Name:_____   Date:_____

Math Club Logarithm Worksheet 4: Logarithm Questions from Last 5 years

Many problems on Logarithms in the Euclid requires a detailed written solution. For each of the following questions, please provide a written solution with the space provided:

1. Determine all values of "x" such that: $\log_{2x}\left(48\sqrt[3]{3}\right) = \log_{3x}\left(162\sqrt[3]{2}\right)$ Euclid

2. Determine all real numbers X>0 for which $\log_4 x - \log_x 16 = \dfrac{7}{6} - \log_x 8$ (Euclid)

3. Determine all real numbers "x" for which $\left(\log_{10} x\right)^{\log_{10}\left(\log_{10} x\right)} = 10,000$ (Euclid)

4. The solution of the equation $7^{x+7} = 8^x$ can be expressed in the form $x = \log_b 7^7$, what is the value of "b"?(AMC!2)

5. What is the value of "x" for which the equation is true? $\dfrac{1}{\log_2 a} + \dfrac{1}{\log_3 a} + \dfrac{1}{\log_4 a} = 1$ (AMC12)

6. The sequence of terms forms an arithmetic progression. What is the value of "x"?

$$\log_{12} 162, \ \log_{12} x, \ \log_{12} y, \ \log_{12} z, \ \log_{12} 1250$$

7. Let "x", "y" and"z" all exceed 1, and let "w" be a positive number such that $\log_x w = 24$, $\log_y w = 40$, and $\log_{xyz} w = 12$. Find $\log_z w$.

8. Determine all pairs (a,b) of real numbers that satisfy the following system of equations. Give your answers as pairs of simplified exact numbers: (Euclid)

$$\sqrt{a} + \sqrt{b} = 8$$
$$\log_{10} a + \log_{10} b = 2$$

9. Consider the following system of equations in which all logarithms have base 10:
   a) If a=-4, b=4, and c=-18, solve the system of equations
   b) Determine all triples (a,b,c) of real numbers for which the system of equations has infinite number of solutions (x,y,z) (Euclid)

$$(\log x)(\log y) - 3\log 5y - \log 8x = a$$
$$(\log y)(\log z) - 4\log 5y - \log 16z = b$$
$$(\log z)(\log x) - 4\log 8x - 3\log 625z = c$$