

Practice 7-4

..... Example Exercises

Example 1

Write each logarithmic expression as a single logarithm.

- | | | |
|---|--|-------------------------------------|
| 1. $\log_5 4 + \log_5 3$ | 2. $\log_6 25 - \log_6 5$ | 3. $\log_2 4 + \log_2 2 - \log_2 8$ |
| 4. $5\log_7 x - 2\log_7 x$ | 5. $\log_4 60 - \log_4 4 + \log_4 x$ | 6. $\log 7 - \log 3 + \log 6$ |
| 7. $2\log x - 3\log y$ | 8. $\frac{1}{2}\log r + \frac{1}{3}\log s - \frac{1}{4}\log t$ | 9. $\log_3 4x + 2\log_3 5y$ |
| 10. $5\log 2 - 2\log 2$ | 11. $\frac{1}{3}\log 3x + \frac{2}{3}\log 3x$ | 12. $2\log 4 + \log 2 + \log 2$ |
| 13. $\log_{b^2} \frac{1}{2} + \log_b 4$ | 14. $\log_6 60 - \log_6 10$ | 15. $\log_5 25 + \log_5 5$ |
| 16. $\log 25 + \log 4$ | 17. $\log 40 - \log 4$ | 18. $\log_3 36 - \log_3 4$ |
| 19. $\log_5 32 - \log_5 8 - \log_5 4$ | 20. $\log 1 + \log 10 - \log 0.1$ | 21. $6\log_4 16 - 3\log_4 4$ |

Example 2

Expand each logarithm.

- | | | | |
|------------------------|-------------------------------|---------------------|---|
| 22. $\log_2 5rt$ | 23. $\log_3 \frac{2x}{y}$ | 24. $\log_7 6x^3$ | 25. $\log_4 \left(\frac{y}{6}\right)^2$ |
| 26. $\log x^5 y^4 z^7$ | 27. $\log \frac{2xy^2}{3z^3}$ | 28. $\log \sqrt{y}$ | 29. $\log \sqrt{\frac{3xy}{w}}$ |

Example 3

For Exercises 30–31, use the formula $L = 10\log \frac{I}{I_0}$.

30. Suppose you decrease the intensity of a sound by 25%. By how many decibels would the loudness be decreased?
31. A sound has an intensity of $4.53 \times 10^{-7} \text{ W/m}^2$. What is the loudness of the sound in decibels? Use $I_0 = 10^{-12} \text{ W/m}^2$.
32. The optical intensity I of an object can be determined by $\log I = \log 2.3 - d$ where d is the distance in inches. Find the optical intensity for a distance of 4 in.
33. The limiting magnitude I of an optical telescope with a lens diameter of d in inches is $L = 8.8 + 5.1 \log d$. Find the limiting magnitude for a 6-inch telescope. Round your answer to the nearest tenth.