Logarithms
A logarithm is an exponent!

For some good "revision" notes go to:
http://www.ibmaths.com/slnotes/logs%20and%20exp.pdf

You might be a little rusty with logs, so we'll go a little slower on this chapter.

exponent

If $a^x = b$, then $x = \log_a b$ ← base

In action: $10^3 = 1000$ so $3 = \log_{10} 1000$

Let's rewrite some examples:

$\log_{10} 100 = 2$

$10^2 = 100$

$\log_{10}(0.01) = -2$

$10^{-2} = .01$

$\log_2(16) = 4$

$2^4 = 16$

$2^{-2} = \frac{1}{4}$

$\log_2 \frac{1}{4} = -2$

Let's look at page 89 #3, 4, and 5

3n $\log_2 \sqrt[3]{2} = \frac{1}{3}$ because $2^{\frac{1}{3}} = \sqrt[3]{2}$

3q $\log_t \frac{1}{t} = -1$ because $t^{-1} = \frac{1}{t}$

- Our TI has both a $\log_{10}$ key and a ln key.

The logarithm of a positive number, in base 10, is its power of 10.

#4 pg 89

$\log_{10} 152 \doteq 2.18$

$\log_{10} 25 \doteq 1.397$

$\log_{10} 74 \doteq 1.87$

$\log_{10} .8 \doteq -.0969$

- $a = 10^{\log a}$ for $a > 0$ and $\log 10^x = x$

Let's look at Example 5 on page 91.

Example 5

Use your calculator to write the following in the form 10^x where x is correct to 4 decimal places: **a** 8 **b** 800 **c** 0.08

a $8 = 10^{\log 8} \doteq 10^{0.9031}$

{ log 8 ENTER }

b $800 = 10^{\log 800} \doteq 10^{2.9031}$

{ log 800 ENTER }

c $0.08 = 10^{\log 0.08} \doteq 10^{-1.0969}$

{ log 0.08 ENTER }

Try page 91 #3

3a $6 = 10^{\log 6}$

$6 \doteq 10^{.7782}$

$6000 = (6)(10^3)$

3c $6000 = 10^{\log 6000}$

$= 10^{\log 6} 10^{\log 1000}$

$\doteq 10^{.7782+3}$

$\doteq 10^{3.7782}$

Now let's do the investigation on page 92!

INVESTIGATION DISCOVERING THE LAWS OF LOGARITHMS

What to do:

$\log a + \log b = \log(ab)$

1 Use your calculator to find

a	$\log 2 + \log 3$	**b**	$\log 3 + \log 7$	**c**	$\log 4 + \log 20$
d	$\log 6$	**e**	$\log 21$	**f**	$\log 80$

From your answers, suggest a possible simplification for $\log a + \log b$.

$\log a - \log b = \log \frac{a}{b}$

2 Use your calculator to find

a	$\log 6 - \log 2$	**b**	$\log 12 - \log 3$	**c**	$\log 3 - \log 5$
d	$\log 3$	**e**	$\log 4$	**f**	$\log(0.6)$

From your answers, suggest a possible simplification for $\log a - \log b$.

$\log a^b = b \log a$

3 Use your calculator to find

a	$3 \log 2$	**b**	$2 \log 5$	**c**	$-4 \log 3$
d	$\log(2^3)$	**e**	$\log(5^2)$	**f**	$\log(3^{-4})$

From your answers, suggest a possible simplification for $n \log a$.

The laws of logarithms are in your textbook [and you should already be familiar with them.]

Let's practice by doing #1 on page 93.

Homework: pages 101 &102 Review 4A #1, 2, 3, 4, and 5