

Definition: **The symbol  $\log_a b$  represents the number that if we write as an exponent of  $a$ , we achieve  $b$ .** This expression is only meaningful if both  $a$  and  $b$  are positive numbers and  $a \neq 1$ .

Every logarithmic statement can be re-written as an exponential statement.

$$\log_a b = x \text{ is the same as } a^x = b$$

### Rules of Logarithms:

1.  $\log_a (a^x) = x$

2.  $a^{\log_a x} = x$

3. When both sides exist,  $\log_a b + \log_a c = \log_a bc$

4. When both sides exist,  $\log_a b - \log_a c = \log_a \left( \frac{b}{c} \right)$

5. When both sides exist,  $x \log_a b = \log_a (b^x)$

6. The change-base theorem:  $\log_a b = \frac{\log_c b}{\log_c a}$