Activity 1 - Math and the Calculator Worksheet

Name Key

Section _____ Date _____

Exercise A. Measured and Exact Numbers

Circle "M" or "E" to indicate whether each of the following numbers is measured or exact:

5 books	M [E]	12 roses	M [E]
5 lb	[M] E	12 inches in 1 foot	M [E]
9.25 g	[M] E	361 miles	[M] E
0.035 kg	[M] E	100 cm in 1 m	M [E]

Exercise B. Scientific Notation

Write the following numbers in scientific notation:

4,450,000	4.45×10^{6}	0.00032	3.2×10^{-4}
38,000	3.8×10^{4}	25.2	2.52×10^{1}
0.0000000021	2.1×10^{-9}	0.0505	5.05×10^{-2}

Write the following as standard numbers:

4×10^{2}	400	3×10^{-4}	0.0003
5×10^{3}	5000	8.2×10^{-3}	0.0082
3.15×10^{5}	315000	2.46×10^{-6}	0.00000246

Exercise C. Significant Figures

State the number of significant figures in each of the following measured quantities:

4.5 m	2 Sig figs	204.52 g	5 Sig figs
0.0004 L	1 Sig fig	625,000 mm	3 Sig figs
850 lb	2 Sig figs	34.80 km	4 Sig figs
2.50×10^{-3} L	3 Sig figs	8×10^{5} g	1 Sig fig

no decimal on value ∴ zero not significant

Exercise D. Rounding Off

Round off each of the following to the number of significant figures indicated. Don't forget placeholder zeros when necessary!

	Three significant Figures	Two Significant Figures
E.g.: 0.4108 g	0.411g	0.41 g
143.63212 mi	143.63212 = 144 mi	143.63212 = 140 mi
532,800 ft	532800 = 533000 ft	532,800 = 530,000 ft
5.448×10^2 yrs	$5.448 \times 10^2 = 5.45 \times 10^2$ yrs	$5.448 \times 10^2 = 5.4 \times 10^2$ years
0.00858345 mm	0.00858345 = 0.00858 mm	0.00858345 = 0.00860 mm

Exercise E. Multiplication and Division

Do the following multiplication and division calculations. **Give a final answer with the correct number of significant figures and the correct units. Units can cancel or multiply just like number factors.**

E.g.: 4.5 ergs × 0.281 in = 1.3 ergs·in

$0.1184\ \text{cm} \times 8.00\ \text{cm} \times 0.0345\ \text{cm} =$ $0.032\,6784\ \text{cm}^3 = 0.0327\ \text{cm}^3$

$(2.5 \times 10^4\ \text{m/s}) \times (5.0 \times 10^{-7}\ \text{s}) =$ $0.012\,5\ \text{m} = 0.012\ \text{m}$

$\dfrac{(42.2\ \text{L})(1.45\ \text{atm})}{(4.8\ \text{mol})\left(0.0821\ \frac{\text{L atm}}{\text{mol K}}\right)} =$ $155.273041\ \text{K} = 160\ \text{K}$ or $1.6 \times 10^2\ \text{K}$

Exercise F. Addition and Subtraction

Do the following addition and subtraction calculations. Give a final answer with the correct number of significant figures and units.

a. 13.45 mL + 0.4552 mL = 13.91 mL

b. 145.5 m + 86.58 m + 1045 m = 1277 m

c. 1315 mi + 200 mi + 1100 mi = 2600 mi or 2.6×10^3 mi

d. 245.625 g - 80.2 g = 165.4 g

e. 4.62 cm - 0.885 cm = 3.74 cm

a) 13.45 + 0.4552 = 13.9052

b) 145.5 + 86.58 + 1045 = 1277.08

c) 1315 + 200 + 1100 = 2615

d) 245.625 − 80.2 = 165.425

e) 4.62 − 0.885 = 3.735

Questions and Problems

1. How can you distinguish an exact number from a measured number?

An exact number is either a definition or counted whole number value. A measured number is obtained from a measurement with some sort of ruler or scale.

2. In the scientific community, the last digit in a measured number that is still significant is sometimes called the estimated digit. Circle or underline the estimated digit in each of the following measurements:

1.5 cm 4500 mi. 0.0782 m 42.50 g

(no decimal)

3. Bill and Beverly have measured the sides of a rectangle. Each recorded the length as 6.7 cm and the width as 3.9 cm. When Bill calculates the area, he gives an answer of 26.13 cm^2. However, Beverly gives her answer for the area as 26 cm^2.

   a. Give the most likely explanation for the difference between the two calculated answers despite the fact that both students used the same measurements.

$6.7\ cm^2 \times 3.9\ cm^2 = 26.13\ cm^2 = 26\ cm^2$

(Bill's Answer; Beverly's Answer)

Beverly is correctly applying the sig fig rules for multiplycation and correctly rounding her answer to two sig figs. Bill is not rounding his answer and reporting its value incorrectly.

   b. You are going to tutor Bill. Using complete sentences, describe how you would help him to understand why his answer is wrong and Beverly's is right.

The two measurements of 6.7 cm and 3.9 cm each have two sig figs. The area of the rectangle can only be as good, known to the same degree of uncertainty, as the values for the length and width. The area of the rectangle must be rounded to the same number of sig figs ⇒ two

$26.13\ cm^2 = 26\ cm^2$

Measurements in Your Daily Life

4. Throughout a typical day, list at least eight numbers (and units) you might use such as measurements, prices, definitions, cooking quantities, gasoline purchases, prescription dosages, etc. Identify each number as exact or measured. Explain your choice. (Did you use a measuring tool, or did you count out something, or use a definition?)

Number used	Type of Number	Explanation
325 mg	Measured	number of mg of asperin in a tablet
3 Tablets	Exact	number of asperin tablets Consumed after Hockey
16 fl Oz	Measured	Amount of Lemon Aid Consumed after game
4.0 mi	Measured	Distance to roller rink
-3.2 °C	Measured	Temp of ice used on ankle after game
$ 36.73	Exact	Amount of Money Spent on Beer by team
2 goals	Exact	number of goals our team won by
1 1st place Trophy	Exact	Priceless!

5. In the list above, were the numbers you used mostly measured numbers, or mostly exact numbers?

50/50 => Though most people will find the majority to be measured numbers.

6. List the names and abbreviations of five units (metric or American) of measurement you used. Give the property measured (weight, mass, volume, distance, etc.)

Unit of Measurement	Abbreviation	Property Measured	
Milligram	mg	Mass	SI
fluid Ounce	fl Oz	Volume	English
Mile	mi	distance	English
degree Celcius	°C	Temperature	SI
dollar	$	amount of Currency	