key

Logs – Group Problems

**1) Find the numerical value of N if $N = (\log_6 24 - \log_6 12) * \log_8 36$

$N = (\log_6 \frac{24}{12}) * \log_8 36$

$= \log_6 2 * \log_8 36$

$= \log_6 2 * \frac{\log_6 36}{\log_6 8}$

$= \log_6 2 * \frac{2}{\log_6 8}$

$= \frac{2\log_6 2}{\log_6 8}$

$= \frac{\log_6 2^2}{\log_6 8}$

$= \frac{\log_6 4}{\log_6 8}$

$= \frac{\log_2 4}{\log_2 8}$

$= \frac{2}{3}$

answer: $N = 2/3$

*2) Solve: $\log_6(x+2) + \log_6(x-3) = 1$

$\log_6[(x+2)(x-3)] = 1$

$\log_6[x^2 - 3x + 2x - 6] = 1$

$\log_6(x^2 - 1x - 6) = 1$

$6 = x^2 - 1x - 6$

$0 = x^2 - 1x - 12$

$0 = (x-4)(x+3)$

$x = 4 \quad x = -3$

answer: $x = 4, -3$

**3) Find $\log_b \sqrt[3]{\frac{7}{8}}$, if $\log_b 7 = .6263$ and $\log_b 4 = .4462$. Round your answer to 4 decimal places.

$\log_b \left(\frac{7}{8}\right)^{1/3}$

$= \log_b \frac{7^{1/3}}{2}$

$= \log_b 7^{1/3} - \log_b 2^{1/2}$

$= \frac{1}{3}\log_b 7 - \log_b 4^{1/2}$

$= \frac{1}{3}(.6263) - \frac{1}{2}\log_b 4$

$= \frac{1}{3}(.6263) - \frac{1}{2}(.4462)$

$= .20876 - .2231$

$= -.0143$

answer: $-.0143$

*4) Find the exact value of x, if $\log x$ is the average of $\log 3$ and $\log 16$.

$\log x = \frac{\log 3 + \log 16}{2}$

$= \log \sqrt{3} + \log 4$

$\log x = \log 4\sqrt{3}$

$x = 4\sqrt{3}$

answer: $x = 4\sqrt{3}$

**5) Solve for x: $\log_3(x+3) - \log_3(x-5) = 2$

$\log_3 \left(\frac{x+3}{x-5}\right) = 2$

$3^2 = \frac{x+3}{x-5}$

$9 = \frac{x+3}{x-5}$

$9(x-5) = x+3$

$9x - 45 = x + 3$

$8x = 48$

$x = 6$

answer: $x = 6$

*6) Find x if $27^{\log_{27} 9} = 8x + 5$

$\log_{27} 8x+5 = \log_{27} 9$

$8x + 5 = 9$

$x = 1/2$

answer: $x = 1/2$

**7) Solve for x: $\log_{10}(x^2 + 3x) + \log_{10} 5x = 1 + \log_{10} 2x$

$\log (x^2+3x) + \log 5x - \log 2x = 1$

$\log\left(\frac{(x^2+3x)5x}{2x}\right) = 1$

$10 = \frac{(x^2+3x)(5x)}{2x}$

$20x = 5x^3 + 15x^2$

$0 = 5x^3 + 15x^2 - 20x$

$0 = 5x(x^2+3x-4)$

$0 = 5x(x+4)(x-1)$

$x = 0, x = -4, x = 1$

answer: $x = 0, -4, +1$

***8) For what value(s) of x, where x is a real number, is $\log_9 16 * \log_8 3 + \log_8 x = \log_8 3$

$\log_9 16 * \log_8 3 = \log_8 3 - \log_8 x$

$\log_9 16 * \log_8 3 = \log_8 \left(\frac{3}{x}\right)$

$\frac{\log_8 16}{\log_8 9} * \log_8 3 = \log_8 \left(\frac{3}{x}\right)$

$\frac{\log_8 (8 \cdot 2)}{\log_8 9} * \log_8 3 = \log_8 \left(\frac{3}{x}\right)$

$\frac{\log_8 8 + \log_8 2}{\log_8 9} * \log_8 3 = \log_8 \left(\frac{3}{x}\right)$

$\frac{1 + \frac{1}{3}}{\log_8 9} * \log_8 3 = \log_8 \left(\frac{3}{x}\right)$

$\frac{4}{3}\left(\frac{\log_8 3}{\log_8 9}\right) = \log_8 \left(\frac{3}{x}\right)$

$\frac{4}{3} \log_9 3 = \log_8 \frac{3}{x}$

$\frac{4}{3} \cdot \frac{1}{2} = \log_8 \left(\frac{3}{x}\right)$

$\frac{2}{3} = \log_8 \left(\frac{3}{x}\right)$

$8^{2/3} = \frac{3}{x}$

$4 = 3/x \rightarrow x = 3/4$

answer: $x = 3/4$

*9) Express $\log_3 8 + \log_3 6 - \log_3 4 + \log_3 10$ as the log of a single number in simplest form.

$\log_3 \left(\frac{8 \cdot 6 \cdot 10}{4}\right) = \log_3 \frac{480}{4} = \log_3 120$

answer: $\log_3 120$

*10) Evaluate the expression $\frac{\log_{64} 8 - \log_7 49}{\log_3 \frac{1}{3} + \log_2 (2^{-4})}$

$= \frac{\frac{1}{2} - 2}{-1 + \log_2 \left(\frac{1}{16}\right)} = \frac{\frac{1}{2} - 2}{-1 + -4} = \frac{-\frac{3}{2}}{-5} = \frac{3}{10}$

answer: $\frac{3}{10}$

***11) If $\log_2 x + \log_4 x - \log_8 x = 7$, solve for x.

$\log_2 x + \frac{\log_2 x}{\log_2 4} - \frac{\log_2 x}{\log_2 8} = 7$

$\log_2 x + \frac{\log_2 x}{2} - \frac{\log_2 x}{3} = 7$

$\log_2 x + \log_2 x^{1/2} - \log_2 x^{1/3} = 7$

$\log_2 \left(\frac{x \cdot x^{1/2}}{x^{1/3}}\right) = 7$

$\log_2 \left(x^{7/6}\right) = 7$

$2^7 = x^{7/6}$

$2^6 = x$

$64 = x$

answer: $x = 64$