



Puzzling with Properties



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.

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

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

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

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

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.



Lesson 5.6— Manipulating Logarithmic Expressions

QuickNotes

Check Your Understanding

1. Condense each logarithmic expression.

a. $\log_3 4 + \log_3 w - \log_3 7$

b. $2\ln 5 - \ln 4$

2. a. Complete the table of values for $y = 2^x$ and $y = 8^x$.

x	0	1	2	3	4	5	6
$y = 2^x$							
$y = 8^x$							

b. Write an equation relating $\log_2 w$ and $\log_8 w$.

3. The parent function $y = \log x$ was stretched horizontally by a factor of 100 to create the graph of f . Which of the following transformations on the parent function would produce the same graph as f ?

- A) A vertical shrink by a factor of 100
- B) A horizontal shift 2 units to the right
- C) A vertical shift 2 units down
- D) A vertical shift 100 units up

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.