Puzzling with Properties

Name:_____

In Algebra you learned some patterns for combining exponents. Today we are going to explore what happens when we combine logarithms.

1. Complete the following table using your calculator. Round answers to four decimal places.

$\log 12$	
$\log 3 + \log 4$	
$\log 9$	
$\log 3 + \log 3$	
$\log 18$	
$\log 6 + \log 3$	

2. Using the patterns you see in the table, complete the equation below.

$$\log x + \log y =$$

3. How could we find the value of $\log 30$ if the "3" button is missing on our calculator?

4. Complete the following table using your calculator. Round answers to four decimal places.

$\log 5$	
$\log 10 - \log 2$	
$\log 7$	
$\log 28 - \log 4$	
$\log \frac{1}{2}$	
$\log 3 - \log 6$	

5. Using the patterns you see in the table, complete the equation below.

$$\log x - \log y =$$

6. How could we find the value of $\log 30$ if the "3" button is missing on our calculator?

7. A student noticed that $\log \frac{1}{2}$ gave the same result as $-\log 2$. How is this possible?

8. Saul was practicing evaluating logarithms on his calculator on Halloween. After he had finished all the calculations he was startled at the results. He was sure that a ghost has haunted his calculator and broken it. What do you think? Can you make sense of the results? Is his calculator haunted?

$\log 5 + \log 5 = 1.398$	$\log 4 + \log 4 + \log 4 = 1.806$
$2 \log 5 = 1.398$	$3 \log 4 = 1.806$
$\log 5^2 = 1.398$	$\log 4^3 = 1.806$
$\log 25 = 1.398$	$\log 64 = 1.806$
$\frac{1}{2} \log 625 = 1.398$	$\log 2^6 = 1.806$
	$6 \log 2 = 1.806$

9. Write two more log statements that are also equal to 1.806.

Section 3.6—Logarithm Properties

Important Ideas:

Check Your Understanding!

1. Expand each logarithmic expression.
   a. $\log_4 5xy$ b. $\ln \frac{4w}{7}$

2. Condense each logarithmic expression.
   a. $\log_3 x + \log_3 x$ b. $2\ln 5 - \ln 4$

3. Which of the following is NOT equivalent to $\log 16$?
   A) $2\log 4$
   B) $\log 8 + \log 2$
   C) $\log 64 - \log 4$
   D) $\frac{1}{2}\log 256$
   E) They are all equivalent

4. Chandler was asked to rewrite $\log_2 32a^3$, then simplify. Her work is shown below.

   Step 1: $\log_2 32a^3 = \log_2 32 + \log_2 a^3$
   Step 2: $= 5 + \log_2 a^3$
   Step 3: $= 5 + 3\log_2 a$
   Step 4: $= 8\log_2 a$

   In which step did Chandler make her first mistake? Explain.