Pre-Calculus CP Unit 5: Exponentials and Logarithmic Equations

Unit #:	APSDO-00018156	Duration:	4.0 Week(s)	Date(s):	

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Grades:
11, 12
Subjects:
Mathematics

Unit Focus

In this unit, students will apply their previous understanding of exponent rules and inverse functions to logarithmic functions and rational exponents. They will apply the properties of exponents and logarithms to simplify, expand, and contract logarithmic expressions. Students will use exponential and logarithmic models to solve real world applications. Summative assessments may include projects, labs, and tests. Primary instructional materials for this unit include Pre-Calculus, 3rd edition Pearson/Prentice Hall, 2007.

Stage 1: Desired Results - Key Understandings

Established Goals

Common Core
Mathematics: 11

- Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
  CCSS.MATH.CONTENT.HSN.RN.A.1
- Rewrite expressions involving radicals and rational exponents using the properties of exponents.
  CCSS.MATH.CONTENT.HSN.RN.A.2

Transfer

T1 (T50) Based on an understanding of any problem, initiate a plan, execute it and evaluate the reasonableness of the solution.
T2 (T53) Articulate how mathematical concepts relate to one another in the context of a problem or in the theoretical sense.
T3 (T51) Examine alternate methods to accurately and efficiently solve problems.
T4 (T52) Use appropriate tools strategically to deepen understanding of mathematical concepts.
T5 (T20) Compose and decompose numbers to establish relationships, perform operations, and solve problems.
T6 (T23) Use functions or equations to model relationships among quantities.

Meaning

- Use the properties of exponents to interpret expressions for exponential functions. For example, 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. *CCSS.MATH.CONTENT.HSF.IF.C.8.B*
- Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. *CCSS.MATH.CONTENT.HSF.LE.A.1.C*
- For exponential models, express as a logarithm the solution to abct = 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*
- Interpret the parameters in a linear or exponential function in terms of a context. *CCSS.MATH.CONTENT.HSF.LE.B.5*
- 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*
- Look for and express regularity in repeated reasoning. *CCSS.MATH.MP.8*
- Reason abstractly and quantitatively. *CCSS.MATH.MP.2*

Understandings	Essential Questions
U1 (U511) Placing a problem in a category gives you a familiar approach to solving it. **U2** (U561) Recognition of patterns and structures fosters efficiency in solving problems. **U3** (U201) The same value can be represented in multiple ways. **U4** (U202) The application of specific properties and order of operations can simplify expressions, solve equations, and combine functions. **U5** (U203) Certain mathematical manipulations preserve the relationship in an expression or equation, even though they change the representation.	**Q1** (Q513) How could this strategy be used to solve similar problems? **Q2** (Q510) What type(s) of problem is this? **Q3** (Q572) How does understanding the pattern/structure help me solve the problem? **Q4** (Q201) How can I represent this information in symbols/equations/models? **Q5** (Q206) How do I evaluate this function or solve the equation? (Gr. 6-12)

Acquisition of Knowledge and Skill

Knowledge	Skills
	S1 Simplify expressions using rational exponents **S2** Rewrite expressions involving radicals and rational exponents **S3** Solve equations by changing the base **S4** Evaluate and solve logarithmic expression/equations **S5** Apply the change of base formula to simplify logarithmic expressions/equations

		S6 Apply properties of logarithms to simplify/expand problems **S7** Write the inverse of a logarithmic and exponential function **S8** Solve exponential equations using logarithms **S9** Apply exponentials to real-world models **S10** Understand that a logarithm is an exponent **S11** Understand the relationship between exponential and logarithmic form of an equation/expression **S12** Understand the difference between a common logarithm and natural logarithm **S13** Understand a logarithmic function and an exponential function with the same base are inverse functions

Stage 3: Learning Plan

Coding	Code	Description of Learning Activity