SCIENCE FAIR SERIES:
DATA HANDLING

Central Tendency and Variation

A Science Project is a story told through data

Inquiry project data is used to validate the hypothesis.

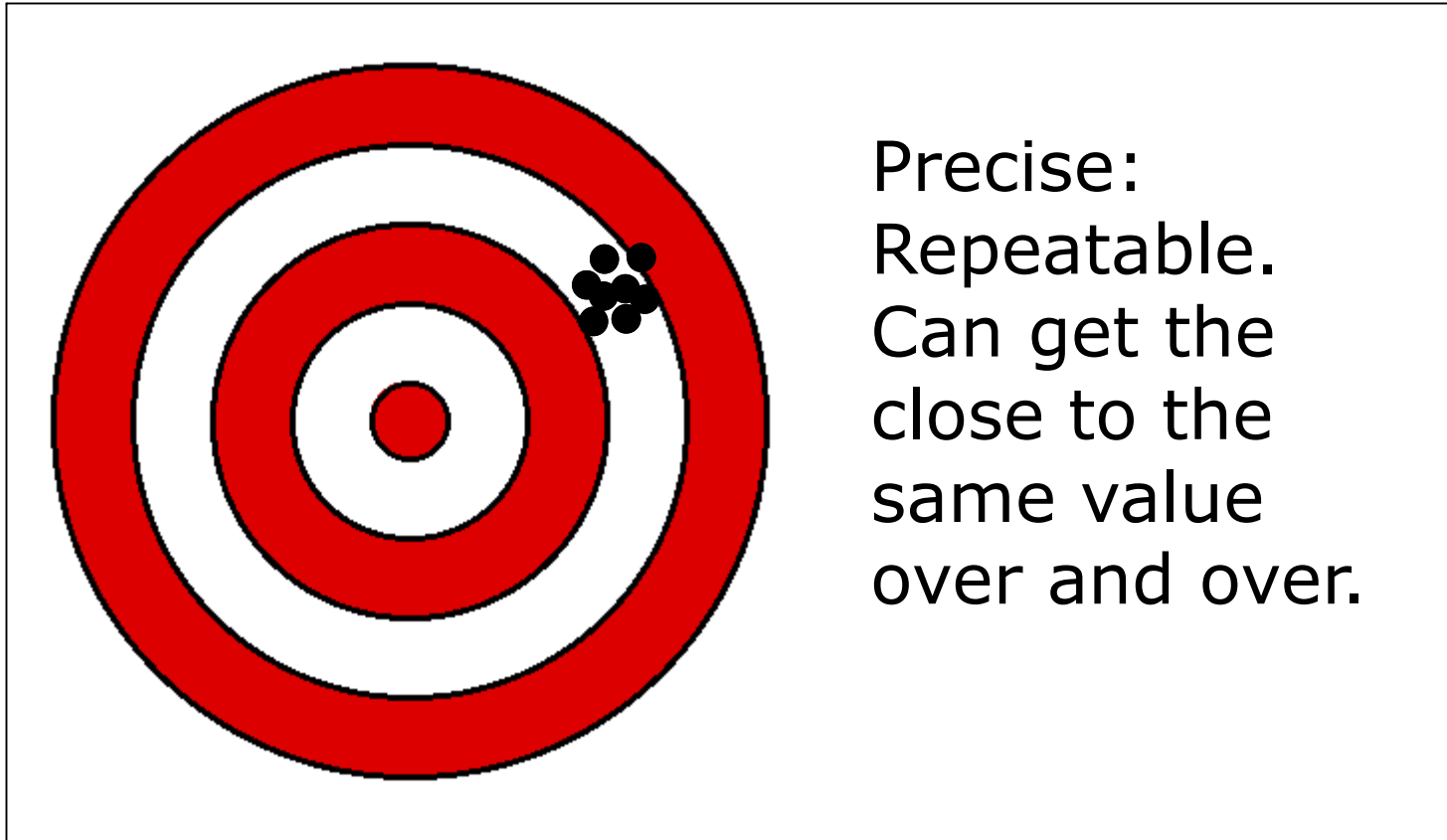An engineering design project data is used to validate the project meets the requirements.

