Commonly used formal notation

$\log_b X = Y$

$b^Y = X$

Annotated 'Tam' notation

$\log_{base} Result = Exponent$

Base two examples

$\log_2 8 = 3$ because $2 \times 2 \times 2 = 8$ OR $2^3 = 8$

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

$\log_2 32 = 5$ because $2^5 = 16$

etc.

Base ten examples

$\log_{10} 100 = 2$ because $10^2 = 100$

$\log_{10} 1000 = 3$ because $10^3 = 1000$

$\log_{10} 10000 = 4$ because $10^4 = 1000$

etc.

If base is unspecified it's assumed as base 10