

Logarithmic Equation

M.A.J. Vidallo
Makati Science High School

Warm-up Exercises

1. Solve the given equation for x .

a. $\log_{\sqrt[3]{4}} x = 9$

b. $\log_{2x} \frac{1}{4} = 2$

c. $\log_{(3x+4)} \frac{1}{64} = -\frac{3}{2}$

d. $\ln e^{x^2-x} = 30$

2. Solve for x .

a. $3^x = 7^{2x-1}$

b. $\frac{1}{5^x} = 3^{2-x}$

c. $\frac{7^{2x+1}}{3} = 2^{3-x}$

d. $e^{x \ln x} = x^2$

e. $3 \cdot 4^{2x} + 5 \cdot 4^x - 2 = 0$

f. $4^{2x} - 4^{x+1} - 21 = 0$

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

h. $a^{5x} - 8a^{2x} + a^{3x} - 8 = 0$

i. $\log_{16} \left(\frac{3x+1}{2x-5} \right) = \log_{16} \sqrt{\frac{3x+1}{2x-5}} + \frac{1}{4}$

j. $81(\log_{27}(x+1))^4 - (\log_3(x^2 + 2x + 1))^2 + 3 = 0$

e. $5^{\log_5 \left(\frac{2}{3x-4} \right)} = \frac{5}{6x-7}$

f. $\log_2 \left\{ \log_{16} \left[\log_5 \left(\frac{2x+5}{3x} \right) \right] \right\} = -2$

g. $[\log_3(2x-1)]^2 - [\log_3(2x-1)] = 6$

h. $\left| \log_{25} \left(\frac{2x-1}{5x+3} \right) \right| = \frac{1}{2}$

k. $\log_5[\log_5(x-2) + \log_5(x+2)] = 0$

l. $\log_4(\log_3(\log_2 x)) = 1$

m. $\log_9(\log_6(\log_3(x+3))) = 0$

n. $\log_8(\log_3(26x-4)) + \log_8(\log_{10} 3) = \frac{1}{3}$

o. $\log x^2 = (\log x)^2$

3. Solve for x and y .

$$\begin{cases} \log_2(1-3x) + y = 3 \\ 3\log_2(1-3x) - 5y = 17 \end{cases}$$

More Problems

4. (USC 1990) If $2^a = 5$ and $2^b = 3$, what is $\log_3 10$?

5. (3RD MSP) Find x in $\log \sqrt{\log x} = 0$.
6. (FUWMT 1996) If $\log_3 x = p$ and $\log_7 x = q$, what is $\log_{21} x$?
7. (FUWMT 2002) Solve for x : $\log_2 3x = \log_3 2x$.
8. (FUWMT 2003) How many real solutions are there in $\log_{\sqrt{3x^2-1}} 121 = 4$?
9. (PMO 2008-2009) How many real roots does the equation $\log_{(x^2-3x)^3} 4 = \frac{2}{3}$ have?
19. (USC 1986) If $\log_7(x^2) = \log_3 9$, then what is the absolute of x ?
11. (USC 2001) Solve for x in the equation $\log_4 \sqrt{x^{\frac{4}{3}}} + 3\log_x 16x = 7$.
- 12a. (BAMM 1995) Find x if $\log_2(\log_3(\log_4 x)) = 0$.
 - b. (AU Math-a-thon 2008) If $\log_2(\log_3 x) = 2$, then what is x ?
 - c. (AMC 1978) If $\log_2((\log_{16} 2)\log_5 125) = -a$, what is a ?
13. (PSHS 2009) Solve for x given that $\log_2 x + \log_4 x = 1$.
14. (USC 2005) If $\log_y x + \log_x y = 7$, then what is $(\log_y x)^2 + (\log_x y)^2$?
15. (PMO 2009-2010) Solve for x in the following system of equations:

$$\begin{aligned}\log x + \log y &= 2 \\ \log y + \log z &= 7 \\ \log z + \log x &= 3\end{aligned}$$
16. (5TH LOM) If $\log xy^3 = 1$ and $\log x^2 y = 1$, what is $\log xy$?
17. (PMO 2000-2001) If $9(\log x)^2 + 4(\log y)^2 = 12(\log x)(\log y)$, what is x when $y = 8$?
18. (MSA 2002) Positive integers A , B and C with common factor greater than 1 exist such that $A \log_{500} 2 + B \log_{500} 5 = 0$, what is $\frac{A+B}{C}$?
19. (FUWMT 2000) Suppose that $\log(x-2) + \log y = 0$ and $\sqrt{x} + \sqrt{y-2} = \sqrt{x+y}$. What is $x+y$?
20. (PMO Primer 2008) If $2\log(x-2y) = \log x + \log y$, find $\frac{x}{y}$

21ST Century Mathematics by Simon Chua

Advanced Algebra with Trigonometry and Statistics by Sr. Illuminada Coronel

2009 Philippine Science High School Interscholastic Mathematics Competition

3RD Mathematical Society of the Philippines search for the Junior Math Wizard

5TH Lord of the Math, St. Stephen's High School

MSA Math Quiz for the Math Whiz 2002

Auburn University Math-a-thon 2008

Australian Mathematics Competition 1978

Bay Area Math Meet 1995, University of San Francisco

Furman University Wylie Mathematics Tournament 1996, 2000, 2002, 2003

University of South Carolina High School Math Contest 1986, 1990, 2001, 2005