

## Lesson 4-8

### Example 1 Express Numbers in Standard Form

Express each number in standard form.

a.  $2.54 \times 10^{-6}$

$$\begin{aligned} 2.54 \times 10^{-6} &= 2.54 \times 0.000001 \\ &= 0.00000254 \end{aligned}$$

$$10^{-6} = 0.000001$$

Move the decimal point 6 places to the left.

b.  $1.8 \times 10^4$

$$\begin{aligned} 1.8 \times 10^4 &= 1.8 \times 10,000 \\ &= 18,000 \end{aligned}$$

$$10^4 = 10,000$$

Move the decimal point 4 places to the right.

### Example 2 Express Numbers in Scientific Notation

Express each number in scientific notation.

a. 520,000

$$\begin{aligned} 520,000 &= 5.2 \times 100,000 \\ &= 5.2 \times 10^5 \end{aligned}$$

The decimal point moves 5 places.

The exponent is positive.

b. 0.0006

$$\begin{aligned} 0.0006 &= 6.0 \times 0.0001 \\ &= 6.0 \times 10^{-4} \end{aligned}$$

The decimal point moves 4 places

The exponent is negative.

c. 321,000,000,000

$$\begin{aligned} 321,000,000,000 &= 3.21 \times 100,000,000,000 \\ &= 3.21 \times 10^{11} \end{aligned}$$

The decimal point moves 11 places.

The exponent is positive.

### Example 3 Use Scientific Notation to Solve a Problem

**SPACE** Light travels 300,000 kilometers per second. Estimate how long it takes light to travel  $9.3 \times 10^7$  kilometers in space.

**Explore** You know the distance and the speed of light.

**Plan** To find the time, solve the equation  $d = rt$ . Write the speed of light as  $3.0 \times 10^5$ .

**Solve**

$$d = rt$$

Write the formula

$$9.3 \times 10^7 = (3.0 \times 10^5)t$$

Replace  $d$  with  $9.3 \times 10^7$  and  $r$  with  $3.0 \times 10^5$ .

$$\frac{9.3 \times 10^7}{3.0 \times 10^5} = \frac{(3.0 \times 10^5)t}{3.0 \times 10^5}$$

Divide each side by  $3.0 \times 10^5$ .

$$3.1 \times 10^2 = t$$

Divide 9.3 by 3.0 and  $10^7$  by  $10^5$ .

So, it would take about  $3.1 \times 10^2$  seconds or about 5 minutes.

**Examine** Use estimation to check the reasonableness of these results.

