

$$+$$

$$=$$

$$\frac{x}{\text{per by}}$$

$$\frac{\div}{\text{how many times}}$$

times each

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 1.5×10^{11} meters from Earth. How many seconds does it take for sunlight to reach Earth?

$$300,000,000 = 3 \times 10^8$$

$$\frac{1.5 \times 10^{11}}{3 \times 10^8} = 0.5 \times 10^3 = 500$$

It takes 500 seconds for sunlight to reach Earth.

Exercise 2

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

$$7.3 \times 10^{22} \text{ kg}$$

$$26,000,000 = 2.6 \times 10^7$$

$$\rightarrow \left(7.3 \times 10^{22} \right) \left(2.6 \times 10^7 \right) =$$

$$\rightarrow 18.98 \times 10^{29} = 1.898 \times 10^{30}$$



The mass of the sun is approximately 1.898×10^{30} g.

The speed of light is 3×10^8 meters per second. The sun is approximately 230,000,000,000 meters from Mars. How many seconds does it take for sunlight to reach Mars?

$$\frac{2.3 \times 10^{11}}{3 \times 10^8}$$

$$= 0.7\bar{6} \times 10^3$$

It takes about 767 seconds

Each shrimp weighs approximately 0.00027g and a shrimp company can bring in over 3,100,000,000 shrimp per year. Approximately how much would that much shrimp weigh?

$$0.00027\text{g} = 2.7 \times 10^{-4}$$

$$3,100,000,000 = 3.1 \times 10^9$$

$$(2.7 \times 10^{-4})(3.1 \times 10^9)$$

$$= 8.37 \times 10^5$$

3,100,000,000 shrimp would weigh about 837,000 g .

Exercise 3

The mass of Earth is 5.9×10^{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 3.8×10^{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 4.5×10^9 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 5.9×10^{24} kg, and the mass of Venus is approximately 4.9×10^{24} kg.
 - a. Find their combined mass.
 - b. Given that the mass of the sun is approximately 1.9×10^{30} kg, how many Venuses and Earths would it take to equal the mass of the sun?