Let's start with something everyone understands…

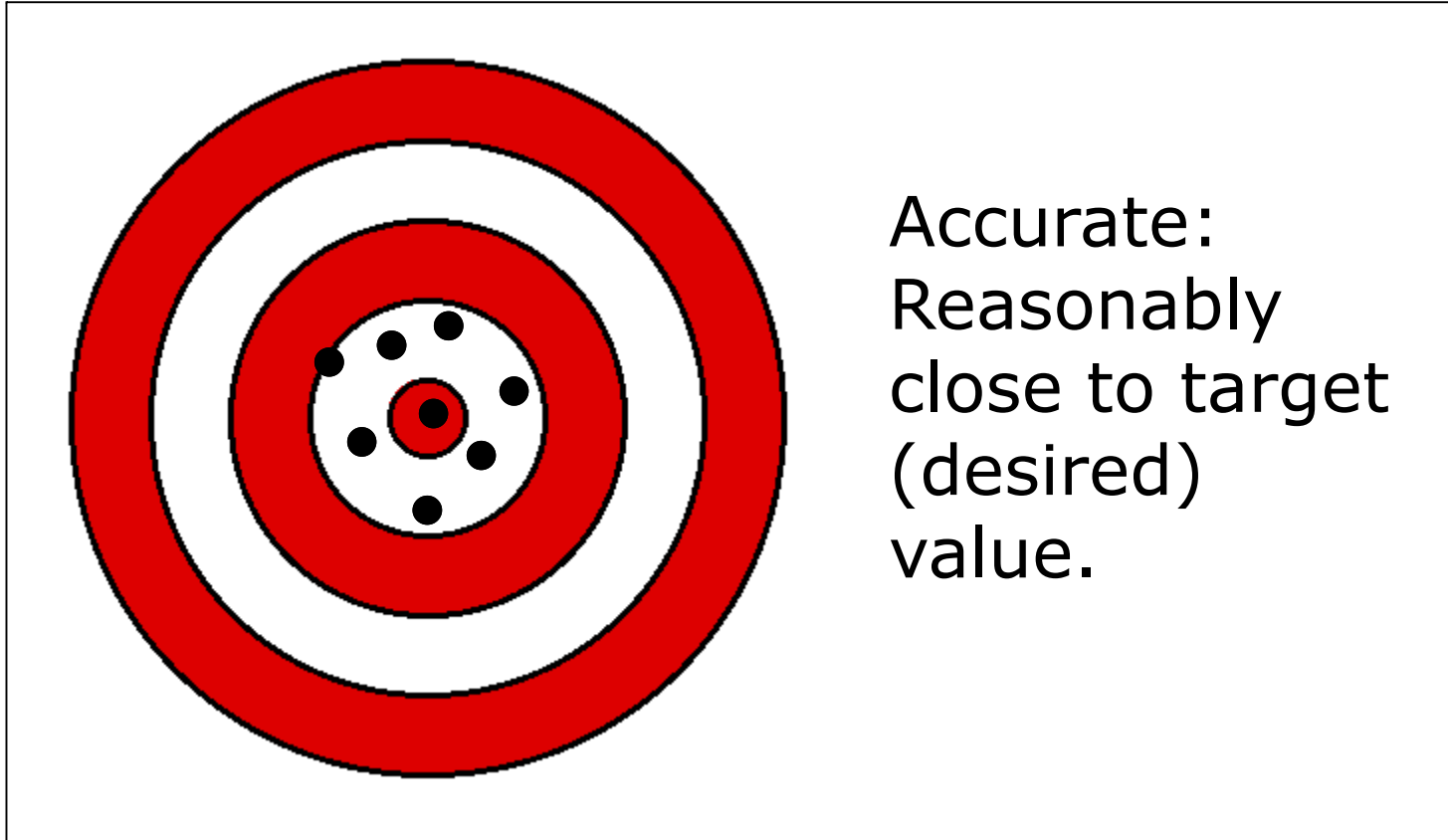darts and targets.

