8-3 Scientific Notation (Pages 425–430)

When dealing with very large numbers, keeping track of place value can be difficult. For this reason, it is not always desirable to express numbers in standard notation. Large numbers such as these may be expressed in **scientific notation**.

Scientific Notation	A number is expressed in scientific notation when it is in the form $a \times 10^n$, where $1 \le a < 10$ and n is an integer.

Examples Express each number in scientific notation.

a. 299,000,000

$299,000,000$
$= 2.99 \times 100,000,000$
$= 2.99 \times 10^8$

b. 0.0000254

0.0000254
$= 2.54 \times 0.00001$
$= 2.54 \times \dfrac{1}{100,000}$
$= 2.54 \times 10^{-5}$

Express each number in standard notation.

c. 3.14×10^6

3.14×10^6
$= 3.14 \times 1,000,000$
$= 3,140,000$

d. 7.2×10^{-4}

7.2×10^{-4}
$= 7.2 \times \dfrac{1}{10^4}$
$= 7.2 \times \dfrac{1}{10,000}$
$= 7.2 \times 0.0001$ or 0.00072

Practice

Express each number in scientific notation.

1. 3500   **2.** 0.0015   **3.** 43.8   **4.** 285,873,000

5. 0.0000000485   **6.** 0.060406   **7.** 655×10^{-5} **8.** 109×10^8

Evaluate. Express each result in scientific notation and standard notation.

9. $(5.4 \times 10^1)(4 \times 10^4)$ **10.** $(6.07 \times 10^{-3})(42 \times 10^{-1})$ **11.** $(9 \times 10^6)(20 \times 10^{-4})$

12. $\dfrac{2.6 \times 10^3}{6.5 \times 10^9}$ **13.** $\dfrac{9.5 \times 10^8}{1.9 \times 10^2}$ **14.** $\dfrac{3.51 \times 10^{-7}}{2.7 \times 10^2}$

15. Chemistry A mole has 6.0×10^{23} molecules. The molecular mass of water is 18 grams, or 18 moles. How many molecules are there in 18 grams of water? Express your answer in scientific notation.

16. Standardized Test Practice Evaluate $(1.42 \times 10^8) \div (7.1 \times 10^{-3})$.

  A 2×10^4 **B** 2×10^5 **C** 2×10^{10} **D** 2×10^{11}

Answers: 1. 3.5×10^3 2. 1.5×10^{-3} 3. 4.38×10^1 4. 2.85873×10^8 5. 4.85×10^{-8} 6. 6.0406×10^{-2} 7. 6.55×10^{-3} 8. 1.09×10^{10} 9. 2.16×10^6; 2,160,000 10. 2.5494×10^{-2}; 0.025494 11. 1.8×10^4; 18,000 12. 4×10^{-7}; 0.0000004 13. 5×10^6; 5,000,000 14. 1.3×10^{-9}; 0.0000000013 15. 1.08×10^{25} 16. C