Unit 4 Lesson 9: What is a Logarithm?

1 Math Talk: Finding Solutions (Warm up)

Student Task Statement

Find or estimate the value of each variable mentally.

$4^a = 16$

$4^b = 2$

$4^{\frac{5}{2}} = c$

$4^d = 56$

2 A Table of Numbers

Student Task Statement

x	$\log_{10}(x)$
2	0.3010
3	0.4771
4	0.6021
5	0.6990
6	0.7782
7	0.8451
8	0.9031
9	0.9542
10	1

x	$\log_{10}(x)$
20	1.3010
30	1.4771
40	1.6021
50	1.6990
60	1.7782
70	1.8451
80	1.9031
90	1.9542
100	2

x	$\log_{10}(x)$
200	2.3010
300	2.4771
400	2.6021
500	2.6990
600	2.7782
700	2.8451
800	2.9031
900	2.9542
1,000	3

x	$\log_{10}(x)$
2,000	3.3010
3,000	3.4771
4,000	3.6021
5,000	3.6990
6,000	3.7782
7,000	3.8451
8,000	3.9031
9,000	3.9542
10,000	4

1. Analyze the table and discuss with a partner what you think the table tells us.
2. Use the table to find the value of the unknown exponent that makes each equation true.
   a. $10^w = 1{,}000$
   b. $10^y = 9$
   c. $10^z = 90$
3. Notice that some values in the columns labeled $\log_{10} x$ are whole numbers, but most are decimals. Why do you think that is?

3 Hello, Logarithm!

Student Task Statement

1. Here are two true equations based on the information from the table:

$$\log_{10} 100 = 2$$
$$\log_{10} 1{,}000 = 3$$

   What values could replace the "?" in these equations to make them true?

   a. $\log_{10} 1{,}000{,}000 = ?$

   b. $\log_{10} 1 = ?$

   c. $\log_{10} ? = 4$

2. Between which two whole numbers is the value of $\log_{10} 600$? Be prepared to explain how do you know.

3. The term *log* is short for **logarithm**. Discuss the following questions with a partner and record your responses:
   a. What do you think logarithm means or does?

   b. Next to "log" is a subscript—a number or letter printed smaller and below the line of text. What do you think the subscript tells us?

   c. What about the other two numbers on either side of the equal sign (for example, the 100 and the 2 in $\log_{10} 100 = 2$)? What do they tell us?