Precision

Precise: Repeatable. Can get the close to the same value over and over.

Accuracy

Accurate: Reasonably close to target (desired) value.
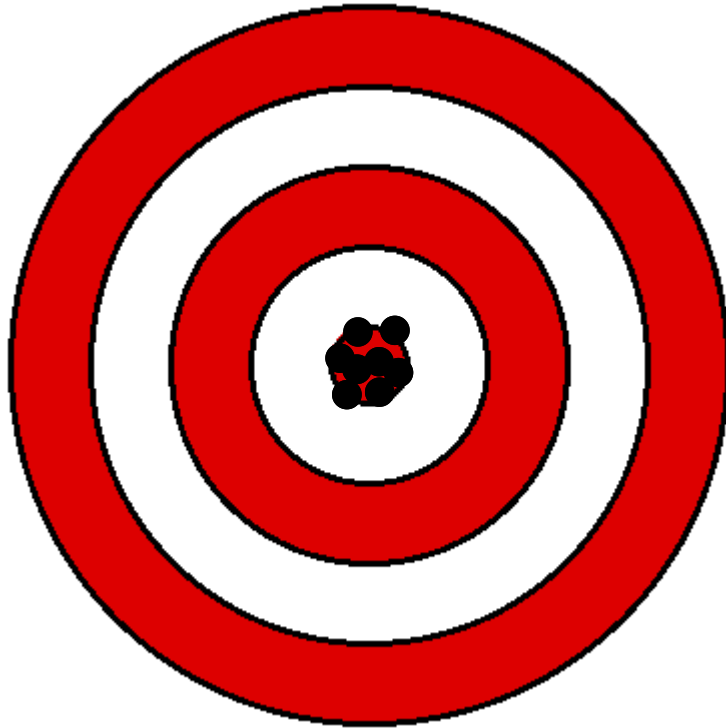
Precision & Accuracy

Precise and Accurate.

Repeatedly getting desired result.

What does this mean?

… let's learn about data.

The most common way to describe data is

by using the measures of **central tendency** and **statistical variation.**

Central Tendency

Central tendency is a way of finding the center of the data using the mean, median, and mode.

