

Lesson 2-8

Example 1

Simplify each expression.

a. $c^6 \div c^{-2}$

b. $d^6 \cdot d^{-3}$

c. $(x^2)^{-3}$

Solution

a. $c^6 \div c^{-2} = c^{6 - (-2)}$
 $= c^8$

b. $d^6 \cdot d^{-3} = d^{6 + (-3)}$
 $= d^3$

c. $(x^2)^{-3} = x^{2(-3)}$
 $= x^{-6}$ or $\frac{1}{x^6}$

Example 2

Evaluate each expression when $a = 3$ and $b = -2$.

a. a^{-4}

b. $(b^2)^{-1}$

c. a^2b^{-3}

Solution

a. $a^{-4} = (3)^{-4}$
 $= \frac{1}{3^4}$
 $= \frac{1}{81}$

b. $(b^2)^{-1} = b^{-2}$
 $= (-2)^{-2}$
 $= \frac{1}{(-2)^2}$
 $= \frac{1}{4}$

c. $a^2b^{-3} = \frac{a^2}{b^3}$
 $= \frac{(3)^2}{(-2)^3}$
 $= \frac{9}{-8}$
 $= -\frac{9}{8}$

Example 3

- a. Write 3,827,000 in scientific notation.
- b. Write $4.5 \cdot 10^{-6}$ in standard form.

Solution

$$\begin{aligned} \text{a. } 3,827,000 &= 3,827,000. \\ &= 3.827000 \\ &= 3.827 \cdot 10^6 \end{aligned}$$

Move the decimal point so that the first factor is between 1 and 10. The exponent of 10 is the number of places that the decimal point moved.

$$\begin{aligned} \text{b. } 4.5 \cdot 10^{-6} &= .0000045 \\ &= 0.0000045 \end{aligned}$$

Move the decimal point to the left 6 places.

Example 4

SCIENCE The speed of sound in water is about $4.92 \cdot 10^3$ ft/sec. How far does an underwater sound wave travel in 30 minutes? Write the answer in scientific notation.

Solution

Find the number of seconds in 30 minutes.

$$30 \text{ min} = 30(60) \text{ sec} = 1,800 \text{ sec} = 1.8 \cdot 10^3$$

To find the distance an underwater sound wave travels in 30 minutes, multiply.

$$\begin{aligned} (4.92 \cdot 10^3)(1.8 \cdot 10^3) &= (4.92 \cdot 1.8)(10^3 \cdot 10^3) \\ &= 8.856 \cdot 10^6 \end{aligned}$$

The sound wave travels $8.856 \cdot 10^6$ feet in 30 minutes.