

Condensing & Solving with Logs - NOTES

Condense each expression to a single logarithm.

1) $\log_5 x + \log_5 y + 5\log_5 z$

$$\log_5 x + \log_5 y + \log_5 z^5$$

$$\log_5 (xyz^5)$$

2) $\log_7 u + \log_7 v + 4\log_7 w$

$$\log_7 u + \log_7 v + \log_7 w^4$$

$$\log_7 (uvw^4)$$

3) $8\log_8 x + 4\log_8 y$

$$\log_8 x^8 + \log_8 y^4$$

$$\log_8 (x^8 y^4)$$

4) $6\log_9 x - 24\log_9 y$

$$\log_9 x^6 - \log_9 y^{24}$$

$$\log_9 \left(\frac{x^6}{y^{24}} \right)$$

5) $\log_9 a + \log_9 b + 3\log_9 c$

$$\log_9 a + \log_9 b + \log_9 c^3$$

$$\log_9 (abc^3)$$

6) $6\log_3 c + \frac{\log_3 a}{2}$

$$\log_3 c^6 + \frac{1}{2} \log_3 a$$

$$\log_3 c^6 + \log_3 a^{1/2}$$

$$\log_3 (c^6 \sqrt{a})$$

7) $\log_2 w + \frac{\log_2 u}{2} + \frac{\log_2 v}{2}$

$$\log_2 w + \frac{1}{2} \log_2 u + \frac{1}{2} \log_2 v$$

$$\log_2 w + \log_2 u^{1/2} + \log_2 v^{1/2}$$

$$\log_2 (w\sqrt{uv})$$

8) $3\log_9 u + 5\log_9 v$

$$\log_9 u^3 + \log_9 v^5$$

$$\log_9 (u^3 v^5)$$

9) $4\log_2 x + 16\log_2 y$

$$\log_2 x^4 + \log_2 y^{16}$$

$$\log_2 (x^4 y^{16})$$

10) $25\log_6 u + 5\log_6 v$

$$\log_6 u^{25} + \log_6 v^5$$

$$\log_6 (u^{25} v^5)$$

Solve each equation. Round your answers to the nearest ten-thousandth.

11) $\log_6 10 + \log_6 x = 2$

$$\begin{aligned}\log_6 (10x) &= 2 \\ 6^2 &= 10x \\ 36 &= 10x \\ \boxed{3.6} &= x\end{aligned}$$

13) $\log_5 x - \log_5 3 = 1$

$$\begin{aligned}\log_5 \left(\frac{x}{3}\right) &= 1 \\ \cancel{5} 5^1 &= \frac{x}{3} \\ 5 &= \frac{x}{3} \\ \boxed{15} &= x\end{aligned}$$

15) $\log_8 x - \log_8 2 = 1$

$$\begin{aligned}\log_8 \left(\frac{x}{2}\right) &= 1 \\ 8^1 &= \frac{x}{2} \\ 8 &= \frac{x}{2} \\ \boxed{16} &= x\end{aligned}$$

17) $\log_2 x - \log_2 9 = 3$

$$\begin{aligned}\log_2 \left(\frac{x}{9}\right) &= 3 \\ 2^3 &= \frac{x}{9} \\ 8 &= \frac{x}{9} \\ \boxed{72} &= x\end{aligned}$$

★ 19) $\log_3 x - \log_3 10 = \log_3 4$

$$\begin{aligned}\log_3 \left(\frac{x}{10}\right) &= \log_3 4 \\ \frac{x}{10} &= 4 \\ \boxed{x} &= 40\end{aligned}$$

12) $\log_4 x + \log_4 3 = 3$

$$\begin{aligned}\log_4 (3x) &= 3 \\ 4^3 &= 3x \\ 64 &= 3x \\ \boxed{21.\bar{3}} &= x\end{aligned}$$

14) $\log_4 x - \log_4 8 = 1$

$$\begin{aligned}\log_4 \left(\frac{x}{8}\right) &= 1 \\ 4^1 &= \frac{x}{8} \\ 4 &= \frac{x}{8} \\ \boxed{32} &= x\end{aligned}$$

16) $\log_6 x + \log_6 9 = 2$

$$\begin{aligned}\log_6 (9x) &= 2 \\ 6^2 &= 9x \\ 36 &= 9x \\ \boxed{4} &= x\end{aligned}$$

18) $\log_9 5 + \log_9 x = 1$

$$\begin{aligned}\log_9 (5x) &= 1 \\ 9^1 &= 5x \\ 9 &= 5x \\ \boxed{1.8} &= x\end{aligned}$$

★ 20) $\log_5 x + \log_5 9 = \log_5 63$

$$\begin{aligned}\log_5 (9x) &= \log_5 63 \\ \cancel{9} 9x &= 63 \\ \boxed{x} &= 7\end{aligned}$$