Mean

Mean is the average of the data – the sum divided by the number of values.
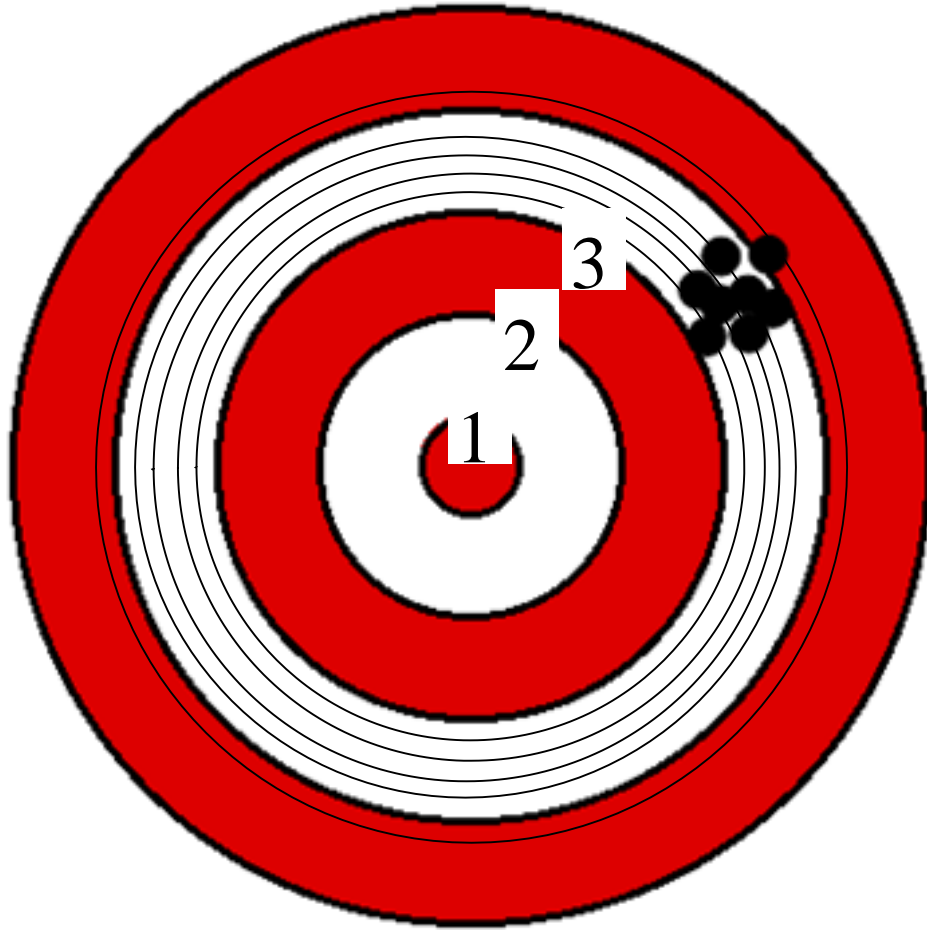
Median

If a group of values in a data set are order from smallest to largest, the center value is the median.

Mode

If a number occurs in a data set more that once, the one that occurs most often is the mode.

Data Set

Values:

#1	3.1
#2	3.3
#3	3.4
#4	3.5
#5	3.7
#6	3.7
#7	3.8
#8	4.1
#9	4.2

Data Set

Median:

#1	3.1
#2	3.3
#3	3.4
#4	3.5
#5	3.7
#6	3.7
#7	3.8
#8	4.1
#9	4.2

Mode:

#1	3.1
#2	3.3
#3	3.4
#4	3.5
#5	3.7
#6	3.7
#7	3.8
#8	4.1
#9	4.2

Mean:

3.1 + 3.3 + 3.4 + 3.5 + 3.7 + 3.7 + 3.8 + 4.1 + 4.2 = 32.8

32.8 / 9 = 3.6

Central Tendency

We have defined the central tendency (or the middle) of our data set:

