Logarithmic Puzzles

- Apply the laws of logarithms to simplify expressions.

Ex 2: $\log_n a = 5$ & $\log_n b = 3$ find: $\log_n (ab)^2$

$\log_n (a) + \log_n (b^2)$

$\log_n (a) + 2\log_n (b)$

$5 + 2 \cdot 3 = 11$

Ex 8: If $\log_a b = m$, $\frac{\log_{10} b}{\log_{10} a} = m$ $\quad \frac{\log_b a}{\log_{10} a} = \frac{1}{m}$

Ex 14: $\log_a b = m$ & $\log_a c = n$ $\quad \log_a\left(\frac{b^2\sqrt{c}}{a}\right) = \log_a (b^2) + \log_a (\sqrt{c}) - \log_a (a)$

$2\log_a (b) + \frac{1}{2}\log_a (c) - 1$

$2m + \frac{1}{2}n - 1$

Solving Logarithmic Equations

- Logarithms & or bases are opposite operations

Ex 3) $\log_{64}(x) = \frac{2}{3} \rightarrow x = 64^{2/3} \rightarrow x = \sqrt[3]{64^2}$ $\quad x = 16$

Ex 8) $\log_3 (x+25) - \log_3 (x-7) = 3$ $\quad \log_3\left(\frac{x+25}{x-7}\right) = 3$

$(x-7)\frac{x+25}{x-7} = 27(x-7) \rightarrow x + 25 = 27x - 27$ $\quad \frac{52}{26} = \frac{26x}{26}$ $\quad x = 2$

$-x \quad +27 \quad -x \quad +27$

Ex 21) $\log_3 (x) + \log_{243}(x^5) + 3 = 0$

$\log_3 (x) + \frac{\log_3 (x^5)}{\log_3 (3^5)} = -3$

$\log_3 (x) + \frac{5 \cdot \log_3 (x)}{5 \cdot \log_3 3} = -3$ $\quad \log_3 (x) + \log_3 (x) = -3$

$2\log_3 (x) = -3$

$\log_3 (x) = \frac{-3}{2}$ $\quad x = 3^{\frac{-3}{2}}$

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