

Do Now: Solve the following problems using the unit conversions (dimensional analysis) technique. SHOW WORK!

1. You have \$300.00 in gas money to spend on a vacation. If your car gets 32km/liter and current gas prices average \$1.15 per liter, how far can you drive?

2. Your parents have offered to buy pizzas for you and your friends. You are having 8 friends over and each will eat 2.0 pieces of pizza. Each pizza has eight slices and costs \$10.99. How much money will your parents have to spend on pizza?

3. You get paid \$7.00 per hour working at a restaurant. You want to buy a car that costs \$9500. If you work an average of 15 hours a week, how long will it take you to earn the money to buy the car?

4. Precious metals and gems are measured in troy weights in the English system:
24 grains = 1 pennyweight 20 pennyweights = 1 troy ounce
12 troy ounces = 1 troy pound 1 grain = 0.0648 gram
The most common English unit of mass is the troy pound. What is 2.0 troy pounds in kilograms?

5. How much would it cost to buy nails used to build a fence 125m long if it requires 30 nails per meter? Assume that 50 nails are sold per box at a cost of \$0.75 per box.

Measurement: Units & Prefixes

*Unit= any standard that is used for _____

Whenever you report a measurement, you report a _____ followed by the _____

Ex: 5 feet
 number unit

System International (SI) Units: an international system of measurement based on the metric system. Some common ones we'll be working with:

Measurement	Base Unit	Symbol
Length	meter	
Mass	gram	
Volume	Liter	
Temperature	Kelvin	
Energy	Joule	
Frequency	Hertz	
Pressure	Pascal	
Amount of Substance	Mole	
Density	grams/milliliter or grams/centimeter ³	

K =

Prefixes: placed _____ of the base unit to indicate a larger or smaller quantity; based on powers of _____

Prefix	Symbol
Mega	M
Kilo	k
Hecto	h
Deca	da
Base (None)	(None)
Deci	d
Centi	c
Milli	m
Micro	μ
Nano	n

Helpful Mnemonic:
Ms. Karen Heats Dollar Bills.
Doesn't Chem Make μ Nervous?

Prefixes at the _____ of the chart represent a _____ amount or quantity.

Prefixes at the _____ of the chart represent a _____ amount or quantity.

Converting between metric units:

Ex: Convert 1609 meters into kilometers		
<p>1. Identify the quantity you're starting with, including the unit</p> <p>1609 m</p>	<p>2. Set up a conversion factor (fraction) so that you can cancel out a unit from the numerator with one in the denominator</p> $1609 \text{ m} \times \frac{\text{km}}{\text{m}}$	<p>3. Place a "1" in front of the larger unit</p> $1609 \text{ m} \times \frac{1 \text{ km}}{\text{m}}$
<p>4. Determine the number of smaller units needed to make "1" of the larger unit</p> $1609 \text{ m} \times \frac{1 \text{ km}}{1000 \text{ m}}$	<p>5. Cancel out similar units: a unit in the numerator cancels with one in the denominator if they are the same</p> $1609 \cancel{\text{m}} \times \frac{1 \text{ km}}{1000 \cancel{\text{m}}}$	<p>6. Multiply numbers that are in the numerator; divide this by the numbers that are in the denominator. Express your final answer with the proper unit</p> $= \frac{1609 \times 1 \text{ km}}{1000} = 1.609 \text{ km}$ <p>Final Answer: 1609 m = 1.609 km</p>

Practice: Convert the following:

1) 950 g = _____ kg

3) 0.450 μm = _____ nm

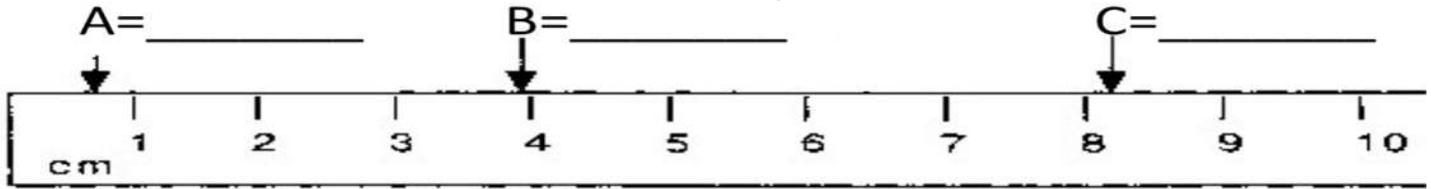
2) 35 mL = _____ dL

4) 106.1 MHz = _____ kHz

Making Measurement & Estimating the Last Digit: When using tools with graduated “tick marks”, you should _____

