

WS 9.3 Logarithms & Exponential Equations

$y = x^n$ In this equation, n is the **logarithm** of y .

For example, $10^3 = 1000$. Therefore, $\log 1000 = 3$.

Power Property of Logarithms: $\log x^n = n \log x$

Logarithms can be used to solve equations in which variables appear as exponents (**exponential equations**). To do this, you take the logarithm of both sides of the equation:

Example: Solve for x : $5^x = 100$

$$\log 5^x = \log 100 \quad (\text{take log of both sides})$$
$$x \log 5 = \log 100 \quad (\text{power property of logs})$$
$$x = \frac{\log 100}{\log 5} \quad (\text{solve for } x)$$
$$x = 2.86$$

Exercises: (solve for the variable, and show all steps)

1. $4^x = 64$

2. $2^n = 256$

3. $3^z = 264$

4. $4.8 = 2^n$

5. $2^x = 5024$

6. $3^n = 4.1 \times 10^5$