

Properties of Exponents : Simplify the expression and write without negative exponents.

1. $y^9 \cdot y$

2. $(5pq)^3$

3. $(-8m^4)^2 \cdot m^3$

4. $(3x^5)^3(2x^7)^2$

5. $(-3x^2y)^3(11x^3y^5)^2$

6. $\left(\frac{7x^3}{2y^4}\right)^2$

7. $\left(\frac{2f^{-2}g^3}{3fg^{-1}}\right)^4$

8. $\frac{2s^3t^3}{st^{-2}} \cdot \frac{(3st)^3}{s^{-2}t}$

9. $2^{-2} \cdot 2^{-3}$

10. $7^{-6} \cdot 7^4$

11. $(2^{-1})^5$

12. $\frac{6^{-3}}{6^{-5}}$

13. $3^{-2} \cdot \left(\frac{5}{7^0}\right)$

14. $\frac{(3x)^{-3}y^4}{x^2y^{-6}}$

15. $\frac{12x^8y^{-7}}{(4x^{-2}y^{-6})^2}$

Fractional Exponents : Simplify the expression and write without negative or fractional exponents.

16. $\sqrt{9x^3}$

17. $x^{3/5} \cdot x^{-1/2}$

18. $(16x^3)^{1/2}$

19. $\frac{15x^{3/2}}{3x^{1/4}}$

20. $\sqrt[4]{25} \cdot \sqrt{5}$

21. $\frac{(64x^4y^4)^{1/2}}{4y^2}$

22. $(5^{1/3} \cdot x^{1/4})^3$

23. $\sqrt[4]{81x^5y^2z^8}$

24. $(x^{2/5})^{3/4}$

25. $\sqrt{\frac{4x^4}{25y^6}}$

26. $\sqrt[5]{x^{15}y^5}$

27. $(49x^{-4/3}y^{2/3})^{-3/2}$

Write each of the following logarithmic equations in exponential form.

28. $\log_3 243 = 5$

29. $\log_a N = x$

30. $\log 1 = 0$

Find the value of each of the following logarithms. It may help to write in exponential form first.

31. $\log_5 25$

32. $\log_7 7$

33. $\log_6 1$

34. $\log_{27} \sqrt[3]{27}$

35. $\log_2 \frac{1}{8}$

36. $\log_{16} 4$

Using the properties of logarithms, please evaluate each expression.

37. $\log_3 3$

38. $5^{\log_5 7}$

39. $\log_4 4^5$

Write each of the following natural logarithmic equations in exponential form.

40. $\ln 1 = 0$

41. $\ln e = 1$

42. $\ln 7.3891 = 2$

Using the properties of natural logarithms, please evaluate each expression.

43. $e^{\ln 7}$

44. $21 \ln 1$

45. $\frac{8}{\ln e}$

Use the properties of logarithms to condense the following logarithmic expressions.

46. $\log_6 7 - \log_6 y$

47. $\log_3 q + \log_3 r$

48. $6 \log_a t - 7 \log_a t$

49. $(\log_a x - \log_a r) + 5 \log_a p$

50. $2 \log_m q - 3 \log_m y^2$

51. $5 \log_2(2x + 6) + 4 \log_2(4x - 4)$

52. $6 \ln x + \frac{1}{2} \ln y - (2 \ln x + 3 \ln 2)$

53. $\frac{1}{2} [\ln(x - 1) + \ln(x + 2)]$

54. $\log x - (2 \log y + 3 \log z)$

Answer Key:

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|------------------------------|---------------------------------|---|-----------------------------|------------------------------|
| 1. y^{10} | 2. $125p^3q^3$ | 3. $64m^{11}$ | 4. $108x^{29}$ | 5. $-3267x^{12}y^{13}$ |
| 6. $\frac{49x^6}{4y^8}$ | 7. $\frac{16g^{16}}{81f^{12}}$ | 8. $54s^7t^7$ | 9. $\frac{1}{32}$ | 10. $\frac{1}{49}$ |
| 11. $\frac{1}{32}$ | 12. 36 | 13. $\frac{5}{9}$ | 14. $\frac{y^{10}}{27x^5}$ | 15. $\frac{3x^{12}y^5}{4}$ |
| 16. $3\sqrt{x^3}$ | 17. $\sqrt[10]{x}$ | 18. $4\sqrt{x^3}$ | 19. $5\sqrt[4]{x^5}$ | 20. 5 |
| 21. $2x^2$ | 22. $5\sqrt[4]{x^3}$ | 23. $3\cdot\sqrt[4]{x^5}\cdot\sqrt{y}\cdot z^2$ | 24. $\sqrt[10]{x^3}$ | 25. $\frac{2x^2}{5y^3}$ |
| 26. x^3y | 27. $\frac{x^2}{343y}$ | 28. $3^5 = 243$ | 29. $a^x = N$ | 30. $10^0 = 1$ |
| 31. 2 | 32. 1 | 33. 0 | 34. $\frac{1}{3}$ | 35. -3 |
| 36. $\frac{1}{2}$ | 37. 1 | 38. 7 | 39. 5 | 40. $e^0 = 1$ |
| 41. $e^1 = e$ | 42. $e^2 = 7.3891$ | 43. 7 | 44. 0 | 45. 8 |
| 46. $\log_6 \frac{7}{y}$ | 47. $\log_3 qr$ | 48. $\log_a \frac{1}{t}$ | 49. $\log_a \frac{p^5x}{r}$ | 50. $\log_m \frac{q^2}{y^6}$ |
| 51. $\log_2(2x+6)^5(4x-4)^4$ | 52. $\ln \frac{x^4\sqrt{y}}{8}$ | 53. $\ln \sqrt{x^2+x-2}$ | 54. $\log \frac{x}{y^2z^3}$ | |