**Algebra 3-4**

**Unit 7: Exponential and Logarithmic Functions**

Designer(s): OPS Secondary Math Department Grade Level: Algebra 3-4, 2013

Exponential and Logarithmic Functions

Unit Overview

Logarithms provide a way to work with the inverses of exponential functions. Exponential functions model what some might call “explosive” growth, but logarithmic values grow very slowly. Decibels are logarithms that measure sound, and when sound energy increases dramatically, the decibel values creep upward. A few extra decibels can bust your eardrums!

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| **Unit 7: Exponential and Logarithmic Functions** | | |
| **Essential Questions** | **Standard** | **Objectives**  F= Factual C=Conceptual D=Debatable |
| * 1. How do you model a quantity that changes regularly over time by the same percentage? | 12.3.1.e  12.3.2.d | * Students will model situations with exponential functions (C) |
| * 1. How are exponents and logarithms related? | 12.3.1.d | * Students will use exponents to solve logarithmic equations and logarithms to solve exponential equations (C) |
| * 1. How are exponential functions and logarithmic functions related? | 12.3.1.e | * Students will show that exponents and logarithms are inverse functions (C) * Students will graph exponential and logarithmic functions (C) |

**Unit 7: Exponential and Logarithmic Functions**

**Critical Content and Skills:**

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| *Knowledge Statements*  Students will know…   1. **Vocabulary**: exponential function, asymptote, exponential growth, logarithm, common logarithm, logarithmic function, Change of Base Formula, logarithmic equation, exponential equation, natural logarithmic function 2. Exponential models 3. Properties of exponential functions 4. Properties of logarithms 5. Exponential and logarithmic equations | *Key Skill Statements*  Students will know how to…   1. Write and solve an exponential growth or decay model 2. Write and solve a continuously compounded interest problem 3. Graph an exponential function using transformations 4. Rewrite logarithms into exponential form 5. Expand and condense logarithms 6. Solve equations using properties of exponential and logarithmic functions |

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| **Algebra 3-4**  **Unit 7: Exponential and Logarithmic Functions** | | | |
| **Advanced**  **Score 4.0** | In addition to the Proficient (3.0) performance, makes ***indepth*** inferences and extended applications of what was learned, including connections to other experiences. | | * Solve real-life models involving logarithmic functions * Given an exponential model, solve for the exponent * Condense and solve a logarithmic equation |
|  | **Proficient +**  **Score 3.5** | In addition to the complex ideas and processes (Proficient 3.0) performance, ***partial success*** at in-depth inferences and extended applications of what was learned, including connections to other experiences. | |
| **Proficient**  **Score 3.0** | ***No major*** errors or omissions regarding any of the information and simple (Basic, 2.0) or complex processes (Proficient, 3.0) that was explicitly taught. | | * Graph an exponential function using transformations * Write an equation for and solve an exponential model * Expand and condense logarithms * Solve exponential and logarithmic equations |
|  | **Basic +**  **Score 2.5** | ***No major*** errors or omissions regarding any of the information and/or simpler details and processes (Basic, 2.0) and ***partial*** knowledge of the more complex ideas and processes (Proficient, 3.0) | |
| **Basic**  **Score 2.0** | ***No major*** errors or omissions regarding the simpler details and processes (Basic, 2.0), but ***major*** errors or omissions regarding the more complex ideas and processes (Proficient, 3.0). | | * Determine if an equation models exponential growth or decay * Solve an exponential model given the equation * Convert between exponential and logarithmic form * Evaluate or simplify a logarithm * Use the Change of Base Formula |
| **Below Basic**  **Score 1.0** | A ***partial*** understanding of ***some*** of the simpler details and processes (Basic, 2.0), but ***major*** errors or omissions regarding the more complex ideas and processes. | | |
| **Failing**  **Score 0** | ***No*** evidence or ***insufficient*** evidence of student learning. | | |

Algebra 3-4 Name

Pd Date

**Unit 7 Assessment**

**Determine whether each function is an example of exponential growth or decay. (L2)**

1. 2.

1. 2.

3. You put $2000 into an account earning 4% interest compounded continuously. Find the amount in the account at the end of 8 years. (L3)

3.