Mean: 3.6

Median: 3.7

Mode: 3.7

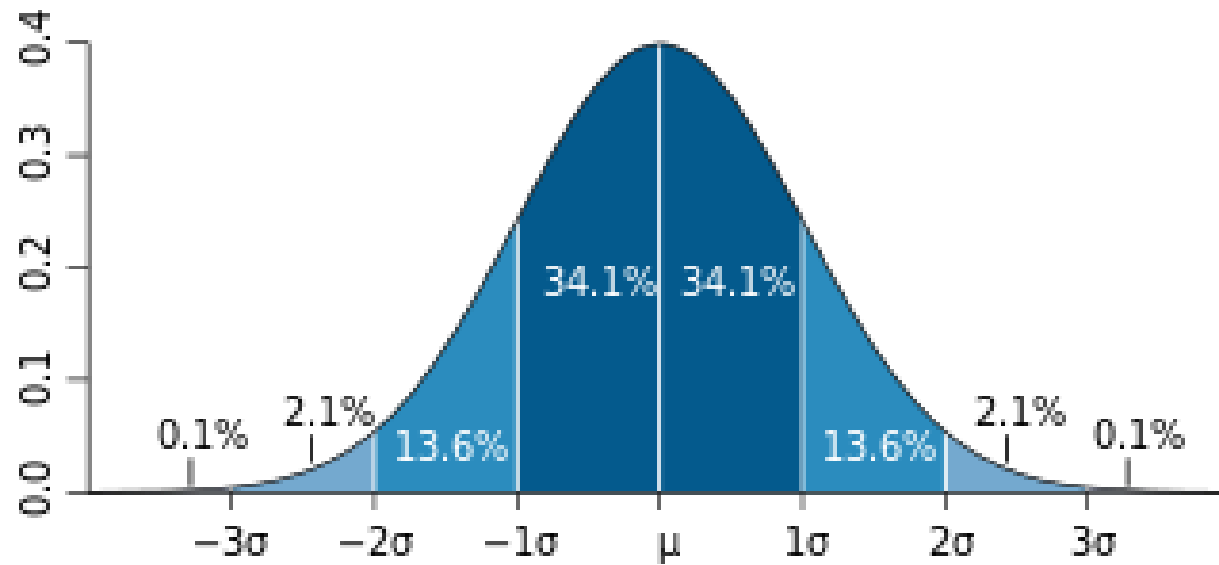# Variation

Variation is a way of describing the span of the data…

Are the data values all very close? – repeatable?

Or are the values very different?

