

NAME: _____

Math _____, Period _____

Mr. Rogove

Date: _____

LEARNING OBJECTIVE: We will multiply and divide numbers expressed in scientific notation. (G8M1L10)

CONCEPT DEVELOPMENT:

Using the Commutative and Associative Properties to Rewrite Multiplication Problems

Example: The world population is about 7 billion. If there are 4.6×10^7 ants for every human, how many ants are there?

$(7 \times 10^9)(4.6 \times 10^7)$

$(7 \times 4.6) \times (10^9 \times 10^7)$

32.2×10^{16}

3.22×10^{17}

$(3.1 \times 10^6) \cdot (6.9 \times 10^7)$

$$\begin{array}{r} 4.6 \\ \times 7 \\ \hline 32.2 \end{array}$$

GUIDED PRACTICE:

Steps for Multiplying (or Dividing) Numbers Expressed in Scientific Notation ($d \times 10^n$)

1. Multiply (or divide) the d values.
2. Multiply (or divide) the powers of 10.
3. If necessary, rewrite expressing number in correct scientific notation.

Multiply $(7 \times 10^2)(4 \times 10^5)$

$(7 \times 4) \cdot (10^2 \times 10^5)$

28×10^7

2.8×10^8

Multiply $(1.5 \times 10^{-4})(7 \times 10^{15})$

$(1.5 \cdot 7) \times (10^{-4} \cdot 10^{15})$

10.5×10^{11}

1.05×10^{12}

Divide:

$\frac{2 \times 10^3}{8 \times 10^8}$

$\frac{1}{4} \cdot 10^{3-8}$

$.25 \times 10^{-5}$

2.5×10^{-6}

Divide: ✖

$\frac{4.2 \times 10^2}{8.4 \times 10^5}$

$\frac{4.2}{8.4} \times \frac{10^2}{10^5}$

$.5 \times 10^{-3}$

$\times 10 \div 10$

5×10^{-4}

The population of California is 3.8×10^7 people. Each person on average eats 6.3×10^2 pounds of dairy products in a year. How many pounds of dairy products are consumed in California each year?

$$(3.8 \times 10^7) \times (6.3 \times 10^2)$$

$$\frac{6.3}{3.8} (3.8 \times 6.3) \times (10^7 \times 10^2)$$

$$23.94 \quad 23.94 \times 10^9$$

2.394×10^{10} lbs.
of dairy

The term mole can be used in chemistry to refer to 6.02×10^{23} atoms of a substance. The mass of a single hydrogen molecule is approximately 1.67×10^{-24} gram. What is the mass (in grams) of 1 mole of hydrogen atoms?

$$(6.02 \cdot 1.67) \cdot (10^{23} \cdot 10^{-24})$$

$$\begin{array}{r} 1.67 \\ \times 6.02 \\ \hline 100200 \\ 100534 \end{array}$$

$$1.00534 \times 10^0$$

1.00534 grams

The rate of light is 300,000,000 meters per second. The sun is approximately distance 1.5×10^{11} meters from earth. How many seconds does it take for sunlight to reach earth?

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

$$t = \frac{d}{r} \quad \frac{1.5 \times 10^{11}}{3 \times 10^8}$$

$$0.5 \times 10^3 = 5 \times 10^2$$

It takes about 500 seconds

In 2010, Americans generated 2.5×10^8 tons of garbage. If there are 2000 landfills in the U. S., how much garbage (on average) did each landfill receive?

$$\frac{2.5 \times 10^8}{2 \times 10^3} \text{ } 5 \times 10^{11}$$

1.25 $\times 10^5$

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INDEPENDENT PRACTICE:

Steps for Multiplying (or Dividing) Numbers Expressed in Scientific Notation ($d \times 10^n$)

1. Multiply (or divide) the d values.
2. Multiply (or divide) the powers of 10.
3. If necessary, rewrite expressing number in correct scientific notation.

<p>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, how many “likes” is each user responsible for?</p>	<p>A cup of decaf coffee has about 0.009 grams of caffeine. A cup of regular coffee has about 12 times the caffeine. How much caffeine does a regular cup have? Please write your answer in scientific notation.</p>
<p>About 8.4×10^{11} drops of water flow over Niagara Falls each minute. Each drop of water contains about 1.7×10^{22} molecules of water. About how many molecules fall each minute?</p>	<p>As of January 1, 2014, the US debt was roughly \$17,300,000,000,000. The population was about 3.14×10^8. About how much is each citizens share of the national debt?</p>

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ACTIVATING PRIOR KNOWLEDGE:

We can compare numbers that are large or small.

<p>Order the following numbers from largest to smallest:</p> <p>A. 3.4×10^8 \Rightarrow (3)</p> <p>B. 9.996×10^7 \Rightarrow (4)</p> <p>C. 10^9 \Rightarrow (1)</p> <p>D. <u>500,000,000</u> 5×10^8 (2)</p>	<p>Order the following numbers from <u>largest to smallest</u>:</p> <p>A. <u>0.00012</u> 1.2×10^{-4}</p> <p>B. 1.2×10^{-3} \rightarrow (B)</p> <p>C. 9.9×10^{-4}</p> <p>D. $10^{-4} = 1 \times 10^{-4}$</p> <p>(B, C, A, D)</p>
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CLOSURE:

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?

If the sun is approximately 1.5×10^{11} meters from Earth, what is the approximate distance from Earth to Mars?

TEACHER NOTES:

Homework for this: Multiplying and Dividing Scientific Notation on Khan