Precision vs Accuracy

To be precise is to have a series of measurements that have close agreement with each other. **Precision is how repeatable a set of measurement are**. We can estimate the precision by looking at the range of a set of measurements. (Hi to low)

To be accurate is to be close to the true or accepted value. (One must know what the accepted value is in order to determine accuracy.) We can calculate accuracy using percent error.

Two student groups determine the density of aluminum in a lab. The following consists of their results

Group One	Group Two
1.98 g/mll	1.50 g/ml
2.01 g/ml	3.80 g/ml
1.99 g/ml	1.213g/ml

Which group had their results close to each other? This is the group that is the most precise in their measurements.

If the known value (sometimes called the true value or actual value) for the density of aluminum is 2.22 grams/ml, which group is more accurate?

When dealing with accuracy we can look at each individual measurement or we can look at the average. For our example we will look at the average density to determine which group was the most accurate.

Find the average density for group one   _____

Find the average density for group two   _____

% error = | $\underline{\text{Experimental average - True Value}}$ | x 100
                                      True Value

In general, the more precise you are the more likely you will be accurate, BUT it is not improbably to have great precision and terrible accuracy, and vice versa.

Practice

The following groups tried to experimentally find the melting temp of an unknown solid.

Group I: 74 degrees C   78 degrees C   71 degrees C
Group 2: 56 degrees C   55 degrees C   55 degrees C
Group 3: 72 degrees C   84 degrees C   60 degrees C

1. Rank the student groups in order of decreasing precison (From most precise to least precise)

2. Find the average melting point for each groups results.

   .Average Group 1 _____   Average Group 2_____   Average Group 3 _____

3. If the True melting point for this solid was 72 degrees Celcius, calculate the percent error for each student group.

Find the percent error for the following (below). SHOW THE MATH AS DEMONSTRATED IN CLASS.

For each of the following, calculate the % error for each measurement.

4) experimental results = 2.8 N   5) experimental result = 78.2 C
      actual value = 3.2 N   actual value = 84.5 C

6) experimental result   =65 lb/in2   7) experimental results =   45.63 Joules
      true value= 72 lb/in2   true value =   32.113 Joules

8) Stephanie calculates in the laboratory that her unknown solid will melt at 58 degrees C. When she checks with her teacher she finds out that it was supposed to melt at 62 degrees C. What is her percent error in her laboratory results?