4. Robert invested $800 in a bank account. The account has an annual interest rate of 5.5%. How much money will be in the account after 12 years? (L3)

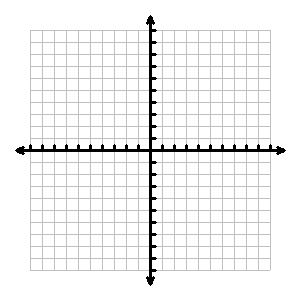
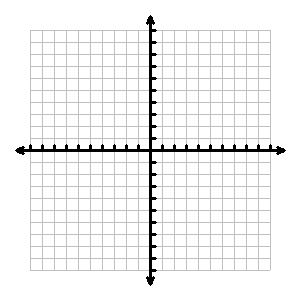
4.

5. The population of a bee colony is declining at a rate of 2.3% each year. There are currently 10,200 bees in the colony. How many bees will there be in 5 years? (L3)

5.

6. A parent increases a child’s allowance by 15% each year. If the allowance was $3 on the child’s 5th birthday, how old will the child be when the allowance is $15? (L4)

6.



**Graph each function. (L3)**

7. 8.

9. Write the equation in exponential form. (L2)

9.

10. Write the equation in logarithmic form. (L2)

10.

**Evaluate each logarithm. (L2)**

11. 12. 13.

**Write each logarithmic expression as a single logarithm. (L3)**

14. 15.

16. Use the Change of Base Formula to evaluate the expression. (L2)

**Solve each equation.**

17. (L3) 18. (L3)

17. 18.

19. (L3) 20. (L4)

19. 20.

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| **Learning Experiences** | **Text Pages/Resources** |
| **Vocabulary (Learning goals 1, 2, and 3)**   * Word wall * Foldable – See Glencoe @2010 Foldables by Dinah Zike for more information * Matching the word to the definition, graph, or example * Anticipation guide (pre and post) |  |
| * **Lesson Resources at the end of each section** * **Online Resources at pearsonsuccessnet.com** | Pearson  Algebra 2  Sections 7-1 through 7-6 |
| **General:**  **Test-Taking Strategy**  Be sure to check the reasonableness of your answer. If students are asked for the balance of a bank account where you were dealing with amounts in the hundreds, it is not reasonable to give an answer in the millions. To make sure the answer to a problem is reasonable, you can estimate before you calculate. If the answer is close to your estimate, your answer is probably correct. |  |

**Teacher Notes/Additional Resources**

**General Algebra & Math sites:**

* AlgebraLAB: Making Math & Science Connections [www.algebralab.org](http://www.algebralab.org)
* Classzone from Holt McDougall’s free site includes really cool animations. You and your students will simply need to figure out which chapter in their book relates to what we’re studying. <http://www.classzone.com/cz/books/algebra_1_2011_na/book_home.htm?state=NE>
* Kuta software <http://www.kutasoftware.com> Excellent free worksheets (with answers) <http://www.kutasoftware.com/free.html>
* NCTM’s Figure This! Web site has several challenge problems that are designed for families to do together. <http://figurethis.org/download.htm> These challenges (there are 80 of them!) could be used for daily warm-ups in class (several involve estimation), weekly Problem-of-the-Week, and even a challenge problem along with their homework, if relevant.
* Math is Fun! Includes an illustrated math dictionary and helpful tutorials for students. [www.mathisfun.com](http://www.mathisfun.com)
* Daily Math Review <http://www.aea11.k12.ia.us/E2T2/dmr.html>
* Great online timer: <http://www.online-stopwatch.com>
* Porta Portal’s consolidated resource list <http://guest.portaportal.com/mrburke>
* Algebra2Go <http://www.saddleback.edu/faculty/lperez/algebra2go/index.html>
* About.com Education site has great warm ups <http://712educators.about.com/cs/warmups/l/blwarmmath.htm>
* Southern Regional Education Boards Instructional Resources <http://www.evalutech.sreb.org/InstResources/index.asp>

**Books:**

* Various resources provided by publishers for the book selection process

**Videos:**

* BrainPop [www.brainpop.com](http://www.brainpop.com)
* Teacher Tube [www.teachertube.com](http://www.teachertube.com)