Name: Period: Date:

Math Lab: Properties of Logs

Estimating Log Values

1. Evaluate these logs without using a calculator. $\log 1 =$____, $\log 10 =$____, $\log 100 =$_____.

2. What pattern do you notice?

3. Write a rule for this pattern: $\boxed{\log(10^n) = \quad}$

4. Use the pattern to complete the table below.

n	1	2	3	4	5	6	7	8	9
log n				.602			.845		

n	10	20	30	40	50	60	70	80	90
log n			1.4771		1.699			1.903	

n	100	200	300	400	500	600	700	800	900
log n		2.301				2.778			2.954

5. What pattern do you notice going across each row?

Investigating Properties of Logs

Use your slide rule to complete the equations in the tables below.

$\log 2 + \log 3 =$	$\log 3 + \log 20 =$
$\log 5 + \log 8 =$	$\log 30 + \log 10 =$

6. What pattern do you notice in these expressions?

7. Write a rule for this pattern: $\boxed{\log_b m + \log_b n = \quad}$

$\log 10 - \log 5 =$	$\log 200 - \log 20 =$
$\log 9 - \log 3 =$	$\log 20 - \log 4 =$

8. What pattern do you notice in these expressions?

9. Write a rule for this pattern: $\boxed{\log_b m - \log_b n =}$

Use your results from the exercises above to answer the following without using a slide rule.

$\log 7 + \log 7 =$	$2 \log 7 =$
$\log 2 + \log 2 + \log 2 =$	$3 \log 2 =$
$\log 3 + \log 3 + \log 3 + \log 3 =$	$4 \log 3 =$

10. What pattern do you notice in these expressions?

11. Write a rule for this pattern: $\boxed{n \log_b m =}$

Use Properties of Logs to Evaluate

12. $\log_{32} 2 + \log_{32} 4 =$

13. $\ln \frac{1}{e^2} + \ln e^2 =$

14. $\log_{1/2} 3x - \log_{1/2} 6x =$

15. $2 \log_2 \left(\frac{1}{4}\right) =$

Extend Your Thinking

16. Use properties of logs to explain why this rule works: $\boxed{\log_{\mathrm{b}}(b^n) = n}$