Title: Logarithms (Properties)
Class: Math 107 or Math 111 or Math 120 or Math 137
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Instructions to Tutor: Read instructions and follow all steps for each problem exactly as given.
Keywords/Tags: logarithms, properties of logarithms, logs, simplifying logarithms, rewriting logarithms

Logarithms (Properties)

Purpose: This is intended to refresh your skills in working with the properties of logarithms. This includes simplifying logarithms and rewriting logarithms.

Activity: Work through the following activity and examples. Do all of the practice problems before consulting with a tutor.

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The rules that govern the use of logarithms can become "familiar" for two reasons:
     i)   logarithms are <u>exponents</u> (so their rules are the rules of exponents)
     ii)   logarithms are <u>functions</u> (where "log_b" is the *name* of the function)

$$(\text{for example, } f(16) = log_4(16) = log_4 16 = 2)$$

Basic Rules for Logarithms: for $b > 0, b \neq 1$, and $m > 0, n > 0$

    1) $log_b(mn) = log_b m + log_b n$

    2) $log_b\left(\dfrac{m}{n}\right) = log_b m - log_b n$

    3) $log_b(m^p) = p\, log_b m$

$log_2(2 \cdot 8) = log_2 2 + log_2 8$ $log_2\left(\dfrac{2}{8}\right) = log_2 2 - log_2 8$ $log_2 2^8 = 8\, log_2 2$

$(Verify: \quad log_2 16 = 1 + 3)$ $\left(Verify: \quad log_2\left(\dfrac{1}{4}\right) = 1 - 3\right)$ $(Verify: \quad log_2 256 = 8 \cdot 1)$

But not all logs can be rewritten. Some common mistakes:

    $log_b(m + n) \neq log_b m + log_b n$ (log_b is a function name, and we can <u>not</u> distribute function names)

    $(log_b m)(log_b n) \neq log_b(mn)$

    $\dfrac{log_b m}{log_b n} \neq log_b\left(\dfrac{m}{n}\right)$

    $(log_b m)^p \neq p\, log_b m = log_b(m^p)$

Practice: Rewrite, then simplify:

$log_5(25 \cdot 25) =$ $log_7\left(\dfrac{1}{49}\right) =$ $log_7 7^3 =$

$log_6 6 + log_6 36 =$

$log_6 6 - log_6 36 =$

$log_6 6^{-2} =$

Extended Questions:

$log_6 (6 + 36) =$

$\dfrac{log_7 49}{log_7 7} =$

$(log_6 6)^2 =$

$log_6 36 + log_5 25 =$

(answer: $log_6 42$)

(answer: 2)

(answer: 1)

(answer: 4)

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Review: Meet with a tutor to verify your work on this worksheet and discuss some of the areas that were more challenging for you. If necessary, choose more problems from the homework to practice and discuss with the tutor.

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For Tutor Use: Please check the appropriate statement:

_____ Student has completed worksheet but may need further assistance. Recommend a follow-up with the instructor.

_____ Student has mastered topic.