

## Lesson 13-9

## Example 1

Write each equation in logarithmic form.

a.  $1331^{-\frac{1}{3}} = \frac{1}{11}$

b.  $8^4 = 4096$

## Solution

a.  $1331^{-\frac{1}{3}} = \frac{1}{11} \square \log_{1331} \frac{1}{11} = -\frac{1}{3}$

b.  $8^4 = 4096 \square \log_8 4096 = 4$

## Example 2

Write each equation in exponential form.

a.  $\log_{216} 6 = \frac{1}{3}$

b.  $\log_5 \frac{1}{3125} = -5$

## Solution

a.  $\log_{216} 6 = \frac{1}{3} \square 6 = 216^{\frac{1}{3}}$

b.  $\log_5 \frac{1}{3125} = -5 \square \frac{1}{3125} = 5^{-5}$

## Example 3

Evaluate  $\log_{\frac{1}{4}} \frac{1}{1024}$ .

## Solution

$\log_{\frac{1}{4}} \frac{1}{1024} = y$       Let the logarithm equal  $y$ .

$\frac{1}{1024} = \left(\frac{1}{4}\right)^y$       Rewrite the equation using the definition of logarithm.

$\left(\frac{1}{4}\right)^5 = \left(\frac{1}{4}\right)^y$

Since  $\left(\frac{1}{4}\right)^5 = \left(\frac{1}{4}\right)^y$ ,  $y$  must equal 5.

**Example 4**

$$\text{Solve } \log_{\frac{1}{8}} a = \frac{2}{3}.$$

**Solution**

$$\log_{\frac{1}{8}} a = \frac{2}{3}$$

$$a = \left(\frac{1}{8}\right)^{\frac{2}{3}}$$

Rewrite the equation using the definition of logarithm.

$$a = \left[\left(\frac{1}{2}\right)^3\right]^{\frac{2}{3}}$$

$$a = \left(\frac{1}{2}\right)^2$$

$$a = \frac{1}{4}$$

**Example 5**

$$\text{Solve } \log_6 (a - 15) = \log_6 2.$$

**Solution**

$$\log_6 (a - 15) = \log_6 2$$

$$a - 15 = 2$$

$$a - 15 + 15 = 2 + 15$$

$$a = 17$$

Use the property of equality for logarithmic equations.

Add 15 to each side.

Simplify.