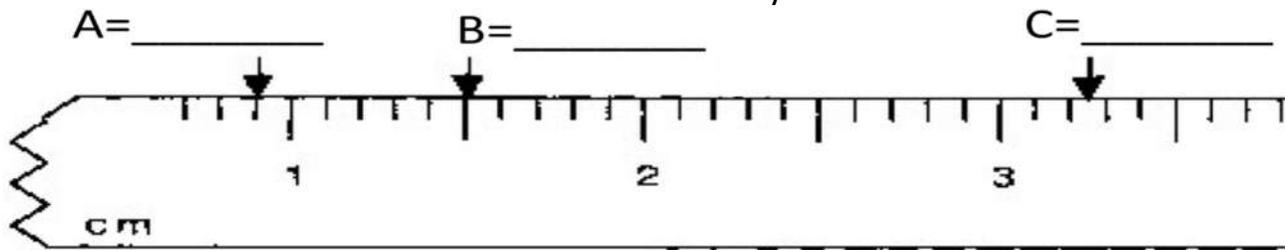
Practice: Reading a Ruler

1. Estimate the number of centimeters indicated by each of the arrows below.



***Each “tick mark” is worth _____, therefore estimate to the nearest _____

2. Estimate the number of centimeters indicated by each of the arrows below.

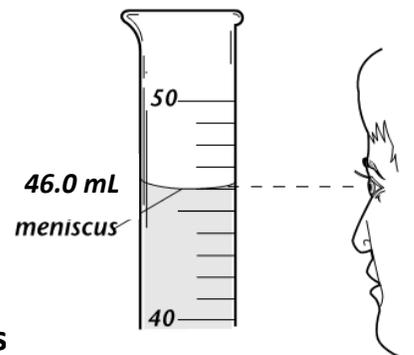


***Each “tick mark” is worth _____, therefore estimate to the nearest _____

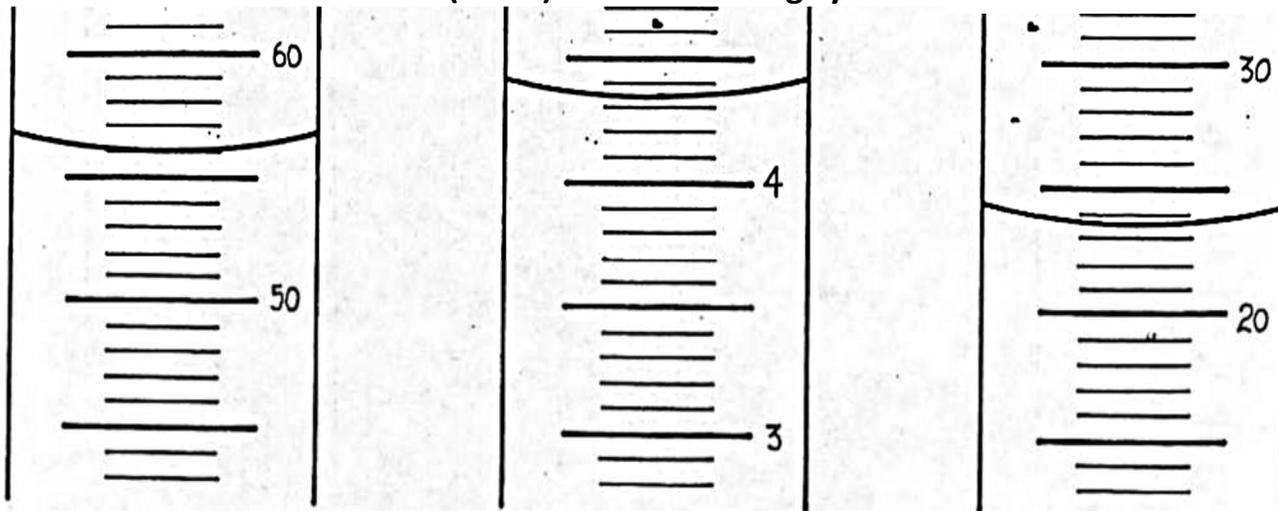
Reading Graduated Cylinders:

*Liquids form a curved surface when in graduated cylinders.

