

Logarithms

Log is to find the Power!

$$10^3 = 1000$$

$$\log_{10} 1000 = 3$$

$$\log_5 25 = 2$$

$$\log_3 81 = 4$$

Skill 1: Same base same result

$$\log_5 25 = \log_{5^2} 5^2 = 2$$

$$\log_{10} 100 = \log_{10^2} 10^2 = 2$$

1. Find the value of $\log_4 64$.

2. Find the value of $\log_5 125$.

3. Find the value of $\log_2 2^3$.

$$\ln = \log_e$$

$$\ln e^3 = \log_e e^3 = 3$$

$$\ln e^{5x+1} = \log_e e^{5x+1} = 5x + 1$$

1. Find the value of $\ln e^{999}$.

2. Find the value of $\ln e^{3x+1}$.

Laws of logarithms

$$\log_c a + \log_c b = \log_c ab$$

$$\log_c a - \log_c b = \log_c \frac{a}{b}$$

$$\log_c a^x = x \log_c a$$

$$\log_c a = \frac{\log_k a}{\log_k c}$$

1. Express $\log_{10} 2 + \log_{10} 3$ in single logarithm.

2. Express $\log_6 x - \log_6(3x + 1)$ in single logarithm.

1. Express $\log_2 7 + \log_2 4$ in single logarithm.

2. Express $\log_3(2x) - \log_3(2x - 3)$ in single logarithm.

3. Given that $\log_4 a = p$. Express $\log_4 64a^2$ in terms of p .

4. Given that $\log_4 x = b$. Express $\log_2 16x^2$ in terms of b .

Skill 2: Same power same base

$$10^{\log_{10} x} = x$$

$$10^{\log_{10} 100} = 10^2 = 100$$

$$\text{So } 10^{\log_{10} 100} = 10^{\log_{10} 100} = 100$$

1. Solve x when $\log_{10} (x - 1) = 2$.

2. Solve x when $\log_3 (3x) = 10$.

3. Solve x when $\ln \left(\frac{x}{3} \right) = 2$.
