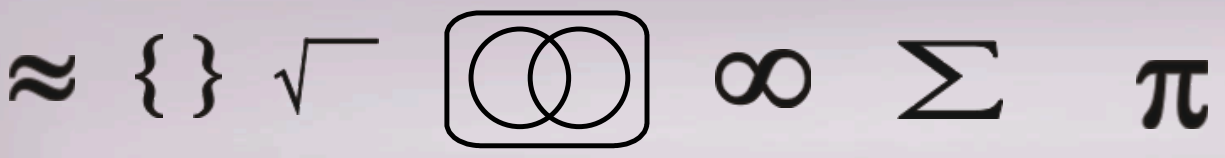

relative, absolute

Math 1030 #7b

random, systematic

Dealing With Uncertainty

significant digits

Types of Error

accuracy, precsion

How accurate are the numbers we read and hear in the media?

Error

Random errors - due to random and inherently unpredictable events in the measurement process.

Systematic errors - a problem in the measurement system that affects all measurement in the same way.

Size of Error

absolute error = measured value - true value

(maintains the units of measurement)

$$\text{relative error} = \frac{\text{absolute error}}{\text{true value}}$$

(this is a percentage)

- When a systematic error is found, then all measurements can be changed to reflect the correction of this error.
- One way to minimize random error is to take multiple measurements and average the measurements.

EX 1: What are some sources of random and systematic error in the following?

a) Number of Skittles in a package

(probably has more ways to have systematic error) ex machine is not properly calibrated

(random error) ex bumped assembly belt

b) Hours of sleep as reported by a group of high school students

(probably have a lot of random error)

EX 2: Calculate the actual and relative error in the following.

a) The weight on a package of cat food says 15 lbs, but it is actually 15.4 lbs.

actual error: $15\text{ lbs} - 15.4\text{ lbs} = -0.4\text{ lbs}$

relative error: $\frac{-0.4\text{ lbs}}{15.4\text{ lbs}} \approx -2.6\%$

b) The votes counted for a particular candidate were 2795. It was later determined that 3 votes had been counted twice.

advertised amt = 2795, true amt = 2792

actual error: $2795 - 2792 = 3$ votes

relative error: $\frac{3\text{ votes}}{2792\text{ votes}} \approx 0.1\%$