NAME _____ DATE _____ PERIOD _____

8-4 Word Problem Practice

Solving Logarithmic Equations and Inequalities

1. FISH The population of silver carp has been growing in the Mississippi River. About every 3 years, the population doubles. Write logarithmic expression that gives the number of years it will take for the population to increase by a factor of ten.

2. POWERS Haley tries to solve the equation $\log_4 2x = 5$. She got the wrong answer. What was her mistake? What should the correct answer be?

1.	$\log_4 2x = 5$
2.	$2x = 4^5$
3.	$x = 2^5$
4.	$x = 32$

3. DIGITS A computer programmer wants to write a formula that tells how many digits there are in a number n, where n is a positive integer. For example, if $n = 343$, the formula should evaluate to 3 and if $n = 10{,}000$, the formula should evaluate to 5. Suppose $8 \leq \log_{10} n < 9$. How many digits does n have?

4. LOGARITHMS Pauline knows that $\log_b x = 3$ and $\log_b y = 5$. She knows that this is the same as knowing that $b^3 = x$ and $b^5 = y$. Multiply these two equations together and rewrite it as an equation involving logarithms. What is $\log_b xy$?

5. MUSIC The first note on a piano keyboard corresponds to a pitch with a frequency of 27.5 cycles per second.

With every successive note you go up the white and black keys of a piano, the pitch multiplies by a factor of $\sqrt[12]{2}$. The formula for the frequency of the pitch sounded when the nth note up the keyboard is played is given by

$$n = 1 + 12 \log_2 \frac{f}{27.5}.$$

a. The pitch that orchestras tune to is the A above middle C. It has a frequency of 440 cycles per second. How many notes up the piano keyboard is this A?

b. Another pitch on the keyboard has a frequency of 1760 cycles per second. How many notes up the keyboard will this be found?