



Algebra 2 Level 1 - Unit 6 - Exponential and Log Functions

Unit Focus

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.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Common Core Mathematics: 9-12 - 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. (CCSS.MATH.CONTENT.HSA.SSE.A.1.B) - 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. (CCSS.MATH.CONTENT.HSA.CED.A.1) - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (CCSS.MATH.CONTENT.HSA.CED.A.2) - Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. (CCSS.MATH.CONTENT.HSF.IF.C.7.E) - 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. (CCSS.MATH.CONTENT.HSF.BF.B.3) - Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. (CCSS.MATH.CONTENT.HSF.BF.B.5) - 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. (CCSS.MATH.CONTENT.HSF.LE.A.4) - Make sense of problems and persevere in solving them. (CCSS.MATH.MP.1)	<i>Students will be able to independently use their learning to...</i> T1 manipulate equations/expressions or objects to create order and establish relationships. T2 draw conclusions about graphs, shapes, equations, or objects. T3 make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Mathematicians can describe patterns, relations, and/or functions to access strategies to solve problems. U2 Mathematicians use models to represent and make meaning of quantitative relationships.	<i>Students will keep considering...</i> Q1 How do you express and describe a pattern and use it to make predictions and solve a problem? Q2 How do I interpret this mathematical model? Q3 What is the most efficient way to solve this problem?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<i>Students will know...</i> K1 The meaning of each of the parameters within an exponential function K2 The relationship between the laws of exponents and how they relate to the laws of logs	<i>Students will be skilled at...</i> S1 Simplifying and factoring expressions with rational exponents including negatives S2 Graphing exponential functions using the concept of transformations

Stage 1: Desired Results - Key Understandings

- Reason abstractly and quantitatively. (CCSS.MATH.MP.2)
- Model with mathematics. (CCSS.MATH.MP.4)
- Attend to precision. (CCSS.MATH.MP.6)

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- Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)

K3 The properties of logarithms
K4 The difference between growth and decay
K5 Vocabulary: exponential growth/decay, e , continuous, logarithm, common and natural logarithms, half-life

S3 Finding the value of an exponential function given x
S4 Graphing functions with base e
S5 Using exponential models including compound interest, continuous interest, growth, decay
S6 Identifying functions as models of exponential growth, exponential decay.
S7 Changing an equation from log form to exponential form and back.
S8 Evaluating basic logarithmic expressions without a calculator
S9 Graphing logarithmic functions using the concept of transformations
S10 Using a calculator to evaluate logs
S11 Using the laws of logs
S12 Expanding and condensing log expressions in order to solve problems
S13 Using change of base formula
S14 Solving log and exponential equations
S15 Using logs to solve application problems including exponential growth/decay and Newton's Law of Cooling