

**8-3 Study Guide and Intervention****Scientific Notation**

**Scientific Notation** Keeping track of place value in very large or very small numbers written in standard form may be difficult. It is more efficient to write such numbers in scientific notation. A number is expressed in scientific notation when it is written as a product of two factors, one factor that is greater than or equal to 1 and less than 10 and one factor that is a power of ten.

**Scientific Notation**

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

**Example 1**

**Express  $3.52 \times 10^4$  in standard notation.**

$$\begin{aligned} 3.52 \times 10^4 &= 3.52 \times 10,000 \\ &= 35,200 \end{aligned}$$

The decimal point moved 4 places to the right.

**Example 3**

**Express 37,600,000 in scientific notation.**

$$37,600,000 = 3.76 \times 10^7$$

The decimal point moved 7 places so that it is between the 3 and the 7. Since  $37,600,000 > 1$ , the exponent is positive.

**Example 2**

**Express  $6.21 \times 10^{-5}$  in standard notation.**

$$\begin{aligned} 6.21 \times 10^{-5} &= 6.21 \times \frac{1}{10^5} \\ &= 6.21 \times 0.00001 \\ &= 0.0000621 \end{aligned}$$

The decimal point moved 5 places to the left.

**Example 4**

**Express 0.0000549 in scientific notation.**

$$0.0000549 = 5.49 \times 10^{-5}$$

The decimal point moved 5 places so that it is between the 5 and the 4. Since  $0.0000549 < 1$ , the exponent is negative.

**Exercises**

**Express each number in standard notation.**

1.  $3.65 \times 10^5$

2.  $7.02 \times 10^{-4}$

3.  $8.003 \times 10^8$

4.  $7.451 \times 10^6$

5.  $5.91 \times 10^0$

6.  $7.99 \times 10^{-1}$

7.  $8.9354 \times 10^{10}$

8.  $8.1 \times 10^{-9}$

9.  $4 \times 10^{15}$

**Express each number in scientific notation.**

10. 0.0000456

11. 0.00001

12. 590,000,000

13. 0.00000000012

14. 0.000080436

15. 0.03621

16.  $433 \times 10^4$

17.  $0.0042 \times 10^{-3}$

18. 50,000,000,000