Write the equation in logarithmic form.

1. $2^4 = 16$

2. $27^{\frac{4}{3}} = 81$

   [A] $\log_4 81 = 27$ [B] $\log_{81} 27 = \dfrac{3}{4}$ [C] $\log_{27} 81 = \dfrac{4}{3}$ [D] $3\log_4 81 = 27$

   (A subscript: $\log_{4^{-\frac{4}{3}}} 81 = 27$)

Evaluate the logarithm.

3. $\log_{81} 3$ [A] $\dfrac{1}{4}$ [B] -4 [C] $-\dfrac{1}{4}$ [D] 4

4. $\log \sqrt[4]{10}$

5. Use your calculator to evaluate the logarithm.
   $\log 0.15$

   [A] -1.214 [B] -1.897 [C] -0.527 [D] -0.824

6. Write the equation $\log_{32} 4 = \dfrac{2}{5}$ in exponential form.

   [A] $\left(\dfrac{2}{5}\right)^{32} = 4$ [B] $4^{\frac{5}{2}} = 32$ [C] $32^{\frac{2}{5}} = 4$ [D] $4^{\frac{2}{5}} = 32$

State the property or properties used to rewrite the expression.

7. $\log \sqrt[6]{8x^3} = \dfrac{1}{2} \log 2x$

   [A] product and power properties   [B] quotient property
   [C] power and quotient properties   [D] power property

8. $2 \log 6 + \log \dfrac{1}{3} = \log 12$

Write the logarithmic expression as a single logarithm.

9. $6 \log_b x + 3 \log_b y$

10. $6 \log x - 3 \log (x+5)$

   [A] $\log x(x+5)^{18}$ [B] $18 \log \dfrac{x}{x+5}$ [C] $\log x^6(x+5)^3$ [D] none of these

Expand the logarithm.

11. $\log_b \sqrt{\dfrac{23}{33}}$

   [A] $\sqrt{\log_b 23 - \log_b 33}$ [B] $\dfrac{1}{2}\left(\log_b 23 - \log_b 33\right)$

   [C] $\log_b \dfrac{1}{2}(23 - 33)$ [D] $\dfrac{1}{2}\left(\log_b 23 + \log_b 33\right)$

12. $\log_a \dfrac{2xy^3}{z^4}$

Use the properties of logarithms to evaluate the expression.

13. $\log_4 4 + \log_4 64 - \log_4 16$

14. $2 \log_5 \sqrt{5}$ [A] 10   [B] 1   [C] 11   [D] $\dfrac{1}{2}$

15. Given $\log_z 2 = 0.333$ and $\log_z 5 = 0.774$, find $\log_z 0.4$.

16. Given $\log 10 = F$ and $\log 5 = G$, find $\log 2$.

   [A] $\dfrac{F}{G}$ [B] $F + G$ [C] $F - G$ [D] FG

17. Indicate whether the following statement is true or false. If it is false, correct the statement.
$\log(3 \cdot 4) = \log 3 \cdot \log 4$

Solve the equation. Check your answer.

18. $-85 + 7.14^x = 45$

19. $\dfrac{1}{9} = 27^{6x-4}$ [A] $\dfrac{1}{3}$ [B] $\dfrac{5}{9}$ [C] $\dfrac{7}{9}$ [D] $\dfrac{1}{9}$

Use the Change of Base Formula to evaluate each expression. Then convert it to a logarithm in base 9.

20. $\log_6 973$

    [A] 3.840, $\log_9 4624.97$ [B] 41.282, $\log_9 4616.427$

    [C] 3.840, $\log_9 4616.427$ [D] 41.282, $\log_9 4624.97$

21. $\log_2 16$

Solve the equation. Check your answer.

22. $3 \log 2x = 4$ [A] 2.7826   [B] 0.6309   [C] 10.7722   [D] 5

23. $\log 3x + 5 = 3$

Solve the equation.

24. $\log(5x+7) = 2$ [A] $\dfrac{13}{5}$ [B] $\dfrac{93}{5}$ [C] $\dfrac{1017}{5}$ [D] $\dfrac{107}{5}$

25. $\log(x+15) - \log x = 2$ [A] 0.1515   [B] 1.2667   [C] 6.6000   [D] 0.7895

26. $\log(2x+43) - \log x = 1$

Solve the equation.

27. $\log x + \log 4 = 2$ [A] 2.5   [B] 25   [C] $\dfrac{1}{2}$ [D] -2

28. $2 \log 4 - \log 3 + 2 \log x - 4 = 0$

Write the expression as a single natural logarithm.

29. $3 \ln 5 + 2 \ln x$

30. $3 \ln a - \dfrac{1}{2}\left(\ln b + \ln c^2\right)$ [A] $\dfrac{3}{2}\ln\dfrac{a}{bc^2}$ [B] $\ln\dfrac{3a}{0.5bc^2}$ [C] $\ln\dfrac{a^3}{bc}$ [D] $\ln\dfrac{a^3}{c\sqrt{b}}$

Simplify the expression.

31. $\ln e^4$

32. $\ln \sqrt[3]{e}$ [A] $3e$ [B] $\dfrac{1}{3e}$ [C] $\dfrac{1}{3}$ [D] 3

33. The sales of a certain product t years after the product is introduced is given by $1200 \ln (8t + 4)$. How many of the product will be sold 4 years after the product is introduced? Round the answer to the nearest whole number.

Solve the equation. Check your answer.

34. $\ln 2 + \ln x = 5$ [A] 50,000   [B] 3   [C] 10   [D] 74.2

35. $\ln (7x - 3) = \dfrac{4}{3}$

36. $\ln x - \ln 6 = 0$ [A] $\ln 6$ [B] 6   [C] e^6 [D] $6e$

Solve the equation. Check your answer.

37. $\ln (3x+2)^2 - 4 = 3.1$

Use natural logarithms to solve the equation.

38. $e^x = \dfrac{1}{8}$

39. $e^{2x} + 5 = 8$

40. The number of bacteria present in a culture after t minutes is given as $B = 100e^{kt}$. If there are 662 bacteria present after 8 minutes, find k.