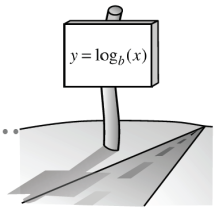
cw#___ Name:_____

5.2.2 How are the properties related?



Properties of Logarithms

#51 Use graphing technology to generate the table below. Then work with your team to identify patterns within the table. Be sure to extend your table far enough to confirm your patterns. You do not need every value, but recording useful values may be helpful to identify patterns. Which values are helpful? How many patterns can you find?

x	
$\log_2(x)$	

Describe any patterns you are seeing below:

#52 Now use the table you created and/or the patterns you noticed to rewrite each expression as a single logarithm.

a. $\log_2(2) + \log_2(3)$	b. $\log_2(3) + \log_2(5)$
c. $\log_2(12) - \log_2(6)$	d. $\log_2(15) - \log_2(3)$

#53 With your team, summarize the patterns you identified. Then explain why the patterns work. Be prepared to share your findings with the class.

#54 Do the patterns you identified in problem 5-53 work for logarithms in any base? Answer this question by completing the following table. Choose appropriate input values for your base.

x	
$\log_3(x)$	

Do the patterns you found work for any base?

#55 Now for a final property of logarithms! What is it? Complete the tables below. Be sure to use a variety of types of numbers.

x	
$\log_2(x)$	
$\log_2(x^4)$	

x	
$\log_3(x)$	
$\log_3(x^2)$	

Identify any patterns you notice.

56. Now use the tables you created and/or the patterns you noticed in problem 5-55 to write at least two equivalent expressions for each given expression.

a. $\log_7(x) + \log_7(x)$

Equivalent expression #1

Equivalent expression #2

b. $\ln(a) + \ln(a) + \ln(a) + \ln(a)$

Equivalent expression #1

Equivalent expression #2

c. $5\log(m)$

Equivalent expression #1

Equivalent expression #2

d. $\log_b(n) + \log_b(n) + \log_b(n)$

Equivalent expression #1

Equivalent expression #2

#57 Mr. Cooper decides to hold a contest with his students. He gives teams the following expression and tells them they have one minute to write as many equivalent expressions as they can.

$$\log_2(8) + \log_2(8) + \log_2(8)$$

After 59 seconds Maddie's and David's teams each have six expressions, so when David quickly adds a 9 to his list Mr. Cooper declares, *"David's team wins!" "Mr. Cooper,"* Maddie exclaims, as she rolls her eyes, *"You didn't even check to see if all of the expressions were correct."*

Maddie's Team	David's Team
$3\log_2(8)$	$\log_2(24)$
$\log_2(512)$	$\frac{\log_2(1024)}{\log_2(2)}$
$\log_2(8^3)$	$\log_2(2^9)$
$\log_2\left(\frac{1024}{2}\right)$	$9\log_2(2)$
$\log_2(1024) - \log_2(2)$	$3\log_2(2^3)$
$3 + 3 + 3$	$\log_2(1024) - \log_2(512)$
	9

#57 Questions		
a. Whose team wins? Why?	b. Write three equivalent expressions neither team used.	c. Choose one incorrect expression and explain what misconception the students might have had.