Pre-Calculus 12
~~7~~.4 – Logarithms

Name:_____
Block: _____

1. Use your calculator to evaluate the following:	2. Find a pattern to evaluate the following :
$\log 10 = 1$	$\log_2 2 = 1$
$\log 100 = 2$	$\log_2 4 = 2$
$\log 1000 = 3$	$\log_2 8 = 3$
$\log 10\,000 = 4$	$\log_2 16 = 4$
$\log 1\,000\,000\,000 = 9$	$\log_2 64 = 6$
$\log \frac{1}{10} = -1$	$\log_2 \frac{1}{2} = -1$

What do you notice?

$2^3 = 8 \iff \log_2 8 = 3$

exponent, base, exponent, base

We say "log base 2 of 8 equals 3".

Note : A log with base 10 is called a common logarithm, and is written as log x (no base written).

3. Complete the table.

Exponential Form	Logarithmic Form
$3^4 = 81$	$\log_3 81 = 4$
$2^5 = 32$	$\log_2 32 = 5$
$10^2 = 100$	$\log 100 = 2$
$5^0 = 1$	$\log_5 1 = 0$
$x^p = w$	$\log_x w = p$
$10^{-1} = 0.1$	$\log 0.1 = -1$
$10^y = x$	$\log x = y$

4. Evaluate.

a) $\log_2 16 = 4$

$2^{\boxed{4}} = 16$

b) $\log_9 3 = \frac{1}{2}$

$9^{\square} = 3$

c) $\log_5 5^4 = 4$

$5^{\square} = 5^4$

d) $\log_3 \frac{1}{81} = -4$

$3^{\square} = \frac{1}{81}$

e) $\log 10^x = x$

$10^{\square} = 10^x$

f) $\log \sqrt[4]{1000} = \frac{3}{4}$

$10^{\square} = \sqrt[4]{1000}$

$= 1000^{\frac{1}{4}}$

$= 10^{3/4}$

5. Evaluate $\log_2 20$ using benchmarks.

$2^4 = 16 \Rightarrow \log_2 16 = 4$

$2^5 = 32 \Rightarrow \log_2 32 = 5$

$2^{\square} = 20$

$\therefore \log_2 20 \cong 4.3$

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