

Exact Numbers vs Measured Values

- Exact Numbers are counted or defined values.
 - 27 students in the class
 - The number of coins in a pile
 - 1 inch = 2.54 cm



Exact Numbers vs Measured Values

- The numbers of measured quantities are not exact.
- Due to the measuring device, this means there is uncertainty in all measurements.



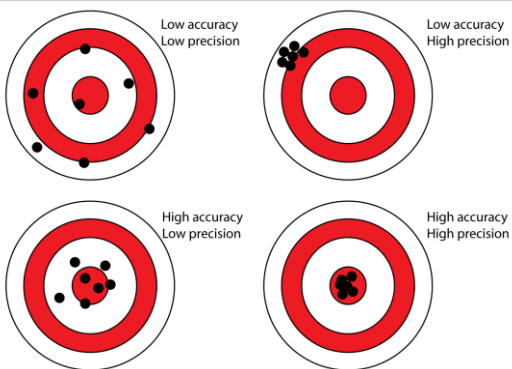
Accuracy vs Precision

- Accuracy refers to how close a measurement is to the actual or true value.



Accuracy vs Precision

- Precision is how close the measurements are to each other.



Measuring: Length

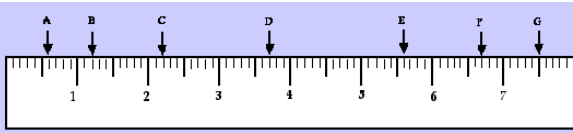
- Base Unit: Meter
- Tools Used: Ruler, Meter Stick

- Tips:
 - Always check where the object starts on the ruler
 - Make sure you are using the correct UNITS



9 cm – How many mm does that equal? 90 mm

Reading a Metric Ruler



- A- 6 mm
- B- 1.2 cm
- C- 2.2 cm
- D- 37 mm
- E- 56 mm
- F- 6.7 cm
- G- 75 mm

Measuring: Mass

- Base Unit: Grams
- Tool Used: Electronic Mass Balance / Scale

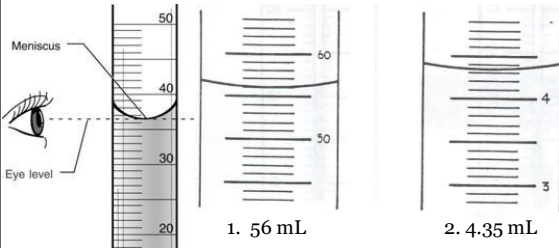
- Tips:
 - Always check what units you are using.
 - Record measurements to the same number of decimal places each time.



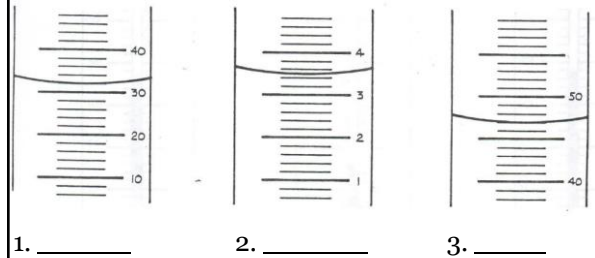
Measuring: Volume

- Base Unit: Liter
- Tool: Graduated cylinder

- Tip: Be sure to read the **meniscus**



Determine the volume of the liquids in the following cylinders (include units!):



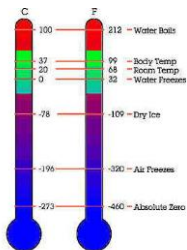
1. _____

2. _____

3. _____

Temperature

- Common Unit: Celsius
- Tool: Thermometer



Water Freezes – 0° C

Water Boils – 100° C

Body Temp: 37° C

Significant Digits

- Because of the uncertainty in measurement, all measured quantities must be represented in terms of significant digits.
- Significant digits help reflect the accuracy and precision of a measurement.



The smallest division on this ruler is 0.1 cm. Therefore when making this measurement you must estimate to 1 place of uncertainty which is 0.01cm. The length of the pencil would be recorded as 9.50cm.