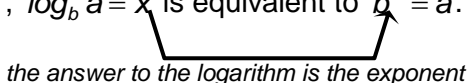**Title:** Logarithms (Definition)
Class: Math 107 or Math 111 or Math 120 or Math 137
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Instructions to Tutor: Read instructions and follow all steps for each problem exactly as given.
Keywords/Tags: logarithms, definition of logarithm, logs, rewriting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

Logarithms (Definition)

Purpose: This is intended to refresh your skills in rewriting logarithms as exponential expressions.

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

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- **Definition:** for $b > 0$, $b \neq 1$, $log_b\, a = x$ is equivalent to $b^x = a$.

    the answer to the logarithm is the exponent

You can rewrite any logarithm as an exponential.

When you are asked to simplify or find a logarithm, if you don't know the answer, give it a "name" and rewrite the logarithm equation as an exponential equation.

Find $log_4\, 16$.

   1) Give it a name: $log_4\, 16 = c$

   2) Rewrite as an exponential: $4^c = 16$

   3) Solve (rewrite so both sides $4^c = 4^2$
      are powers of the same base) $\therefore c = 2$ ($\therefore$ means "therefore")

   4) Rewrite the original: $log_4\, 16 = 2$

Find $log_4\, 64$	Find $log_4\, 2$	Find $log_4\, \frac{1}{4}$	Find $log_4\, 1$
$log_4\, 64 = c$	$log_4\, 2 = c$	$log_4\, \frac{1}{4} = c$	$log_4\, 1 = c$
$4^c = 64$	$4^c = 2$	$4^c = \frac{1}{4}$	$4^c = 1$
$4^c = 4^3$	$4^c = 4^{\frac{1}{2}}$	$4^c = 4^{-1}$	$4^c = 4^0$
$\therefore c = 3$	$\therefore c = \frac{1}{2}$	$\therefore c = -1$	$\therefore c = 0$
$log_4\, 64 = 3$	$log_4\, 2 = \frac{1}{2}$	$log_4\, \frac{1}{4} = -1$	$log_4\, 1 = 0$

After you get used to this, you can often just write down the answer. Just say to yourself, "What power do I raise (the base) to in order to get (the number I'm taking the log of)?"

$log_2\, 8 = 3$ (What power do I raise 2 to in order to get 8? 3.)

$log_5\, 25 = 2$ (What power do I raise 5 to in order to get 25? 2.)

$log_7\, 1 = 0$ (What power do I raise 7 to in order to get 1? 0.)

Practice:

$log_5\,125 =$ $log_6\,36 =$ $log_2\,32 =$ $log_7\,49 =$

$log_6\,\frac{1}{36} =$ $log_5\,\frac{1}{125} =$ $log_{25}\,5 =$ $log_{36}\,6 =$

$log_9\,9 =$ $log_9\,3 =$ $log_9\,81 =$ $log_9\,\frac{1}{81} =$

Extended Questions:

$log_5\,(-25) =$ $log_5\,0 =$

(Both answers to the extended questions are **none**. Do you know why?)

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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.