

Rewrite the equation in exponential form.

- 1. $\log_7 49 = 2$ $7^2 = 49$
- 2. $\log_2 16 = 4$ $2^4 = 16$
- 3. $\log_5 125 = 3$ $5^3 = 125$
- 4. $\log_{16} 4 = \frac{1}{2}$ $16^{\frac{1}{2}} = 4$
- 5. $\log_4 \frac{1}{4} = -1$ $4^{-1} = \frac{1}{4}$
- 6. $\log_3 \frac{1}{9} = -2$ $3^{-2} = \frac{1}{9}$

Evaluate the logarithm without using a calculator.

- 7. $\log_9 81 = x$ $9^x = 81$ $x = 2$
- 8. $\log_8 1$ $8^x = 1$ $x = 0$
- 9. $\log_3 \frac{1}{3}$ $3^x = \frac{1}{3}$ $x = -1$
- 10. $\log_4 2$ $4^x = 2$ $2^{2x} = 2^1$ $2x = 1$ $x = \frac{1}{2}$
- 11. $\log_{27} 3$ $27^x = 3^1$ $3^{3x} = 3^1$ $3x = 1$ $x = \frac{1}{3}$
- 12. $\log_4 4^{2/3}$ $4^x = 4^{2/3}$ $x = \frac{2}{3}$

Match the expression with the logarithm that has the same value.

- (C) 13. $\log \sqrt{2} + \log \sqrt{8}$ $\log \sqrt{16} = \log 4$ A. $\log \frac{2}{5}$
- (A) 14. $\log 4 - \log 10$ $\log \frac{4}{10} = \log \frac{2}{5}$ B. $\log 27$
- (D) 15. $2 \log 4 - \log 2$ $\log \frac{16}{2} = \log 8$ C. $\log 4$
- (B) 16. $-3 \log \frac{1}{3}$ $\log \left(\frac{1}{3}\right)^{-3} = \log 27$ D. $\log 8$

Expand the expression.

- 17. $\log_3 3x$ $\log_3 3 + \log_3 x$ $1 + \log_3 x$
- 18. $\log \frac{2x}{5}$ $\log 2 + \log x - \log 5$
- 19. $\log_7 x^2 y$ $2 \log_7 x + \log_7 y$
- 20. $\log_2 \frac{x^2}{4}$ $2 \log_2 x - \log_2 4$

21. $\log\sqrt{xy}$

$\log x^{\frac{1}{2}} y^{\frac{1}{2}}$

$\frac{1}{2} \log X + \frac{1}{2} \log Y$

22. $\log \frac{1}{2x^2}$

$\log 1 - \log 2 - 2 \log X$

23. $\log 5\sqrt[3]{x}$

$\log 5 + \frac{1}{3} \log X$

24. $\log_6 \frac{xy^2}{\sqrt{z}}$

$\log_6 X + 2 \log_6 Y - \frac{1}{2} \log_6 Z$

Condense the expression.

25. $\log_3 4 + \log_3 2 + \log_3 2$

$\log_3 16$

26. $\log 4 + 3 \log x + \log y$

$\log 4x^3 y$

27. $\log 3 + \frac{1}{2} \log x - \log 5$

$\log \frac{3\sqrt{x}}{5}$

28. $2 \log x - \log 3 + \log 6$

$\log \frac{6x^2}{3} = \log 2x^2$

29. $3 \log x + \log 4 - \log x - \log 6$

$\log \frac{4x^3}{6x} = \log \frac{2x^2}{3}$

30. $3 \log(x+1) - 2 \log y + \log y + \log 2$

$\log \frac{2y(x+1)^3}{y^2} = \log \frac{2(x+1)^3}{y}$

Use the change-of-base formula to evaluate the logarithm. Round your result to three decimal places.

31. $\log_7 12$

1.277

32. $\log_4 112$

3.404

33. $\log_5 1.25$

0.139

34. $\log_{2.2} 22$

3.920

34. $\log_{4.2} 18.1$

2.018

36. $\log_{1/3} 0.0005$

6.919