Name: Key **Class:** ____________

M8-U6: Notes #8 – Applications of Scientific Notation **Date:** ____________

Warm-Up:

If you could walk at a rate of 2 meters per second it would take you 1.92×10^8 seconds to walk to the moon. Is it more appropriate to report this time as 1.92×10^8 seconds or 6.09 years? *Explain.*

It would be a far distance so it would take you a long time. Years is a larger measurement.

In an ocean the sea floor moved 475 kilometers over 65 million years. Is it more appropriate to report this rate as 7.31×10^{-5} kilometer per year or 7.31 centimeters per year? *Explain.*

$7.31 \times 10^{-5} \times 10^3$

7.31×10^{-2}

7.31 centimeters

conversion (these values are equivalent)

It would be easier to report this as 7.31 cm per year. It is reported as a very small amount because the seafloor moves slowly.

When measuring "things" they have several properties like **length, mass,** and **volume.**

Length = the distance from point A to point B. (measured in **meters**)

Mass = How much gravity is pulling down on a thing…weight (sort of). (measured in **grams**)

Volume = How much of a thing there is. How much space is it taking up? (measured in **liters**)

Conversion Chart

Prefix	**Kilo**	**Hecto**	**Deca**	**base (m, g, L)**	**deci**	**centi**	**milli**
Symbol	k	h	D		d	cm	mm
10^n	10^3	10^2	10^1	10^0	10^{-1}	10^{-2}	10^{-3}
Standard Form	1,000	100	10	1	0.1	0.01	0.001
Term	Thousand	Hundred	Ten	One	Tenth	Hundredth	Thousandth
Silly Saying							

Prefix Form

Example 1: Write each of the following using the appropriate unit in prefix form.

a) 2.8×10^3 meters

2.8 kilometers

b) 1.5×10^{-3} Liters

1.5mL

c) 4.8×10^{-2} grams

4.8 centigrams

Example 2: Write each of the following using the appropriate unit in prefix form.

a) 0.070 grams

7×10^{-2} grams

7 centigrams

b) 4200 volts

4.2×10^3 volts

4.2 kilovolts

c) 0.0085 Liters

8.5×10^{-3} liters

8.5 milliliters

Example 3: Application Questions

Using the table below, answer the following questions:

Planet	Average distance from Sun in meters	Average distance from the Sun in kilometers
Mercury	5.83×10^{10} m	$5.83 \times 10^{7} \times 10^{3}$ m = 5.83×10^{7} km
Earth	$1.5 \times 10^{8} \times 10^{3}$ m = 1.5×10^{11} m	1.5×10^{8} km
Saturn	1.43×10^{12} m	$1.43 \times 10^{9} \times 10^{3}$ m = 1.43×10^{9} km

a) How close to Earth does Mercury come when both planets are at an average distance from the Sun? Answer using most appropriate units.

1.5×10^{8} km $- 5.83 \times 10^{7}$ km

1.5×10^{8} km $- (.583 \times 10^{1}) \times 10^{7}$ km

1.5×10^{8} km $- .583 \times 10^{8}$ km

1.500×10^{8} km
$- .583 \times 10^{8}$ km
$.917 \times 10^{8}$ km

$(9.17 \times 10^{-1}) \times 10^{8}$ km

9.17×10^{7} km

b) How close does Saturn come to Mercury when both are at an average distance from the Sun? Answer using most appropriate units.

1.43×10^{9} km $- 5.83 \times 10^{7}$ km

1.43×10^{9} km $- .0583 \times 10^{2} \times 10^{7}$ km

1.43×10^{9} km $- .0583 \times 10^{9}$ km

1.4300×10^{9} km
$- .0583 \times 10^{9}$ km
1.3717×10^{9} km

c) How close does Saturn come to Earth when both planets are at an average distance from the Sun? Answer using most appropriate units.

1.43×10^{9} km $- 1.5 \times 10^{8}$ km

1.43×10^{9} km $- .15 \times 10^{1} \times 10^{8}$ km

1.43×10^{9} km $- .15 \times 10^{9}$ km

1.43×10^{9} km
$- .15 \times 10^{9}$ km
1.28×10^{9} km

Is the distance that you found in (c) greater or less than the average distance from Earth to the Sun? *Explain.*

The distance in (c) is greater than the distance from Earth to the Sun. 1.28×10^{9} km is greater than 1.5×10^{8} km (higher exponent).

Example 4: An ant has a mass of approximately 4×10^{-3} grams and an elephant has a mass of approximately 8 metric tons.

Note: 1 kg = 1000 grams, 1 metric ton = 1000 kg, 1m = 100 cm, 1km = 1000 m

a. How many ants does it take to have the same mass as an elephant?

Elephant = 8 metric tons
which is 8000 kg which is 8×10^6 grams

converted everything to grams (base weight)

$$\frac{8 \times 10^6}{4 \times 10^{-3}} = 2 \times 10^9 \text{ ants}$$

which is 2,000,000,000
or 2 billion ants

b. An ant is 10^{-1} cm long. If you put all these ants from your answer to part (a) in a line (front to back), how long would the line be?

$(2 \times 10^9) \times (10^{-1}) = 2 \times 10^8$ cm ← small units; large distance

We can stop here. They didn't ask for a specific unit of measure.

$$\frac{2 \times 10^8 \text{ cm}}{100 \text{ cm}} = 2 \times 10^6 \text{ m}$$

or

$$\frac{2 \times 10^6 \text{ m}}{1000 \text{ m}} = \boxed{2000 \text{ km}}$$