Unit 1 – Lesson 10 **Name: _____**

Operations with Numbers in Scientific Notation **Date: _____ Period: _____**

Focus Standard:	8.EE.A.3	Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3 x 10^8 and the population of the world as 7 x 10^9, and determine that the world population is more than 20 times larger.*
	8.EE.A.4	Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

Student Outcomes

- Students practice operations with numbers expressed in scientific notation and standard notation.

Simplify the following problems, leave your answer in scientific notation.

1. $2 \times 10^3 - 1.9 \times 10^2$

2. $6.2 \times 10^5 + 9.7 \times 10^1$

Example 1: The world population is about 7 billion. There are 4.6×10^7 ants for every human on the planet. About how many ants are there in the world?

Example 2: A certain social media company processes about 990 billion *likes* per year. If the company has approximately 8.9×10^8 users of the social media, about how many *likes* is each user responsible for per year? Write your answer in scientific and standard 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?

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.

Exercise 3

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