NAME _____ DATE _____ PERIOD _____

8-5 Word Problem Practice

Properties of Logarithms

1. MENTAL COMPUTATION Jessica has memorized $\log_5 2 \approx 0.4307$ and $\log_5 3 \approx 0.6826$. Using this information, to the nearest ten-thousandth, what power of 5 is equal to 6?

2. POWERS A chemist is testing a soft drink. The pH of a solution is given by

$$-\log_{10} C,$$

where C is the concentration of hydrogen ions. The pH of a popular soft drink is 2.5. If the concentration of hydrogen ions is increased by a factor of 100, what is the new pH of the solution?

3. LUCKY MATH Frank is solving a problem involving logarithms. He does everything correctly except for one thing. He mistakenly writes

$$\log_2 a + \log_2 b = \log_2 (a + b).$$

However, after substituting the values for a and b in his problem, he amazingly still gets the right answer! The value of a was 11. What must the value of b have been?

4. LENGTHS Charles has two poles. One pole has length equal to $\log_7 21$ and the other has length equal to $\log_7 25$. Express the length of both poles joined end to end as the logarithm of a single number.

5. SIZE Alicia wanted to try to quantify the terms *tiny, small, medium, large, big, huge,* and *humongous.* She picked a number of objects and classified them with these adjectives of size. She noticed that the scale seemed exponential. Therefore, she came up with the following definition. Define S to be $\frac{1}{3}\log_3 V$, where V is volume in cubic feet. Then use the following table to find the appropriate adjective.

S satisfies	Adjective
$-2 \le S < -1$	tiny
$-1 \le S < 0$	small
$0 \le S < 1$	medium
$1 \le S < 2$	large
$2 \le S < 3$	big
$3 \le S < 4$	huge
$4 \le S < 5$	humongous

a. Derive an expression for S applied to a cube in terms of ℓ where ℓ is the side length of a cube.

b. How many cubes, each one foot on a side, would have to be put together to get an object that Alicia would call "big"?

c. How likely is it that a large object attached to a big object would result in a huge object, according to Alicia's scale?