

# Practice 8-4

## Properties of Logarithms

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**For Exercises 1–2, use the formula  $L = 10 \log \frac{I}{I_0}$ .**

1. A sound has an intensity of  $5.92 \times 10^{25} \text{W/m}^2$ . What is the loudness of the sound in decibels? Use  $I_0 = 10^{-12} \text{W/m}^2$ .
2. Suppose you decrease the intensity of a sound by 45%. By how many decibels would the loudness be decreased?

**Assume that  $\log 3 \approx 0.4771$ ,  $\log 4 \approx 0.6021$ , and  $\log 5 \approx 0.6990$ . Use the properties of logarithms to evaluate each expression. Do not use a calculator.**

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|--------------|------------------------|------------------------|---------------|
| 3. $\log 12$ | 4. $\log 16$           | 5. $\log \frac{3}{5}$  | 6. $\log 0.8$ |
| 7. $\log 75$ | 8. $\log \frac{16}{5}$ | 9. $\log_6 1 - \log 1$ | 10. $\log 60$ |

**Write each logarithmic expression as a single logarithm.**

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|--|--|---|
| 11. $\log_5 4 + \log_5 3$                                | 12. $\log_6 25 - \log_6 5$   | 13. $\log_2 4 + \log_2 2 - \log_2 8$      |
| 14. $5 \log_7 x - 2 \log_7 x$                            | 15. $\log_4 60 - \log_4 4 + \log_4 x$                              | 16. $\log 7 - \log 3 + \log 6$            |
| 17. $2 \log x - 3 \log y$                                | 18. $\frac{1}{2} \log r + \frac{1}{3} \log s - \frac{1}{4} \log t$ | 19. $\log_3 4x + 2 \log_3 5y$             |
| 20. $5 \log 2 - 2 \log 2$                                | 21. $\frac{1}{3} \log 3x + \frac{2}{3} \log 3x$                    | 22. $2 \log 4 + \log 2 + \log 2$          |
| 23. $(\log 3 - \log 4) - \log 2$                         | 24. $5 \log x + 3 \log x^2$  | 25. $\log_6 3 - \log_6 6$                 |
| 26. $\log 2 + \log 4 - \log 7$                           | 27. $\log_3 2x - 5 \log_3 y$                                       | 28. $\frac{1}{3}(\log_2 x - \log_2 y)$    |
| 29. $\frac{1}{2} \log x + \frac{1}{3} \log y - 2 \log z$ | 30. $3(4 \log t^2)$  | 31. $\log_5 y - 4(\log_5 r + 2 \log_5 t)$ |

**Expand each logarithm.**

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|------------------------|-----------------------------------|--------------------------|
| 32. $\log xyz$         | 33. $\log_2 \frac{x}{yz}$         | 34. $\log 6x^3y$         |
| 35. $\log 7(3x - 2)^2$ | 36. $\log \sqrt{\frac{2rst}{5w}}$ | 37. $\log \frac{5x}{4y}$ |
| 38. $\log_5 5x^{-5}$   | 39. $\log \frac{2x^2y}{3k^3}$     | 40. $\log_4 (3xyz)^2$    |

**State the property or properties used to rewrite each expression.**

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|---|--|--|
| 41. $\log 6 - \log 3 = \log 2$                  | 42. $6 \log 2 = \log 64$                     | 43. $\log 3x = \log 3 + \log x$                      |
| 44. $\frac{1}{3} \log_2 x = \log_2 \sqrt[3]{x}$ | 45. $\frac{2}{3} \log 7 = \log \sqrt[3]{49}$ | 46. $\log_4 20 - 3 \log_4 x = \log_4 \frac{20}{x^3}$ |