Unit 6 - *Exponential and Log Functions*

Overview

This unit is the study of exponential and logarithmic functions. Understanding the inverse relationship between exponential and logarithmic functions is important. The properties and rules of logarithms will be related to exponential rules and then used in application problems including Newton's Law of Cooling, compound interest and exponential growth and decay.

21st Century Capacities: Analyzing

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 1 Make sense of problems and persevere in solving them
MP2 Reason abstractly and quantitatively
MP4 Model with Mathematics
MP6 Attend to precision

A.SSE.1 Interpret expressions that represent a quantity in terms of its context.*

A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.

A.CED.1 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.*

Transfer:

Students will be able to independently use their learning in new situations to...

1. Manipulate equations and expressions to create order and establish relationships.
2. Draw conclusions about graphs and equations. (Analyzing)
3. Make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution. (Analyzing)

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Mathematicians can describe patterns, relations, and/or exponential and logarithmic functions to access strategies to solve problems.
2. Mathematicians use models to represent and make meaning of quantitative relationships.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. How do you express and describe an exponential or logarithmic pattern and use it to make predictions and solve a problem?
B. How do I interpret this mathematical model?
C. What is the most efficient way to solve this problem?

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.* F.IF.7e Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. F.BF.3 Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, 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.LE.4 For exponential models, express as a logarithm the solution to $ab^{(ct)} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F.BF.5 (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.	***Acquisition:***	
	Students will know… 1. The meaning of each of the parameters within an exponential function 2. The relationship between the laws of exponents and how they relate to the laws of logs 3. The properties of logarithms 4. The difference between growth and decay 5. Vocabulary: exponential growth/decay, e, continuous, logarithm, common and natural logarithms, half-life	*Students will be skilled at…* 1. Simplifying and factoring expressions with rational exponents including negatives 2. Graphing exponential functions using the concept of transformations 3. Finding the value of an exponential function given x 4. Graphing functions with base e 5. Using exponential models including compound interest, continuous interest, growth, decay 6. Identifying functions as models of exponential growth, exponential decay. 7. Changing an equation from log form to exponential form and back. 8. Evaluating basic logarithmic expressions without a calculator 9. Graphing logarithmic functions using the concept of transformations 10. Using a calculator to evaluate logs 11. Using the laws of logs 12. Expanding and condensing log expressions in order to solve problems 13. Using change of base formula 14. Solving log and exponential equations 15. Using logs to solve application problems including exponential growth/decay and Newton's Law of Cooling