

What is a Logarithm?

U3IF1: I can apply properties of logarithms.

A logarithm answers the question, "How many of a certain number do we need to multiply to get another number?"

Parts of a logarithm:

$$\log_b a = c$$

↖ argument
↖ exponent
↖ base

Which can be rewritten as

$$b^c = a$$

↖ exponent
↖ argument
↖ base

Practice finding the value of the logarithms below:

1) $\log_2 8$ **3**
 Think: What exponent can I raise the base (2) to, to get 8? *because $2^3 = 8$*

2) $\log_3 9$ **2**
 Think: What exponent can I raise the base 3 to, to get _____?

3) $\log_4 \frac{1}{4}$ **-1**

Think: What exponent can I raise 4 to, to get $\frac{1}{4}$?
because $4^{-1} = \frac{1}{4}$

4) $\log_5 -25$ **No Solution**
 Think: what exponent can I raise 5 to, to get 25?

We are rewriting exponents!!

Rewrite the following in exponential form:

5) $\log_3 81 = 4$
 $3^4 = 81$

6) $\log_2 \frac{1}{8} = -3$
 $2^{-3} = \frac{1}{8}$

Rewrite the following in logarithmic form:

7) $5^2 = 25$
 $\log_5 25 = 2$

8) $4^{-2} = \frac{1}{16}$
 $\log_4 \frac{1}{16} = -2$

Evaluate (find the value of) each logarithm and write the question you would ask yourself! Then write each in exponential form.

Logarithmic Form

1) $\log_{10} 10000 = 4$

Question: What exponent do I raise 10 to, to get 10000?

2) $\log_4 16 = 2$

Question: What exponent do I raise 4 to, to get 16?

3) $\log_2 64 = 6$

Question: What exponent do I raise 2 to, to get 64?

4) $\log_5 5 = 1$

Question: What exponent do I raise 5 to, to get 5?

5) $\log_{17} 1 = 0$

Question: What exponent do I raise 17 to, to get 1?

6) $\log_{16} \frac{1}{16} = -1$

Question: What exponent do I raise 16 to, to get 1/16?

* 7) $\log_9 3 = \frac{1}{2}$

Question: What exponent do I raise 9 to, to get 3?

8) $\log_{20} 1 = 0$

Question: What exponent do I raise 20 to, to get 1?Exponential Form

$10^4 = 10000$

$4^2 = 16$

$2^6 = 64$

$5^1 = 5$

$17^0 = 1$

$16^{-1} = \frac{1}{16}$

$9^{\frac{1}{2}} = 3$

$20^0 = 1$