

7-5

Practice

Exponential and Logarithmic Equations

Solve each equation.

To start, rewrite each side with a common base.

1. $125^{2x} = 25$

$$(5^3)^{2x} = 5^2$$

$$5^{6x} = 5^2$$

$$6x = 2$$

2. $2^{3x-3} = 64$

$$2^{3x-3} = 2^6$$

3. $81^{3x} = 27$

$$x =$$

Solve each equation. Round to the nearest ten-thousandth. Check your answers. To start, take the logarithm of each side.

4. $6^{4x} = 234$

$$\log 6^{4x} = \log 234$$

$$4x \log 6 = \log 234$$

$$x = \frac{\log 234}{4 \log 6}$$

$$x \approx$$

5. $3^{5x} = 375$

$$\log 3^{5x} = \log 375$$

6. $7^{3x} - 24 = 184$

7. $3^{6x} = 2000$

8. $8^{3x} = 154$

9. $12^{4x} = 4600$

Use the following formula for Exercise 10.

$$y = a(b)^x$$

- x = the number of minutes it takes for $\frac{3}{4}$ of the crowd to leave the stadium
- y = the number of people *remaining* in the stadium after x minutes
- a = the number of people initially/currently in the stadium
- b = growth or decay factor (Pay attention to whether there is an increase or decrease.)

10. There are currently 100,000 people in a stadium watching a soccer game. When the game ends, about 3% of the crowd will leave the stadium each minute. At this rate, how many minutes will it take for $\frac{3}{4}$ of the crowd to leave the stadium?

Convert from Logarithmic Form to Exponential Form to solve each equation.

Exponential and Logarithmic Form	
Logarithmic Form $\log_b x = y$	Exponential Form $b^y = x$

11. $\log(2x + 4) = 3$

$$2x + 4 = 10^3$$

$$2x = 996$$

$$x =$$

12. $\log 4z - 3 = 2$

$$\log 4z = 5$$

13. $\log(2x - 8) = 2$

Use the properties of logarithms to solve each equation.

Product Property	Quotient Property	Power Property
$\log_b mn = \log_b m + \log_b n$	$\log_b \frac{m}{n} = \log_b m - \log_b n$	$\log_b m^n = n \log_b m$

14. $2 \log x + \log 4 = 3$

$$\log x^2 + \log 4 = 3$$

$$\log 4x^2 = 3$$

$$4x^2 = 10^3$$

$$x^2 = 250$$

$$x \approx$$

15. $\log y - \log 4 = 2$

$$\log \frac{y}{4} = 2$$

16. $\log 10 + \log 2x = 3$

17. **Error Analysis** Your friend used the following steps to solve the equation $\log x + \log 6 = 4$.

What error did he make? What is the correct answer?

$$\log x + \log 6 = 4$$

$$\log \frac{x}{6} = 4$$

$$\frac{x}{6} = 10^4$$

$$x = 6000$$