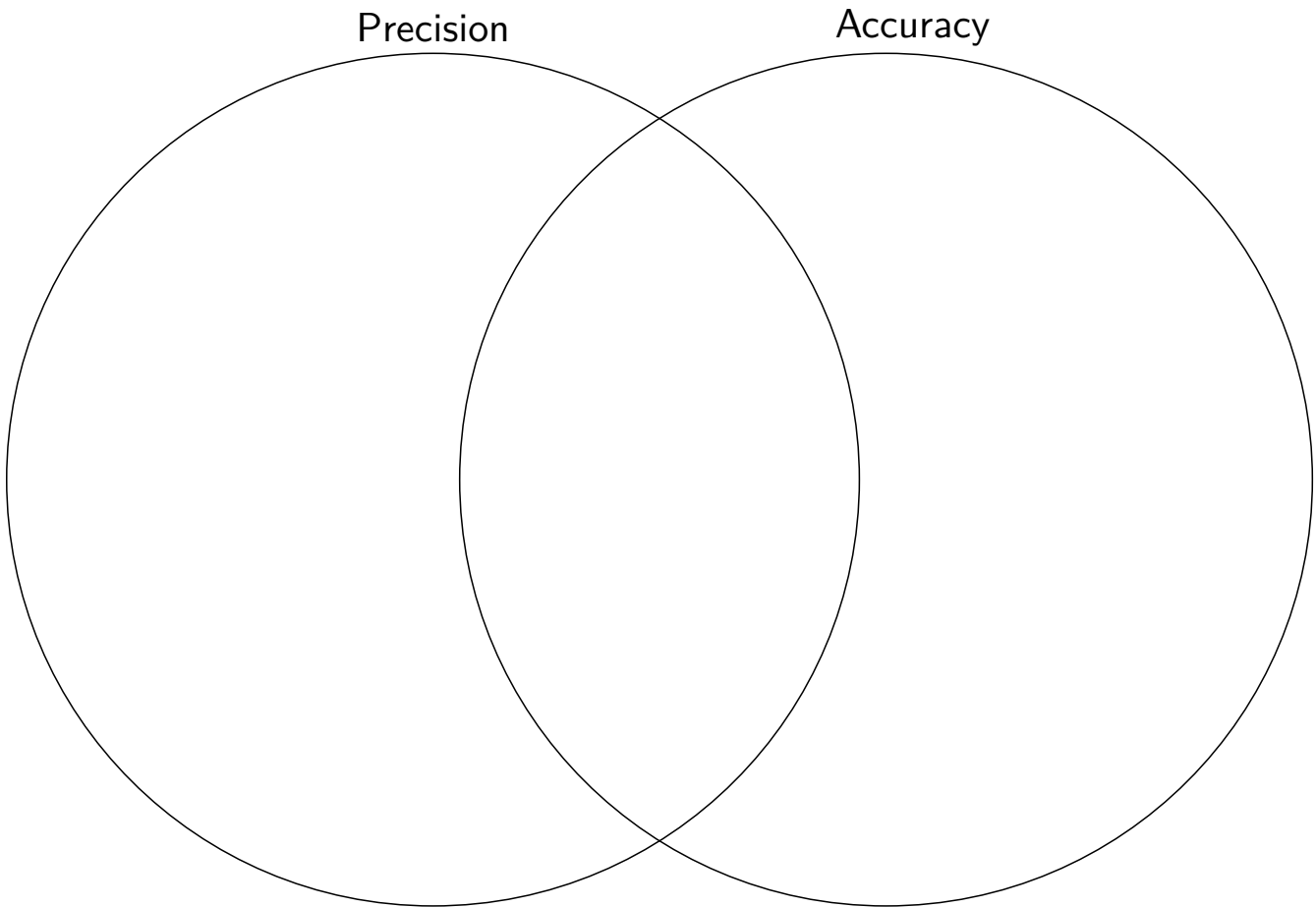


PLL 5: Uncertainty and Statistics

First: Announcements, Debriefs, Etc.

This Week's System(s)	This Week's Question(s)

Precision and Accuracy



Uncertainty

Uncertainty:

	Affects precision		Affects accuracy
Type of uncertainty			
How does it work?			
Examples			

A note on human error

We will not use human error to describe uncertainty in this class!

Why not? →

Sample Problem: Categorize the following sources of uncertainty as random error, systematic error, or reading error.

Source of uncertainty	Type of uncertainty	Why?
The digital scale you're using won't settle on one value, but wobbles up and down.		
Your calipers read to the nearest 0.01 cm		
You accidentally used $4\pi r^3$ instead of $\frac{4}{3}\pi r^3$ when calculating the volumes of a set of marbles.		
To find the mass of each marble, you put a bowl on the scale to keep them from rolling. You don't subtract the mass of the bowl when recording your values.		
You're measuring the sizes of lentil beans and your values vary from lentil to lentil.		

Think-Pair-Share: What's the difference between a *type* of uncertainty and a *source* of uncertainty?

Statistics and Uncertainty

We use statistics to ...

- _____
- _____
- _____

Statistical values can be categorized as *measures of central tendency* and *measures of spread*.

Measures of Central Tendency	Measures of Spread

For BE, we will use _____

For uncertainty, we will use _____

Why average for BE?	Why AE for uncertainty?

Performing Stats Calculations

To calculate average ...

Formula	How to do it in Excel

To calculate associated error ...

The Process	How to do it in Excel

Excel Stats Quick Ref!

To calculate ...	Use this	Example
Average		
Standard Deviation		
Standard Error		
Associated Error		

Putting it all together ...

Brainstorm: Based on what we just learned about precision and accuracy, random and systematic error, and statistics ...

1. If there is a large amount of random error affecting your data, how would that be reflected in your statistical analysis? (E.g., would you expect your average to be affected? Your AE?)
2. If there is a large amount of systematic error affecting your data, how would that be reflected in your statistical analysis?