

Simplify each expression.

17. $3ab^0$

18. $5x^{-4}$

19. $\frac{1}{x^{-7}}$

20. $\frac{1}{c^{-1}}$

21. $\frac{5^{-2}}{p}$

22. $a^{-4}c^0$

23. $\frac{3x^{-2}}{y}$

24. $\frac{7ab^{-2}}{3w}$

25. $x^{-5}y^{-7}$

26. $x^{-5}y^7$

27. $\frac{8}{2c^{-3}}$

28. $\frac{7s}{5t^{-3}}$

29. $\frac{6a^{-1}c^{-3}}{d^0}$

30. $2^{-3}x^2z^{-7}$

31. $9^0y^7t^{-11}$

32. $\frac{7s^0t^{-5}}{2^{-1}m^2}$

Evaluate each expression for $r = -3$ and $s = 5$.

33. s^{-2}

34. r^{-2}

35. $-r^{-2}$

36. s^0

37. $3s^{-2}$

38. $(2s)^{-2}$

39. $r^{-4}s^2$

40. $\frac{1}{r^{-4}s^2}$

41. s^2r^{-3}

42. r^0s^{-2}

43. $5r^3s^{-1}$

44. $2^{-4}r^3s^{-2}$

Simplify each expression.

7. $c^{-2}c^7$

8. $3r \cdot r^4$

9. $5t^{-2} \cdot 2t^{-5}$

10. $(7x^5)(8x)$

11. $3x^2 \cdot x^2$

12. $(-2.4n^4)(2n^{-1})$

13. $b^{-2} \cdot b^4 \cdot b$

14. $(-2m^3)(3.5m^{-3})$

15. $(15a^3)(-3a)$

16. $(x^5y^2)(x^{-6}y)$

17. $(5x^5)(3y^6)(3x^2)$

18. $(4c^4)(ac^3)(3a^5c)$

19. $x^6 \cdot y^2 \cdot x^4$

20. $a^6b^3 \cdot a^2b^{-2}$

21. $-m^2 \cdot 4r^3 \cdot 12r^{-4} \cdot 5m$

Simplify each expression. Write each answer in scientific notation.

22. $(2 \times 10^3)(3 \times 10^2)$

23. $(2 \times 10^6)(3 \times 10^3)$

24. $(4 \times 10^6) \cdot 10^{-3}$

25. $(1 \times 10^3)(3.4 \times 10^{-8})$

26. $(8 \times 10^{-5})(7 \times 10^{-3})$

27. $(5 \times 10^7)(3 \times 10^{14})$

Simplify each expression.

1. $(c^5)^2$

2. $(c^2)^5$

3. $(n^8)^4$

4. $(q^{10})^{10}$

5. $(c^5)^3c^4$

6. $(d^3)^5(d^3)^0$

7. $(t^2)^{-2}(t^2)^{-5}$

8. $(x^3)^{-1}(x^2)^5$

Simplify each expression.

9. $(5y)^4$

10. $(4m)^5$

11. $(7a)^2$

12. $(12g^4)^{-1}$

13. $(6y^2)^2$

14. $(3n^6)^4$

15. $(2y^4)^{-3}$

16. $(2p^6)^0$

17. $(x^2)^5(x^3)^2$

18. $(2xy)^3x^2$

19. $(mg^4)^{-1}(mg^4)$

20. $(c^{-2})^3c^{-12}$

21. $(3b^{-2})^2(a^2b^4)^3$

22. $(2a^2c^4)^{-5}(c^{-1}a^7)^6$

Simplify. Write each answer in scientific notation.

23. $(4 \times 10^5)^2$

24. $(3 \times 10^5)^2$

25. $(2 \times 10^{-10})^3$

26. $(2 \times 10^{-3})^3$

27. $(7 \times 10^4)^2$

28. $(6 \times 10^{12})^2$

29. $(4 \times 10^8)^{-2}$

30. $(3.5 \times 10^{-4})^3$

Simplify each expression.

5. $\frac{2^5}{2^7}$

6. $\frac{2^7}{2^5}$

7. $\frac{c^{12}}{c^{15}}$

8. $\frac{m^{-2}}{m^{-5}}$

9. $\frac{3s^{-9}}{6s^{-11}}$

10. $\frac{x^{13}y^2}{x^{13}y}$

11. $\frac{c^2d^{-3}}{c^3d^{-1}}$

12. $\frac{3^2m^3t^6}{3^5m^7t^{-3}}$

Simplify each quotient. Write each answer in scientific notation.

13. $\frac{6.5 \times 10^{15}}{1.3 \times 10^8}$

14. $\frac{2.7 \times 10^{-8}}{9 \times 10^{-4}}$

15. $\frac{4.2 \times 10^8}{7 \times 10^5}$

16. $\frac{8.4 \times 10^{-5}}{2 \times 10^{-8}}$

17. $\frac{4.65 \times 10^{-4}}{3.1 \times 10^2}$

18. $\frac{3.5 \times 10^6}{5 \times 10^8}$

Challenge

Simplify each expression.

52. $\left(\frac{2ab^6}{a^3b}\right)^{-2}$

53. $\frac{a^3b^2c^{-4}}{a^{-2}b^5c^{-9}}$

54. $\frac{\left(\frac{1}{3}\right)^{-3}}{\left(\frac{1}{6}\right)^{-2}}$

55. $\frac{0.2^2 \cdot 0.2^3}{0.2^6}$

56. $\left(\frac{p^{-2}q^4r}{p^3q^5}\right)^5$

57. $\left(\frac{(-3)^2}{(-2)^{-4}}\right)^2$

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

59. $\frac{(5a^2)(6b^3)}{(2a^3)(25b^{-2})}$