ERROR IN MEASUREMENTS

All measurements have some degree of error to them. The instrument for measuring might be inaccurate, you might have used the instrument incorrectly, or your estimates might be slightly off from someone else's. These factors can all contribute to the amount of error in a measurement. We can describe error in a few different ways.

Absolute Error- Absolute error is determined by finding the difference between the measured value and the accepted value.

For example: You measure the length of a football field to be 103 yards, while the accepted length of a football field is 100 yards.

Absolute Error= Measured Value - Accepted Value

= 103 yards - 100 yards = 3 yards

Percent Error- Percent error is determined by finding the difference between the measured value and the accepted value and then dividing by the accepted value.

For example: You purchase measure the diagonal of a television set to be 21.5". You look at the box it came in only to find that it is actually a 21" set. Assuming the box give the accepted value:

$$\textbf{Percent Error} = \frac{\textbf{Measured Value - Accepted Value}}{\textbf{Accepted Value}} \times 100$$

$$= \frac{21.5" - 21"}{21"} \times 100 = \frac{0.5"}{21"} \times 100 = 2.4\%$$

Percent Difference- Percent difference is determined by finding the difference between the measured value and the average value and then dividing by the average value. This is useful when you do not have a widely accepted value, but you are able to take many measurements.

For example: You and your classmates are asked to each, individually measure the height of a table. The average measurement in the class is 0.82 meters and your individual measurement was 0.79 meters.

$$\textbf{Percent Difference} = \frac{\textbf{Measured Value - Average Value}}{\textbf{Average Value}} \times 100$$

$$= \frac{0.79m-0.82m}{0.82m} \times 100 = \frac{0.03m}{0.82m} \times 100 = 3.7\%$$