Variation – the bell curve
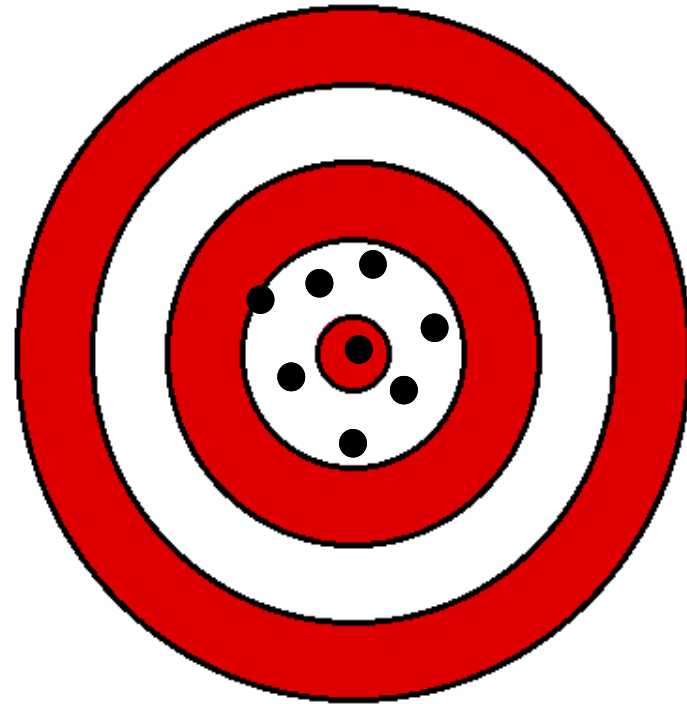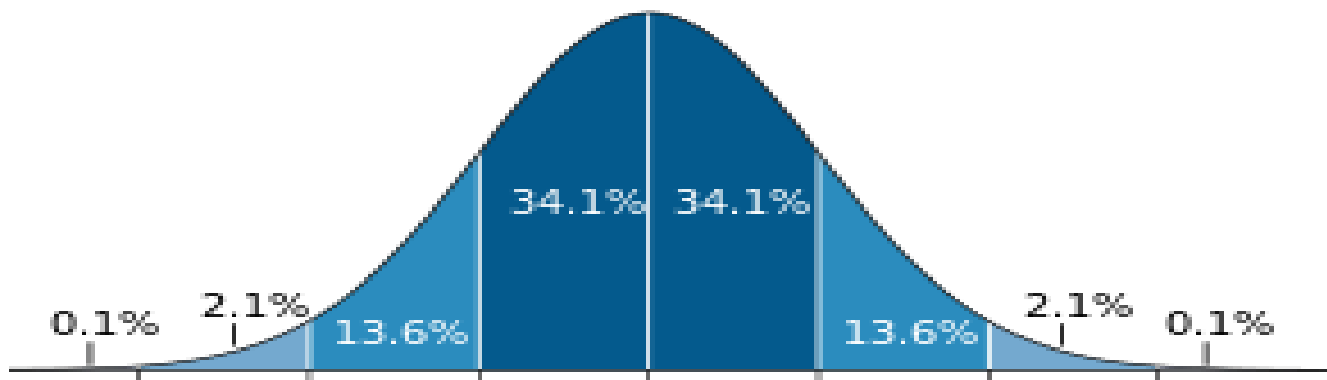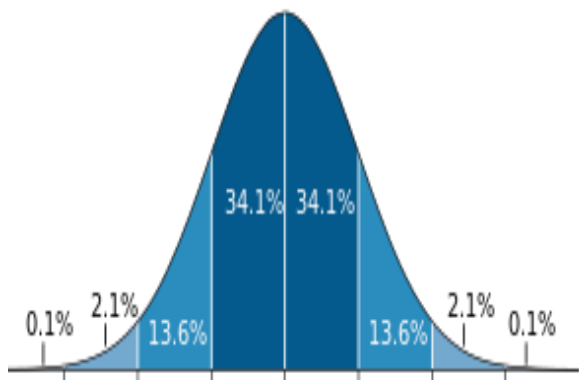
In a variation, we are describing how far away each point in the data set is from the center
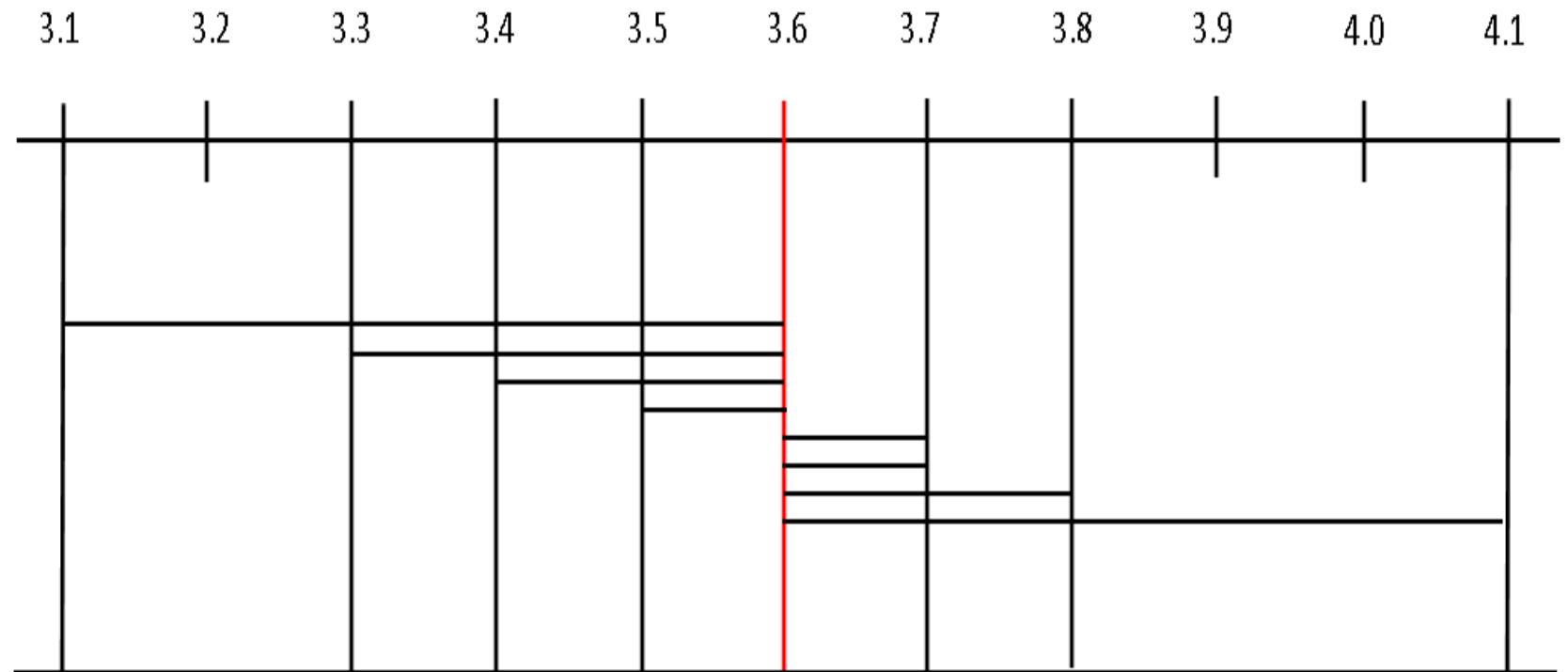
Standard Deviation

