

Objectives

- Write the equivalent forms for exponential and logarithmic functions.
- Write, evaluate, and graph logarithmic functions.

Vocabulary

- Logarithm
- Common logarithm
- Logarithmic function

Exponential Equation

Logarithmic Equation

$$b^x = a$$

$$\log_b a = x$$

$$b > 0, b \neq 1$$

Example 1

Write each exponential equation in logarithmic form.

Exponential Equation	Logarithmic Form
$2^6 = 64$	
$4^1 = 4$	
$5^0 = 1$	
$5^{-2} = 0.04$	
$3^x = 81$	

Try it!

Write each exponential equation in logarithmic form

a) $9^2 = 81$

b) $3^3 = 27$

c) $x^0 = 1(x \neq 0)$

Example 2

Write each logarithmic equation in exponential form.

Logarithmic Equation	Exponential Form
$\log_{10} 100 = 2$	
$\log_7 49 = 2$	
$\log_8 0.125 = -1$	
$\log_5 5 = 1$	
$\log_{12} 1 = 0$	

Try it!

Write each logarithmic equation in exponential form.

a) $\log_{10} 10 = 1$

b) $\log_{12} 144 = 2$

c) $\log_{\frac{1}{2}} 8 = -3$

Special Properties of Logarithms		
For any base b such that $b > 0$ and $b \neq 1$		
Logarithmic Form	Exponential Form	Example
$\log_b b = 1$	$b^1 = b$	$\log_{10} 10 = 1$ $10^1 = 10$
$\log_b 1 = 0$	$b^0 = 1$	$\log_{10} 1 = 0$ $10^0 = 1$

Example 3

Evaluate logarithms by Using Mental Math

a) $\log 1000$

b) $\log_4 \frac{1}{4}$