

Exponent and Logarithm Practice

Evaluate.

1. $-(-32)^{\frac{-6}{5}}$
2. $2(16)^{\frac{-3}{4}}$
3. $\left(-243^{\frac{2}{5}}\right) - (\sqrt{9})^3$
4. $\left(\frac{32}{256^{\frac{-1}{2}}}\right)^{\frac{1}{3}}$
5. $\left(64^{\frac{-1}{6}}\right) - (\sqrt[3]{8})^{-2}$
6. $\log_4 64$
7. $\log_3 \frac{1}{27}$
8. $\log_5 5\sqrt{5}$
9. $\log_2 8\sqrt{2}$
10. $\log_{10} 1000\sqrt[4]{100}$
11. $3 \cdot \log_2 2 - \log_2 4$
12. $\log_{10} 1 - \log_{10} 100$

Simplify each of the following. Write all answers without negative exponents.

- 13.. $\frac{x^{\frac{2}{3}}y^{\frac{-1}{4}}}{x^{\frac{1}{2}}y^{\frac{-1}{2}}}$
14. $\left(x^{\frac{1}{2}} \cdot x^{\frac{5}{12}}\right) \div x^{\frac{2}{3}}$
15. $\left[\left(\sqrt{x^3y^3}\right)^{\frac{1}{3}}\right]^{-1}$
16. $8x^{\frac{2}{3}} \cdot 5^{\frac{-1}{2}}x^{\frac{1}{6}}$

Rewrite each of the following equations in logarithmic form.

17. $4^x = 64$
18. $10^{-2} = 0.01$
19. $6^{\frac{3}{2}} = 6\sqrt{6}$
20. $16^{\frac{-3}{4}} = \frac{1}{8}$

Rewrite each of the following equations in exponential form.

21. $\log_3 27 = 3$
22. $\log_5 125 = 3$
23. $\log_b m = n$
24. $\log_2 \frac{1}{8} = -3$

Rewrite each of the following equations in expanded logarithmic form.

25. $\log_a xz$
26. $\log_5 \sqrt[7]{y^2}$
27. $\log_b \frac{(9x)^2}{\sqrt[5]{y^3}}$
28. $\log_3 \left[(4x)^5 \div \sqrt{5z}\right]^{\frac{1}{2}}$

Rewrite each of the following equations as a single logarithm, if possible.

29. $\log_3 y + 4\log_3 x$
30. $\frac{1}{2}\log_4 p - \log_4 r$
31. $(\log_2 x + \log_2 y) - \log_2 z$
32. $\frac{5\log_3 x}{3}$
33. $\frac{4\log_a x + \log_a y}{\log_a 2}$
34. $\left(\frac{2\log x}{3} + \frac{3\log y}{4}\right) - 5\log z$
35. $\frac{\log_a m - \log_a 3}{4} - 5\left(\frac{\log_a x}{2} + \frac{3\log_a y}{7}\right)$

Solve each of the following for x.

- 36.. $4^x = 64$
37. $3^x = \frac{1}{27}$
38. $100^x = 0.001$
39. $\left(\frac{1}{3}\right)^{x+6} = 81^{-x}$
40. $3^{2x-1} = 9^{x-3}$
41. $5^{2x-2} = 25^{2x+5}$
42. $9^{2x+1} = 27^{x+2}$
43. $4^{3x+1} = 16^{x-1}$
44. $27^x = 3^3 \cdot 9^{2x+1}$
45. $x^{-2} + 2 = 27$
46. $a^{x-4} = a^6 \cdot a^{3x-6}$
47. $(2a)^x = (4a^2)^{x+2}$

