

Random and Systemic Errors Lab

There are two types of calculations you need to do for these labs: Precision and Standard Error (and/or Percent Error)

For both of these, you need to first determine the differences between your data points.

The actual distance is 1000 m

Here is an example

1. 100.0 mm
2. 1092.9 mm
3. 100.1 mm
4. 1095.5 mm
5. 101.5 mm
6. 1090.2 mm

Find the difference between data pairs by subtraction:

$$992.9 \text{ mm}, 995.4 \text{ mm}, 988.7 \text{ mm}$$

Determine the average difference (Mean):

$$992.3 \text{ mm}$$

Precision (Range) : find the range....that is the difference between the highest and lowest values:

$$995.4 - 988.7 = 6.7 \text{ mm}$$

Standard Error: subtract the average distance from the actual distance:

$$1000.0 - 992.3 = 7.7 \text{ mm}$$

Percent Error: (Standard Error/Actual Distance) x 100

$$7.7/1000 = 0.77\%$$

For the Random Errors Lab, you are evaluating primarily precision (how close together your values are). Ideally, you will get both high precision and high accuracy (how close the values are to the actual value)

High precision means small range in data points

High accuracy means low percent error...below 2.0% is high accuracy!

For the Systematic Errors Lab, you are evaluating primarily accuracy but also precision.

Ideally you will get high precision but your accuracy will vary, depending what the systematic error is. This is built into the lab and you cannot do anything about this.

You can control precision!

