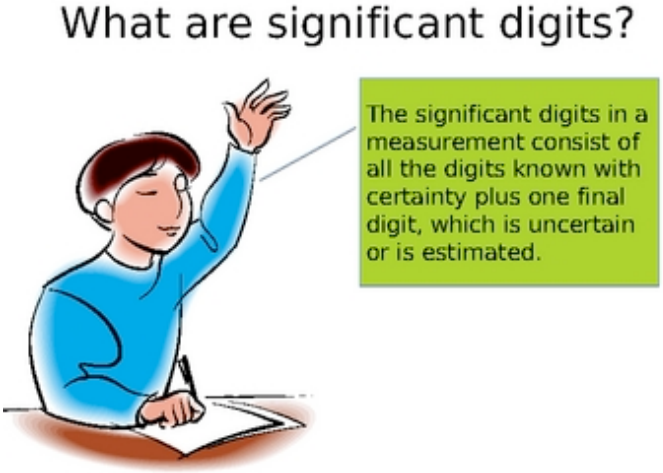
Lab: Sig Figs



Purpose: To investigate how to improve precision with different measuring instruments and use of significant figures.

Safety: None

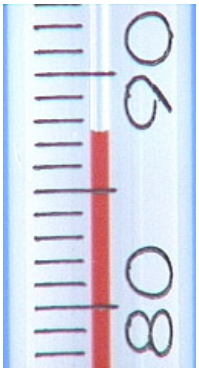
Station 1 – Accuracy & Precision

1. Each of five students used the same ruler to measure the length of the same pencil. These data resulted: 15.33 cm, 15.34 cm, 15.33 cm, 15.33 cm, 15.34 cm. The actual length of the pencil was 15.85 cm. Describe whether accuracy and precision are each good or poor for these measurements.

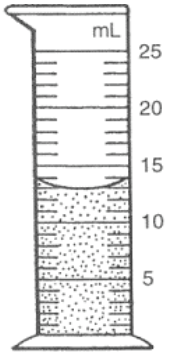
2. A chemistry student measured the boiling point of naphthalene ($C_{10}H_8$) at 231.0°C. What is the percent error for this measurement if the literature value is 217.9°C?

Station 2 – Measuring with Sig Figs

Make measurements use the pictures on the right.
Show the correct number of significant figures.



3. _____ Temperature in °C (close up of thermometer)



4. _____ Volume in mL (graduated cylinder)

5. _____ Length of line in cm (ruler)

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Station 3 – Volume of Liquids

Directions: Measure 25 mL of water into a beaker. Measure and record the volume, being careful to report your data to the correct number of significant figures and units. Then pour that SAME liquid into the following measuring instruments, being careful to follow this order: 100 mL graduated cylinder, 50 mL graduated cylinder, 10 mL graduated cylinders. Record each of your measurements to the correct number of sig figs and units. Compare your measurements with two other sets of partners and answer the analysis questions.

	Your Data	Group #1 Data	Group #2 Data
Beaker			
100 mL graduated cylinder			
50 mL graduated cylinder			
10 mL graduated cylinders (total the volumes)			

Analysis Questions:

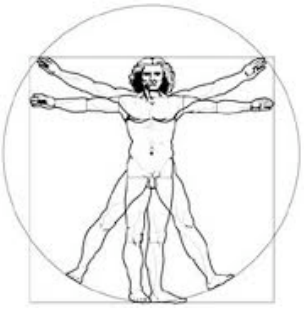
1. Can you report all of your measurements to the same number of significant figures? Explain your answer using your knowledge of significant figures.

2. Are your measurements precise? Explain your answer using your data as support.

3. Which piece of glassware do you believe was most accurate? Use your data to support your answer.

4. Which type of glassware would best measure 2.5 mL of water? Explain.

Station 4 – Percent Error



Directions: With a partner complete measurements measure your height and arm span. Both you and your partner need to complete the measurements from question 1 (you will each record the data from your own height and arm span). Please include units and show all work during calculations. Once you have your measurements complete the analysis questions.

Your Height: _____

Your Total Arm Span (from finger tip to finger tip): _____

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Analysis Questions:

1. In studying the human body, the Greeks discovered that a person's height is nearly the same as their total arm span. Where the Greek's correct? Calculate the percent difference between your height and your arm span.

2. Please identify at least one possible experimental (NOT human) error that could have occurred during this activity. How will this error alter your percent difference calculated in question 2?

Station 5 – Length

Directions: Using your metric ruler please measure the objects found at your station. Again please report your values to proper significant figures and with proper units. Once you have completed your measurements complete the analysis questions.

Object	Length
1. Height of your Lab Bench	
2. Length of line (on index card)	
3. Diameter of the Circle (on index card)	
4. Thickness of Paper Clip	
5. Length of String	

1. Did you encounter any problems when measuring your objects?

2. Do you think your measurements are accurate? Explain why or why not.

3. Did the ruler provide you with an appropriate scale to measure all of the objects?

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Station 6 – Why are they Significant?

Determine the number of significant figures in each of the following. Explain your reasoning.

1) 3.57 m _____ Reason:

2) 20.040 g _____ Reason:

3) 0.004 m^3 _____ Reason:

4) 730 000 kg _____ Reason:

5) 12 700. mL _____ Reason:

6) 30 ***atoms*** _____ Reason:

7) 0.6034 g/mL _____ Reason:

8) 19.0 s _____ Reason:

9) 810 ^oC _____ Reason:

10) 0.0100 mol _____ Reason: