Problem 1 – Logarithms in base 10

What exactly is the log or logarithm function? To learn about it, enter the expression $=10^x$ in the formula bar of Column B and $=\log_{10}(10^x)$ in the formula bar of Column C on page 1.2.

What do you notice about the numbers in the three columns?

1. What is the value of 10^3?

2. What is the value of log 10^3?

To learn more about these functions, enter the equations $y=10^x$ and $y=\log_{10}(10^x)$ in *f1* and *f2* on page 1.6.

3. Why does the graph of $y=\log(10^x)$ appear to be the same as the graph of $y = x$?

Display a table of values. Set the **Table Start** and **Table Step** to show negative values of *x* (negative exponents) and fractional values of *x* (Use a step size such as 0.25).

4. Do the relationships between the numbers in the three columns that you noticed on page 1.6 remain the same?

Evaluate log(100) on page 1.10.

5. When you type log(100) and press enter, how does the handheld change the expression you entered?

On page 1.13, drag the log expressions on the left next to the exponential equation that it matches. Then evaluate the log expressions using the direction given on your handheld. Write the log expression next to the matching exponential equation below.

Logarithm Expression	Exponential Equation
	$10^x = 10$
	$10^x = 0.01$
	$10^x = 250$
	$10^x = 2$
	$10^x = 1000$

6. What is the value of 10^3?

7. What is the value of $\log 10^3$?

A very powerful idea in studying logarithms is the change-of-base property.

This property states $\log_b a = \dfrac{\log a}{\log b}$.

It can be used to evaluate a logarithm of any base as the ratio of two logarithms both in base 10. Use this change of base property to evaluate $\log_4(64)$.

With the TI-Nspire, you can easily evaluate a logarithm of any base by using the logarithm template. Use this feature to solve for x in the equation $4^x = 256$.

On page 2.8, drag the log expressions on the left next to the exponential equation that it matches. Then evaluate the log expressions using the direction given on your handheld. Write the log expression next to the matching exponential equation below.

Logarithm Expression	Exponential Equation
	$2^x = 128$
	$4^x = \dfrac{1}{64}$
	$4^x = 16$
	$4^x = 2$
	$64^x = 100$

Display a table of values. Set the **Table Start** and **Table Step** to show negative values of *x* (negative exponents) and fractional values of *x* (Use a step size such as 0.25).

8. Do the relationships between the numbers in the three columns that you noticed on page 1.6 remain the same?