

### WS 5.3 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  $x$ :  $5^x = 100$   
 $\log 5^x = \log 100$  (take log of both sides)  
 $x \log 5 = \log 100$  (power property of logs)  
 $x = \frac{\log 100}{\log 5}$  (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.  $3^n = 4.1 \times 10^5$