WKS
Significant Digits
(Significant Figures)

Name_____
Date_____ **Period**_____

<u>Part A</u>: Determining the number of significant digits in a measurement:

1. Digits other than zero are always significant.
   Ex: 96 g 2 sig figs
   Ex: 61.4 g 3 sig figs
   Ex: 1.5345 5 sig figs

2. One or more final zeros used after the decimal point are always significant.
   Ex: 4.70 L 3 sig figs
   Ex: 576.980 L 6 sig figs
   Ex: 45.9000 L 6 sig figs

   When there is a decimal, trailing zeros ARE significant.

3. Zeros between other digits are always significant.
   Ex: 5.089 mL 4 sig figs
   Ex: 80017 mL 5 sig figs
   Ex: 480.020 mL 6 sig figs

4. For numbers less than 1, all **zeros at the beginning** are insignificant until one hits a digit other than 0.
   Ex: 0.0052 cm 2 sig figs
   Ex: 0.0306 cm 3 sig figs
   Ex: 0.00400 cm 3 sig figs

   When there is a decimal, leading zeros are NOT significant.

5. **Unclear number of significant digits**: When a measurement ends with one or more zeros which are not after the decimal point, the number of significant digits is unclear. In these cases, one could clarify the precision by writing the measurement in scientific notation.
   Ex: 3870 m 3 sig figs (at least), but could be 4 sig figs
   Is it 3.87×10^3 or 3.870×10^3 ?

   Ex: 500 m 1 sig fig (at least), but could be 2 sig figs or 3 sig figs
   Is it 5×10^2 or 5.0×10^2 or 5.00×10^2 ?

   When there is NO decimal, trailing zeros are ambiguous. Thus, one generally must assume that they are NOT significant.

<u>Part A Practice:</u> Determine the number of significant digits for the following measurements. If the number of significant digits is unclear, write "unclear" and list all the possible number of significant digits it could have. For example: 4050 L <u>unclear, 3 or 4 possible</u> Also, convert each of the measurements to scientific notation.

	<u># of sig figs</u>	<u>Write number in Scientific Notation</u>
1) 678 g		
2) 4.098 mm		
3) 0.0089 s		
4) 0.07608 mL		
5) 5098 cm		
6) 57.0010 min		
7) 63100 km		
8) 0.000001 pm		
9) 600.0200 g		
10) 20 m		

More PART A Practice: Round all of the following numbers to **three** significant digits.

11) 8.97893 _____

12) 0.004524 _____

13) 2.995 _____

14) 354,680_____

15) 5.903×10^5 _____

Part B: *Keeping proper number of significant digits/decimal places when doing calculations*

Multiplication and Division: The answer may contain only as many significant digits as the measurement with the **LEAST** number of **significant digits**.

Ex: (2.30 m) (4.565 m) = *10.4995 (on calc)* = **10.5 m^2**
3 sig figs 4 sig figs 3 sig figs

Ex: $\frac{5.2 \times 10^{-4}\,\text{m}\ \ (2\,\text{sig figs})}{3.04\ \text{s}\ (3\ \text{sig figs})} =$ $= 1.710526316 \times 10^{-4}$ *(on calc)* = $\mathbf{1.7 \times 10^{-4}\ m/s}$
2 sig figs

Addition and Subtraction: Do NOT count significant digits. Instead, just look at the number of digits after the decimal point. The answer may contain only as many decimal places as the measurement having the **LEAST** number of **decimal places**.

Ex: 4.56 m
+ 0.32 m
4.88 m (only 2 decimal places)

Ex: 7678.0 g
− 3.907 g
7674.1 g (only 1 decimal place)

Practice: Make the following calculations and round answers to have the correct number of significant digits or decimal places. Please write answers in **normal and scientific notation**. Write UNITS!!!

16) (5.09 cm) (3.4 cm) =

17) $\frac{0.000434\ \text{g}}{0.0045\ \text{mL}} =$

18) (4001 cm) (2.34 cm) (40.1 cm) =

19) $(6.890 \times 10^{3}\ \text{m})\ (5.00 \times 10^{5}\ \text{m}) =$

20) $\frac{4.98 \times 10^{-5}\ \text{m}}{4.500 \times 10^{2}\ \text{s}} =$

21) 5.879 s + 89.98 s = (Normal notation only is fine.)

22) 0.0989 g − 0.0078 g = (Normal notation only is fine.)

23) $\frac{35.5\ \text{g} - 1.2\ \text{g}}{1.234 \times 10^{3}\ \text{L}} =$