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48. $(3a)^{x+4} = (27a^3)^{x+6}$ 49. $3^{x^2-3} = 9^x$ 50. $9^{2-x} = 27^{\frac{x}{3}}$ 51. $2^{x^2+2} = 2^{3x}$
52. $\log_3 27 = 3x+6$ 53. $\log_4 \frac{1}{4} = \frac{x}{8}$ 54. $\log_{\frac{4}{3}} \frac{64}{27} = 2x-1$ 55. $4\log_2 x = 8$
56. $\log_x 125 = 3$ 57. $\log_3 x = 4$ 58. $\log_3 x + \log_3 (x-2) = 1$ 59. $\log_3 (x^2 - 22) = 3$
60. $2^x = 5$ 61. $3^{x+4} = 101$ 62. $7^{2x-1} = 316$ 63. $7^{3x} \div 2^{7x-1} = (43.2)^{x+2}$
64. $4^{2x+1} = 5^{3x-2}$ 65. $(3^x)(5^{2x}) = 271^{x+1}$

Answers

1. $-\frac{1}{64}$ 2. $\frac{1}{4}$ 3. -36 4. $64\sqrt[3]{2}$ 5. $\frac{1}{4}$ 6. 3 7. -3 8. $\frac{3}{2}$ 9. $\frac{7}{2}$ 10. $\frac{7}{2}$ 11. 1
12. -2 13. $\sqrt[12]{x^2y^3}$ 14. $\sqrt[4]{x}$ 15. $\frac{\sqrt{xy}}{xy}$ 16. $\frac{8\sqrt[6]{125x^5}}{5}$ 17. $\log_4 64 = x$ 18. $\log 0.01 = -2$
19. $\log_6 6\sqrt{6} = \frac{3}{2}$ 20. $\log_{16} \frac{1}{8} = -\frac{3}{4}$ 21. $3^3 = 27$ 22. $5^3 = 125$ 23. $b^n = m$ 24. $2^{-3} = \frac{1}{8}$
25. $\log_a x + \log_a z$ 26. $\frac{2}{7}\log_5 y$ 27. $\log_b 81 + 2\log_b x - \frac{3}{5}\log_b y$
28. $\frac{5}{2}\log_3 4 + \frac{5}{2}\log_3 x - \frac{1}{4}\log_3 5 - \frac{1}{4}\log_3 z$ 29. $\log_3 x^4 y$ 30. $\log_4 \frac{\sqrt{p}}{r}$ 31. $\log_2 \frac{xy}{z}$
32. $\log_3 x^{5/3}$ 33. $\frac{\log_a x^4 y}{\log_a 2}$ 34. $\log\left(\frac{x^{2/3}y^{3/4}}{z^5}\right)$ 35. $\log_a\left(\frac{m^{1/4}}{\sqrt[4]{3}x^{5/2}y^{15/7}}\right)$ 36. $x = 3$ 37. $x = -3$
38. $x = -1.5$ 39. $x = 2$ 40. no solution 41. $x = -6$ 42. $x = 4$ 43. $x = -3$ 44. $x = -5$
45. $x = \pm\frac{1}{5}$ 46. $x = -2$ 47. $x = -1$ 48. $x = -7$ 49. $x = 3$ or $x = -1$ 50. $x = \frac{4}{3}$
51. $x = 2$ or 1 52. $x = -1$ 53. $x = -8$ 54. $x = 2$ 55. $x = 4$ 56. $x = 5$ 57. $x = 81$ 58.
- $x = 3$ 59. $x = \pm 7$ 60. $x = \frac{\log 5}{\log 2} \approx 2.3219$ 61. $x = \frac{\log 101}{\log 3} - 4 \approx 16.8035$
62. $x = \frac{1}{2}\left(\frac{\log 316}{\log 7} + 1\right) \approx 1.9789$ 63. $x = \frac{2\log 43.2 - \log 2}{3\log 7 - 7\log 2 - \log 43.2} \approx -1.2074$
64. $x = \frac{-2\log 5 - \log 4}{2\log 4 - 3\log 5} \approx 2.240$ 65. $x = \frac{\log 271}{\log 3 + 2\log 5 - \log 271} \approx -4.361$