c, F-BF.B.4d, F-BF.B.5

Focus Standards:	F-BF.B.4	Find inverse functions.
		b. (+) Verify by composition that one function is the inverse of another.
		c. (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.
		d. (+) Produce an invertible function from a non-invertible function by restricting the domain.
	F-BF.B.5	(+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
Instructional Days:	4	
	Lesson 18:	Inverse Functions (P)[1]
	Lesson 19:	Restricting the Domain (P)
	Lesson 20:	Inverses of Logarithmic and Exponential Functions (P)
	Lesson 21:	Logarithmic and Exponential Problem Solving (E)

The inverse of a function and the associated properties of inverses were first introduced in Algebra II Module 3. Students solved for inverse functions by interchanging x and y and discovered that the graphs of inverse functions result from reflecting the original graph over the line $y = x$. Students studied the relationship between exponential and logarithmic functions graphically and in problem solving. Lesson 18 presents inverses in a slightly different context as students understand that when you compose a function and its inverse they undo each other (**F-BF.B.4b**). Students then create the inverse of a function algebraically. In Lesson 19, students work with functions and their inverses represented numerically, graphically, and algebraically. This lesson builds on student understanding of inverses as they explore the inverse of a function in the context of tables and graphs (**F-BF.B.4c**). They also consider that not every function has an inverse that is also a function and learn how to restrict the domain of a function to produce an invertible function (**F-BF.B.4d**), setting the stage for the definition of the inverse trigonometric functions in Module 4. The lesson defines the adjective invertible (a function is invertible if its inverse is also a function) as it applies to functions and provides practice for students to verify by composition that two functions are inverses (**F-BF.B.4b**). Lessons 20 and 21 focus on logarithmic and exponential functions. Students have worked with

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[1] Lesson Structure Key: **P**-Problem Set Lesson, **M**-Modeling Cycle Lesson, **E**-Exploration Lesson, **S**-Socratic Lesson

exponential functions since Algebra I, and logarithmic functions were introduced and studied extensively in Algebra II. In fact, the inverse of a function was first defined in Algebra II because students needed to be able to solve equations of the form $a \cdot b^{cx} = d$ and needed to understand that the solution to this type of equation was a logarithm. In Lesson 20, students review the inverse relationship between exponents and logarithms (**F-BF.B.5**) and use composition to verify that a logarithmic function and an exponential function are inverses (**F-BF.B.4d**). Lesson 21 wraps up Topic C and Module 3 as students solve modeling problems using exponential and logarithmic functions (**F-BF.B.5**).

Mathematical practices MP.2 and MP.4 are highlighted as students consider a simple linear model of straight-line depreciation in a business application, relating parameters of the function to the context. Students also study carbon dating techniques used to determine the age of woolly mammoth remains and write exponential and logarithmic models. Students use graphing calculators and graphing software to explore the relationships between functions and their inverses and to problem solve (MP.5).