As a standard, you should read the liquid level from the _____



Practice: Estimate the volume (in mL) in the following cylinders



Significant Figures:

- When we make measurements, we are limited by the measuring tool. We can only state values in a measurement that we are sure are correct.
- With each measurement, there is a degree of uncertainty/estimation beyond the markings
- The last digit in a measurement is called the **uncertain digit**
- **Significant figures include** _____
- The _____ significant figures, the _____ precise the instrument

Rules for Counting Number of Significant Figures



1. _____ (1,2,3,4,5,6,7,8,9) are

ALWAYS significant

15=2 sig figs

145=3 sig figs

2. 0's between nonzero digits (_____) are

ALWAYS significant

105=3 sig figs

5005=4 sig figs

3. 0's to the left of the first nonzero are **NOT significant**

0.0005=1 sig fig

0.0505=3 sig figs

4. If there is a _____, the _____ of the number are

ALWAYS SIGNIFICANT

9010.0 = 5 sig figs

5. If there _____, the **0's at the end** of the number **DO NOT count!**

91010 = 4 sig figs

6. For scientific notation, only count the sig figs for the decimal part (not the $\times 10^n$ part)

$3.6 \times 10^5 = 2$ sig figs

"Pacific-Atlantic Method"

P = Pacific = Present

If the **decimal point is** _____, start counting digits from the _____

starting with the first non-zero digit.

→ 1 2 3

0.00310 (3 sig. figs.)

A = Atlantic = Absent

If the **decimal point is** _____, start counting digits from the _____

starting with the first non-zero digit.

3 2 1 ←

31,400 (3 sig. figs.)

Practice: Underline the significant digits and indicate how many significant figures are in each number

1) 1234 _____

5) 9010.0 _____

9) 9.0×10^3 _____

2) 0.023 _____

6) 1090.0010 _____

3) 890 _____

7) 0.00120 _____

4) 91010 _____

8) 3.4×10^4 _____

Calculations and Rounding with Significant Figures

- Adding and Subtracting:** Count the number of _____.
Round the final answer to the _____.

$$\begin{array}{r} 89.332 \leftarrow \text{3 digits after decimal point} \\ +1.1 \leftarrow \text{1 digit after decimal point} \\ \hline 90.432 \leftarrow \text{Raw answer} \end{array}$$

90.4 ← Rounded answer, 1 digit after decimal point

$$\begin{array}{r} 3.70 \leftarrow \text{2 digits after decimal point} \\ -2.9133 \leftarrow \text{4 digits after decimal point} \\ \hline 0.7867 \leftarrow \text{Raw answer} \end{array}$$

0.79 ← Rounded answer, 2 digits after decimal point

***Don't round your answer until the very end!**

Original Problem	Raw Answer	Final Answer w/ Proper Sig Figs and Units
3.482 cm + 8.51 cm + 16.324 cm		
48.0032 g + 9.17 g + 65.4321 g		
80.4 cm - 16.532 cm		
106.5 mL - 30. mL		

- Multiplying and Dividing:** Count the number of _____.
Round the final answer to the _____.

$$\begin{array}{c} 4.51 \times 3.6666 = 16.536366 = 16.5 \\ \uparrow \quad \uparrow \quad \uparrow \\ \text{3 sig figs} \quad \text{5 sig figs} \quad \text{round to} \\ \quad \text{3 sig figs} \end{array}$$

$$\begin{array}{c} 6.8 \div 112.04 = 0.0606926 = 0.061 \\ \uparrow \quad \uparrow \quad \uparrow \\ \text{2 sig figs} \quad \text{5 sig figs} \quad \text{round to} \\ \quad \text{2 sig figs} \end{array}$$

