10.2 More Multiplication Properties of Exponents

Simplify each expression.

1. $(z^5)^3$ **2.** $(m^4)^{10}$ **3.** $(v^7)^{\frac{1}{2}}$ **4.** $(k^{\frac{4}{3}})^3$

5. $(x^7)^{-2}$ **6.** $\left(r^{\frac{1}{4}}\right)^{-6}$ **7.** $b(b^{-8})^{-3}$ **8.** $h^2(h^7)^0$

9. $(m^2)^{\frac{3}{2}}n^{\frac{1}{7}}$ **10.** $(x^6)^2(y^3)^0$ **11.** $(g^5)^{-5}(g^6)^{-2}$ **12.** $(v^2)^3(w^4)^{\frac{1}{3}}$

13. $(6a)^4$ **14.** $(5f)^{-3}$ **15.** $(9z)^{\frac{1}{2}}$ **16.** $(10m^3)^{-2}$

17. $(6j^{-2})^{-3}$ **18.** $(9d^{10})^{-2}$ **19.** $(gh)^0$ **20.** $(qr^6)^{\frac{1}{2}}$

21. $(4a^3)^2a^5$ **22.** $\left(m^{\frac{4}{7}}n^3\right)^7(m^4)^3$ **23.** $(xy^2)(xy^2)^{-1}$ **24.** $z(y^{-5}z^7)^{-1}y^{-5}$

25. $(7t^{-3})^3\left(s^5t^{\frac{1}{4}}\right)^2$ **26.** $m^{-9}(m^{-1}n)^{\frac{1}{2}}n^8$ **27.** $(3b^{-4}c^{-2})^6c^3$ **28.** $5x^{-5}y^2(2x^{-14})^2$

Simplify. Write each answer in scientific notation.

29. $(5 \times 10^7)^2$ **30.** $(2 \times 10^4)^6$ **31.** $(9 \times 10^{-12})^2$ **32.** $(3 \times 10^{-8})^3$

33. $(3.6 \times 10^5)^2$ **34.** $(9.3 \times 10^{-6})^{-2}$ **35.** $(1.7 \times 10^{-8})^3$ **36.** $(6.24 \times 10^{13})^3$

37. The radius of a cylinder is 5.4×10^6 cm. The height of the cylinder is 2.5×10^3 cm. What is the volume of the cylinder? (Hint: $V = \pi r^2 h$)

38. The side length of a square is 9.6×10^5 in. What is the area of the square?

39. The side length of a cube is 3.78×10^3 ft. What is the volume of the cube?

43. $(w^3)^{\square} = w^{-12}$

44. $(n^{-8})^{\square} = n$

45. $10(g^2)^{\square} = 10g^6$

46. $(3a^{\square})^3 = 27a^{\frac{3}{2}}$

47. $(6q^4r^{\square})^2 = 36q^8$

48. $(x^4y^3)^{\square} = \frac{1}{x^8y^6}$

49. Writing Is $(y^m)^n = (y^n)^m$ a true statement? Explain your reasoning.

50. Reasoning What is the difference between x^4x^3 and $(x^4)^3$? Justify your answer.

Simplify each expression.

51. $2^3(2m)^2$

52. $(68.68)^8(68.68)^{-8}$

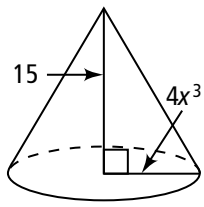
53. $\left(d^{\frac{2}{3}}\right)^{-5} d^3$

54. $(-7p)^3 + 7p^3$

55. $4a\left(0^{\frac{1}{2}}\right)b^4(-b)^{-7}$

56. $(10^{-5})^3(9.9 \times 10^{-12})^2$

57. The volume of a circular cone can be determined by the formula $V = \frac{1}{3}3.14r^2h$, where r is the radius of the base and h is the height of the cone. Find the volume of the cone shown at the right in terms of x.



58. The volume of a sphere can be determined by the formula $V = \frac{4}{3}3.14r^3$, where r is the radius. Find the volume of the sphere shown at the right in terms of t.