

# LOGARITHM CONCEPTS – THE LOGARITHM EXPLAINED BY ANALOGY TO ROOTS\*

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## Abstract

This module discusses another way of understanding logarithms by providing an analogy to roots.

The logarithm may be the first really new concept you've encountered in Algebra II. So one of the easiest ways to understand it is by comparison with a familiar concept: roots.

Suppose someone asked you: "Exactly what does root mean?" You do understand roots, but they are difficult to define. After a few moments, you might come up with a definition very similar to the "question" definition of logarithms given above.  $\sqrt[3]{8}$  means "what number cubed is 8?"

Now the person asks: "How do you find roots?" Well...you just play around with numbers until you find one that works. If someone asks for  $\sqrt{25}$ , you just have to know that  $5^2 = 25$ . If someone asks for  $\sqrt{30}$ , you know that has to be bigger than 5 and smaller than 6; if you need more accuracy, it's time for a calculator.

All that information about roots applies in a very analogous way to logarithms.

	Roots	Logs
The question	$\sqrt[x]{a}$ means "what number, raised to the a power, is x?" As an equation, $?^a = x$	$\log_a x$ means "a, raised to what power, is x?" As an equation, $a^? = x$
Example that comes out even	$\sqrt[3]{8} = 2$	$\log_2 8 = 3$
Example that doesn't	$\sqrt[3]{10}$ is a bit more than 2	$\log_2 10$ is a bit more than 3
Out of domain example	$\sqrt{-4}$ does not exist ( $x^2$ will never give $-4$ )	$\log_2(0)$ and $\log_2(-1)$ do not exist ( $2^x$ will never give 0 or a negative answer)

Table 1

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