

## Notes 10-7

### Operations with scientific notation

How do you evaluate this problem?

$$40 \times 10 + 8 \times 10 + 0.5 \times 10 + 0.07 \times 10$$

$$10(40 + 8 + 0.5 + 0.07)$$

### Example 1:

#### Adding & Subtracting Numbers in Scientific Notation

a.  $(4.6 \times 10^3) + (8.72 \times 10^3)$

b.  $(3.5 \times 10^{-2}) - (6.6 \times 10^{-3})$

a.  $(4.6 \times 10^3) + (8.72 \times 10^3)$

$$= (4.6 + 8.72) \times 10^3$$

Distributive Property

$$= 13.32 \times 10^3$$

Add.

$$= (1.332 \times 10^1) \times 10^3$$

Write 13.32 in scientific notation.

$$= 1.332 \times 10^4$$

Product of Powers Property

b.  $(3.5 \times 10^{-2}) - (6.6 \times 10^{-3})$

Rewrite  $6.6 \times 10^{-3}$  so that it has the same power of 10 as  $3.5 \times 10^{-2}$ .

$$6.6 \times 10^{-3} = 6.6 \times 10^{-1} \times 10^{-2}$$

Rewrite  $10^{-3}$  as  $10^{-1} \times 10^{-2}$ .

$$= 0.66 \times 10^{-2}$$

Rewrite  $6.6 \times 10^{-1}$  as 0.66.

Subtract the factors.

$$(3.5 \times 10^{-2}) - (0.66 \times 10^{-2})$$

$$= (3.5 - 0.66) \times 10^{-2}$$

Distributive Property

$$= 2.84 \times 10^{-2}$$

Subtract.

## Example 2: Multiplying Numbers in Scientific Notation

Find  $(3 \times 10^{-5}) \times (5 \times 10^{-2})$ . Write your answer in scientific notation.

**Find  $(3 \times 10^{-5}) \times (5 \times 10^{-2})$ . Write your answer in scientific notation.**

$$(3 \times 10^{-5}) \times (5 \times 10^{-2})$$

$$= 3 \times 5 \times 10^{-5} \times 10^{-2}$$

Commutative Property of Multiplication

$$= (3 \times 5) \times (10^{-5} \times 10^{-2})$$

Associative Property of Multiplication

$$= 15 \times 10^{-7}$$

Simplify.

$$= 1.5 \times 10^1 \times 10^{-7}$$

Write 15 in scientific notation.

$$= 1.5 \times 10^{-6}$$

Product of Powers Property

### Example 3 Dividing Numbers in Scientific Notation

**Find  $\frac{1.5 \times 10^{-8}}{6 \times 10^7}$ . Write your answer in scientific notation.**

Find  $\frac{1.5 \times 10^{-8}}{6 \times 10^7}$ . Write your answer in scientific notation.

$$\frac{1.5 \times 10^{-8}}{6 \times 10^7} = \frac{1.5}{6} \times \frac{10^{-8}}{10^7}$$

Rewrite as a product of fractions.

$$= 0.25 \times \frac{10^{-8}}{10^7}$$

Divide 1.5 by 6.

$$= 0.25 \times 10^{-15}$$

Quotient of Powers Property

$$= 2.5 \times 10^{-1} \times 10^{-15}$$

Write 0.25 in scientific notation.

$$= 2.5 \times 10^{-16}$$

Product of Powers Property

Find the product or quotient. Write your answer in scientific notation.

3.  $6 \times (8 \times 10^{-5})$

4.  $(7 \times 10^2) \times (3 \times 10^5)$

5.  $(9.2 \times 10^{12}) \div 4.6$

6.  $(1.5 \times 10^{-3}) \div (7.5 \times 10^2)$

## How many times greater is the diameter of the Sun than the diameter of Earth?



Diameter = 1,400,000 km



Diameter =  $1.28 \times 10^4$  km

Write the diameter of the Sun in scientific notation.

$$1,400,000 = 1.4 \times 10^6$$

Divide the diameter of the Sun by the diameter of Earth.

$$\begin{aligned} \frac{1.4 \times 10^6}{1.28 \times 10^4} &= \frac{1.4}{1.28} \times \frac{10^6}{10^4} && \text{Rewrite as a product of fractions.} \\ &= 1.09375 \times \frac{10^6}{10^4} && \text{Divide 1.4 by 1.28.} \\ &= 1.09375 \times 10^2 && \text{Quotient of Powers Property} \\ &= 109.375 && \text{Write in standard form.} \end{aligned}$$

❖ The diameter of the Sun is about 109 times greater than the diameter of Earth.