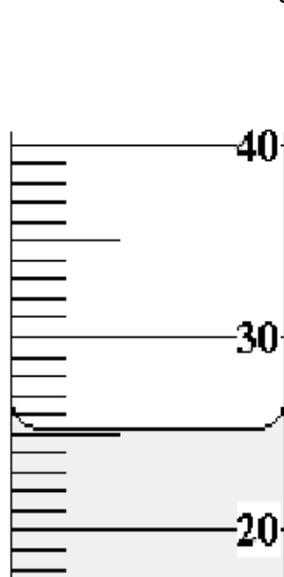
***Don't round your answer until the very end!**

***This rule doesn't apply for calculating averages (i.e. when dividing by 3 to find the avg of 3 measurements)**

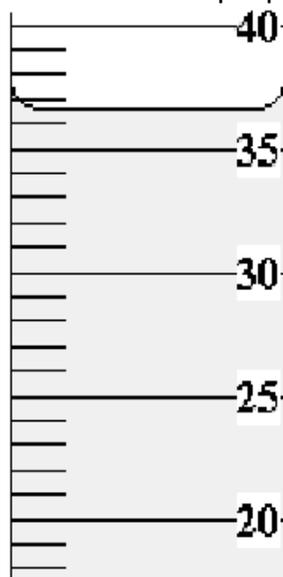
Original Problem	Raw Answer	Final Answer w/ Proper Sig Figs and Units
48.2 cm × 1.6 cm × 2.12 cm		
8.3 m × 4.0 m × 0.9823 m		
64.34 cm ³ ÷ 8.149 cm		
4.93 mm ² ÷ 18.71 mm		

Sig Figs HW

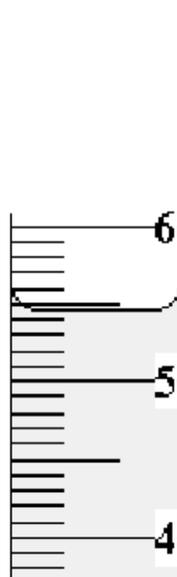
Estimate the following measurements to the proper number of decimal places:



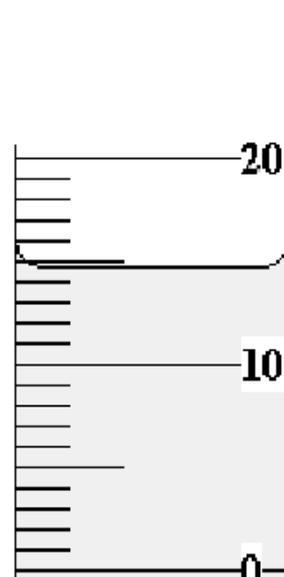
a) _____



b) _____



c) _____



d) _____

Identify the number of significant digits in each of the following measurements. Write the number in the space provided.

1. 520-mL _____

2. 0.0102-ms _____

3. 0.230-kg _____

4. 25,600-L _____

5. 10.002-ns _____

6. 0.451-Pa _____

7. 0.001-cm _____

Perform the following calculations and round off the answer to the correct number of significant digits.

8. $0.3287\text{-g} \times 45.2\text{-g} = ?$

13. $0.258\text{-mL} + 0.36105\text{-mL} = ?$

9. $125.5\text{-kg} + 52.68\text{-kg} + 2.1\text{-kg} = ?$

14. $(1250\text{-cal} - (234.207\text{-cal} \div 52.69\text{-cal})) = ?$

Unit Conversions w/ sig Figs

Perform the following metric conversions and round your final answer to the proper number of sig figs (round based on the value you are trying to convert) **SHOW WORK!**

1) $10.3 \text{ mm} \rightarrow \text{cm}$

3) $0.00419 \text{ kg} \rightarrow \text{ng}$

2) $7.2 \text{ L} \rightarrow \text{mL}$

4) $3300 \text{ mL} \rightarrow \text{L}$

Use the following conversions to help you complete the problems below. **SHOW WORK!**

$1 \text{ egg} = 45 \text{ grams (g)}$ $1000 \text{ g} = 1 \text{ kilogram (kg)}$ $1 \text{ kg} = 2.2 \text{ pounds (lbs)}$ $1 \text{ car} = 2000 \text{ lbs}$

5) $500 \text{ grams} \rightarrow \text{pounds}$

6) $27 \text{ eggs} \rightarrow \text{kilograms}$

7) $500 \text{ pounds} \rightarrow \text{eggs}$

8) $3000 \text{ grams} \rightarrow \text{cars}$