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

$\log_5 25 = \cancel{\log_5} 5^2$ = 2
$\log_{10} 100 = \cancel{\log_{10}} 10^2$ = 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}.

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

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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.

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

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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

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

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

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

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

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

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

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