- Standard deviation it he most frequently used measure of variation.

- One standard deviation is where 68% (approx. 2/3) of the data resides from the mean.

Standard Deviation on the bell curve
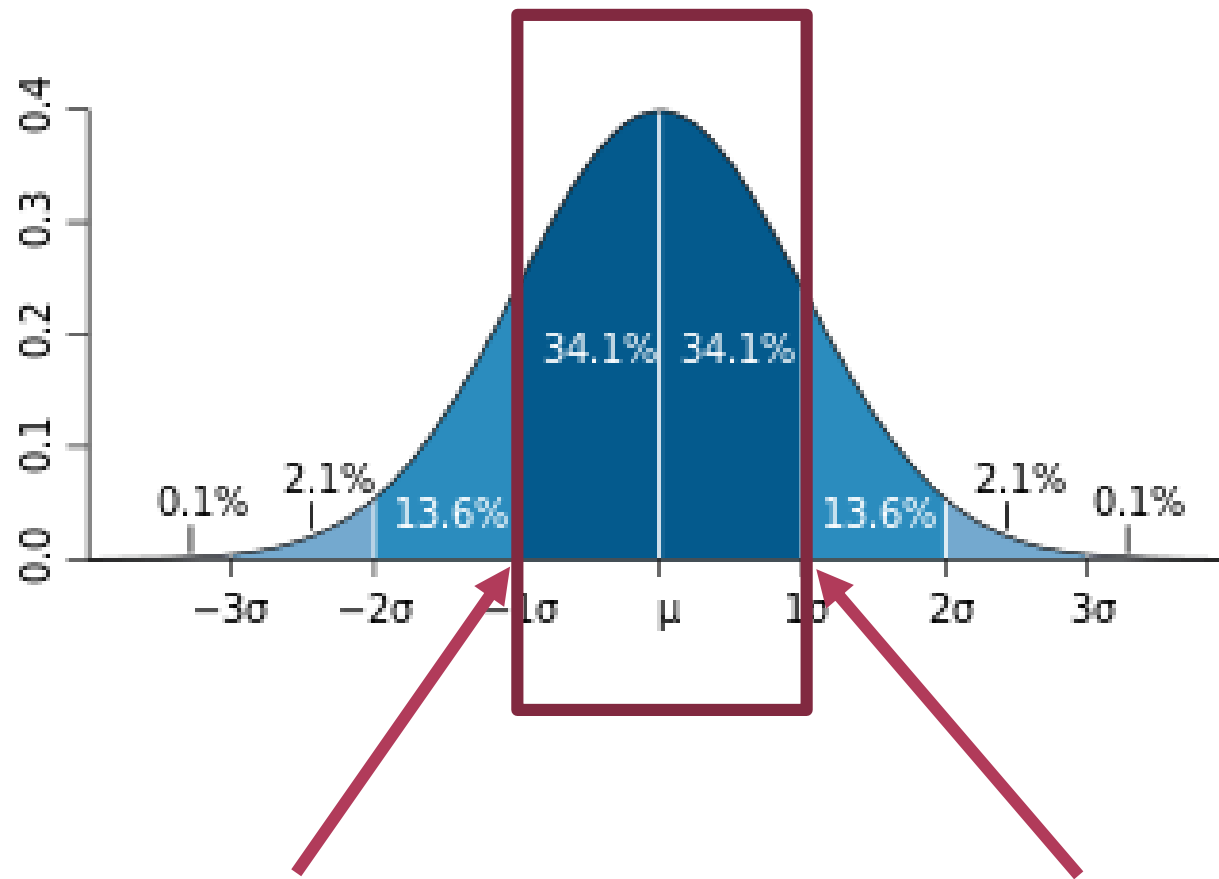
Steps in Excel

