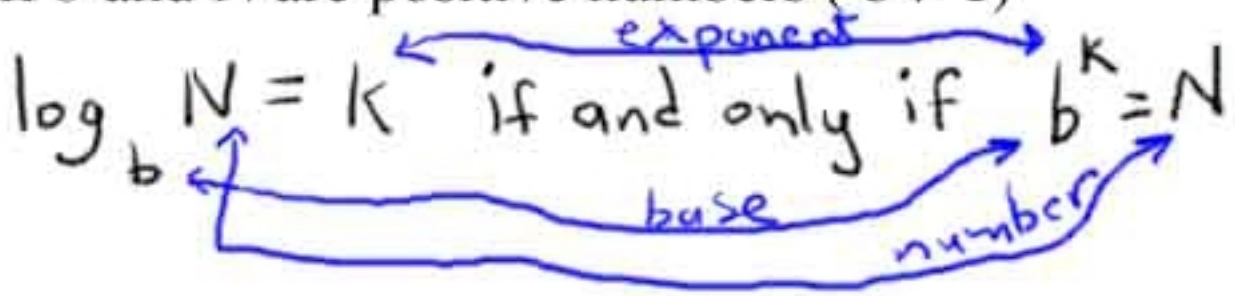
Definition of Logarithm

If b and N are positive numbers ($b \neq 1$)



Rewrite the following exponential functions in logarithmic form, and rewrite the following logarithms in exponential form.

Exponential Form	Logarithmic Form
$2^3 = 8$	$\log_2 8 = 3$
$2^4 = 16$	$\log_2 16 = 4$
$2^0 = 1$	$\log_2 1 = 0$
$2^{-1} = \frac{1}{2}$	$\log_2 \frac{1}{2} = -1$
$2^k = N$	$\log_2 N = k$

Ex 1) Rewrite each equation in exponential form:

1a) $\log_6 36 = 2 \rightarrow 6^2 = 36$

1b) $\log_2 2 = 1 \rightarrow 2^1 = 2$

1c) $\log_{10}(0.001) = -3 \rightarrow 10^{-3} = 0.001$

Ex 2) Rewrite the following in logarithmic form:

2a) $6^0 = 1 \rightarrow \log_6 1 = 0$

2b) $8^{-\frac{2}{3}} = \frac{1}{4} \rightarrow \log_8 \frac{1}{4} = -\frac{2}{3}$

2c) $5^{\frac{3}{2}} = 5\sqrt{5} \rightarrow \log_5 5\sqrt{5} = \frac{3}{2}$

Ex 3) Simplify each logarithm:

3a) $\log_5 25$

$\log_5 25 = x$

$5^x = 25$

$5^x = 5^2$

$x = 2$

3b) $\log_2 8\sqrt{2}$

$\log_2 8\sqrt{2} = x$

$2^x = 8\sqrt{2}$

$2^x = (2^3)(2^{\frac{1}{2}})$

$2^x = 2^{\frac{7}{2}}$

$x = \frac{7}{2}$

3c) $2^{\log_2 7}$

$2^{\log_2 7} = x$

$\log_2 x = \log_2 7$

$x = 7$

Ex 4) Solve each equation:

4a) $\log_4 x = 3$

$4^3 = x$

$x = 64$

4b) $\log_x 81 = 4$

$x^4 = 81$

$\sqrt[4]{x^4} = \sqrt[4]{81}$

$x = 3$