

# Lesson 4 Reteach

## Scientific Notation

Numbers like 5,000,000 and 0.0005 are in **standard form** because they do not contain exponents. A number is expressed in **scientific notation** when it is written as a product of a factor and a power of 10. The factor must be greater than or equal to 1 and less than 10.

By definition, a number in scientific notation is written as  $a \times 10^n$ , where  $1 \leq a < 10$  and  $n$  is an integer.

**Example 1** Express the number  $7.8 \times 10^{-6}$  in standard form.

$$\begin{aligned} 7.8 \times 10^{-6} &= 7.8 \times 0.000001 & 10^{-6} &= 0.000001 \\ &= \underbrace{0.0000078} & & \text{Move the decimal point 6 places to the left.} \end{aligned}$$

**Example 2** Express the number 62,000,000 in scientific notation.

$$\begin{aligned} 62,000,000 &= 6.2 \times 10,000,000 & \text{The decimal point moves 7 places.} \\ &= 6.2 \times 10^7 & \text{The exponent is positive.} \end{aligned}$$

To compare numbers in scientific notation, compare the exponents.

- If the exponents are positive, the number with the greatest exponent is the greatest.
- If the exponents are negative, the number with the least exponent is the least.
- If the exponents are the same, compare the factors.

**Example 3** Compare each set of numbers using  $<$ ,  $>$  or  $=$ .

a.  $2.097 \times 10^5$  ●  $3.12 \times 10^3$  Compare the exponents:  $5 > 3$ .  
So,  $2.097 \times 10^5 > 3.12 \times 10^3$ .

b.  $8.706 \times 10^{-5}$  ●  $8.809 \times 10^{-5}$  The exponents are the same, so compare the factors:  $8.706 < 8.809$ .  
So,  $8.706 \times 10^{-5} < 8.809 \times 10^{-5}$ .

## Exercises

Express each number in standard form.

1.  $4.12 \times 10^6$

2.  $5.8 \times 10^2$

3.  $9.01 \times 10^{-3}$

4.  $1.034 \times 10^9$

5.  $3.48 \times 10^{-4}$

6.  $6.02 \times 10^{-6}$

Express each number in scientific notation.

7. 12,000,000,000

8. 5000

9. 0.00475

10. 7,989,000,000

11. 0.0000403

12. 13,000,000

Order each set of numbers from least to greatest.

13.  $6.9 \times 10^3$ ,  $7.6 \times 10^{-6}$ ,  $7.1 \times 10^3$ ,  $6.8 \times 10^4$     14.  $4.02 \times 10^{-8}$ ,  $4.15 \times 10^{-3}$ ,  $4.2 \times 10^2$ ,  $4.0 \times 10^{-8}$