

# Operations with Scientific Notation

## Multiplication and Division

When we multiply and divide numbers written in scientific notation, we use the associative property to group the decimals together separate from the powers of 10,

$$\begin{aligned} \text{a.) } (1.3 \times 10^4)(2.4 \times 10^3) &= \\ (1.3 \times 2.4) \times (10^4 \cdot 10^3) & \end{aligned}$$

$$\boxed{3.12 \times 10^7}$$

$$\text{b.) } \frac{(3.7) \times (10^{12})}{(1.3) \times (10^5)} \approx 2.85 \times 10^7$$

$$\text{c.) } \frac{(1.5 \times 10^3)}{(2.8 \times 10^5)} = 0.54 \times 10^{-2-1}$$

Fix!

\* Bring it back (-)

or

Push it forward(+)

$$= 5.4 \times 10^{-3}$$

$$\underline{(1.08 \times 10^{-6})} (\underline{9.3 \times 10^{-3}}) =$$

$$\underline{10.044} \times 10^{-9+1}$$

$$1.0044 \times 10^{-8}$$

$$(\underline{7.1} \times \underline{10^{-5}})(\underline{6.7} \times \underline{10^{-6}}) =$$

$$47.57 \times 10^{-11+1}$$

$$4.757 \times 10^{-10}$$

$$(\underline{3.48} \times 10^3)(\underline{9.8} \times 10^4)$$

$$= 34.104 \times 10^{7+1}$$

$$= 3.4104 \times 10^8$$

$$\frac{5.4 \times 10^{-1}}{3.4 \times 10^1} = 1.59 \times 10^{-2}$$

-1 + -1

$$\frac{7.3 \times 10^{-2+2}}{2.8 \times 10^2} = 2.61 \times 10^{-4}$$

$$\frac{9.4 \times 10^{-5}}{2.1 \times 10^5} = 4.48 \times 10^{-10}$$

$$\left( 2.3 \times 10^2 \right)^4 = 2.3^4 \times 10^8$$



## Lesson 10: Operations with Numbers in Scientific Notation

### Classwork

#### Exercise 1

The speed of light is 300,000,000 meters per second. The sun is approximately  $1.5 \times 10^{11}$  meters from Earth. How many seconds does it take for sunlight to reach Earth?

#### Exercise 2

The mass of the moon is about  $7.3 \times 10^{22}$  kg. It would take approximately 26,000,000 moons to equal the mass of the sun. Determine the mass of the sun.

**Exercise 3**

The mass of Earth is  $5.9 \times 10^{24}$  kg. The mass of Pluto is 13,000,000,000,000,000 kg. Compared to Pluto, how much greater is Earth's mass?

**Exercise 4**

Using the information in Exercises 2 and 3, find the combined mass of the moon, Earth, and Pluto.

**Exercise 5**

How many combined moon, Earth, and Pluto masses (i.e., the answer to Exercise 4) are needed to equal the mass of the sun (i.e., the answer to Exercise 2)?

## Problem Set

1. The sun produces  $3.8 \times 10^{27}$  joules of energy per second. How much energy is produced in a year? (Note: a year is approximately 31,000,000 seconds).
2. On average, Mercury is about 57,000,000 km from the sun, whereas Neptune is about  $4.5 \times 10^9$  km from the sun. What is the difference between Mercury's and Neptune's distances from the sun?
3. The mass of Earth is approximately  $5.9 \times 10^{24}$  kg, and the mass of Venus is approximately  $4.9 \times 10^{24}$  kg.
  - a. Find their combined mass.
  - b. Given that the mass of the sun is approximately  $1.9 \times 10^{30}$  kg, how many Venuses and Earths would it take to equal the mass of the sun?