- Select the square where you would like the standard deviation or variance value to be placed.
- Select "Function" Tab.
- Select "Insert Function".
- In pop-up select "STDDEV"/ "MODE".
- Select "OK".
- In pop-up fill in the cell range for the Standard   Deviation (In this case B2:B9).
- Select "OK".

Examples of Central Tendency and Variation

	Series 1	Series 2	Series 3	Series 4	Series 5		Series 6	Series 7	Series 8				
	8.0	7.0	4.0	0.0	0.0		2.0	2.0	2.0				
	8.0	7.0	4.0	2.0	0.0		2.0	2.0	2.0				
	8.0	7.0	4.0	2.0	2.0		2.0	2.0	2.0				
	8.0	7.0	4.0	4.0	2.0		2.0	2.0	2.0				
	8.0	7.0	6.0	4.0	4.0		2.0	2.0	2.0				
	8.0	7.0	6.0	4.0	4.0		4.0	2.0	4.0				
	8.0	8.0	6.0	6.0	6.0		4.0	2.0	4.0				
	8.0	8.0	6.0	6.0	6.0		4.0	2.0	4.0				
	8.0	8.0	8.0	6.0	8.0		4.0	2.0	4.0				
	8.0	8.0	8.0	6.0	8.0		10.0	2.0	10.0				
Median	8.0	8.0	8.0	10.0	8.0		10.0	2.0	10.0				
	8.0	8.0	8.0	10.0	8.0		10.0	10.0	10.0				
	8.0	8.0	10.0	10.0	10.0		10.0	16.0	10.0				
	8.0	8.0	10.0	10.0	10.0		10.0	16.0	10.0				
	8.0	9.0	10.0	12.0	12.0		12.0	16.0	12.0				
	8.0	9.0	10.0	12.0	12.0		12.0	16.0	12.0				
	8.0	9.0	12.0	12.0	14.0		14.0	16.0	14.0				
	8.0	9.0	12.0	14.0	14.0		14.0	16.0	14.0				
	8.0	9.0	12.0	14.0	16.0		16.0	16.0	16.0				
	8.0	9.0	12.0	16.0	16.0		16.0	16.0	16.0				
Mean	8.0	8.0	8.0	8.0	8.0		8.0	8.0	8.0				
Median	8.0	8.0	8.0	8.0	8.0		10.0	2.0	10.0				
Mode	8.0	8.0	4.0	6.0	8.0		2.0	2.0	2.0				
Minimum	8.0	7.0	4.0	0.0	0.0		2.0	2.0	2.0				
Maximum	8.0	9.0	12.0	16.0	16.0		16.0	16.0	16.0				
Variation	0.0	0.6	8.4	21.1	25.3		26.1	48.0	26.1				
Standard Deviation	0.0	0.8	2.9	4.6	5.0		5.1	6.9	5.1				

Visit **NEOHSTEM** Alliance Website

- For more project information
- http://neohstem.org/

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- stdiv@akronlibrary.org