




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.

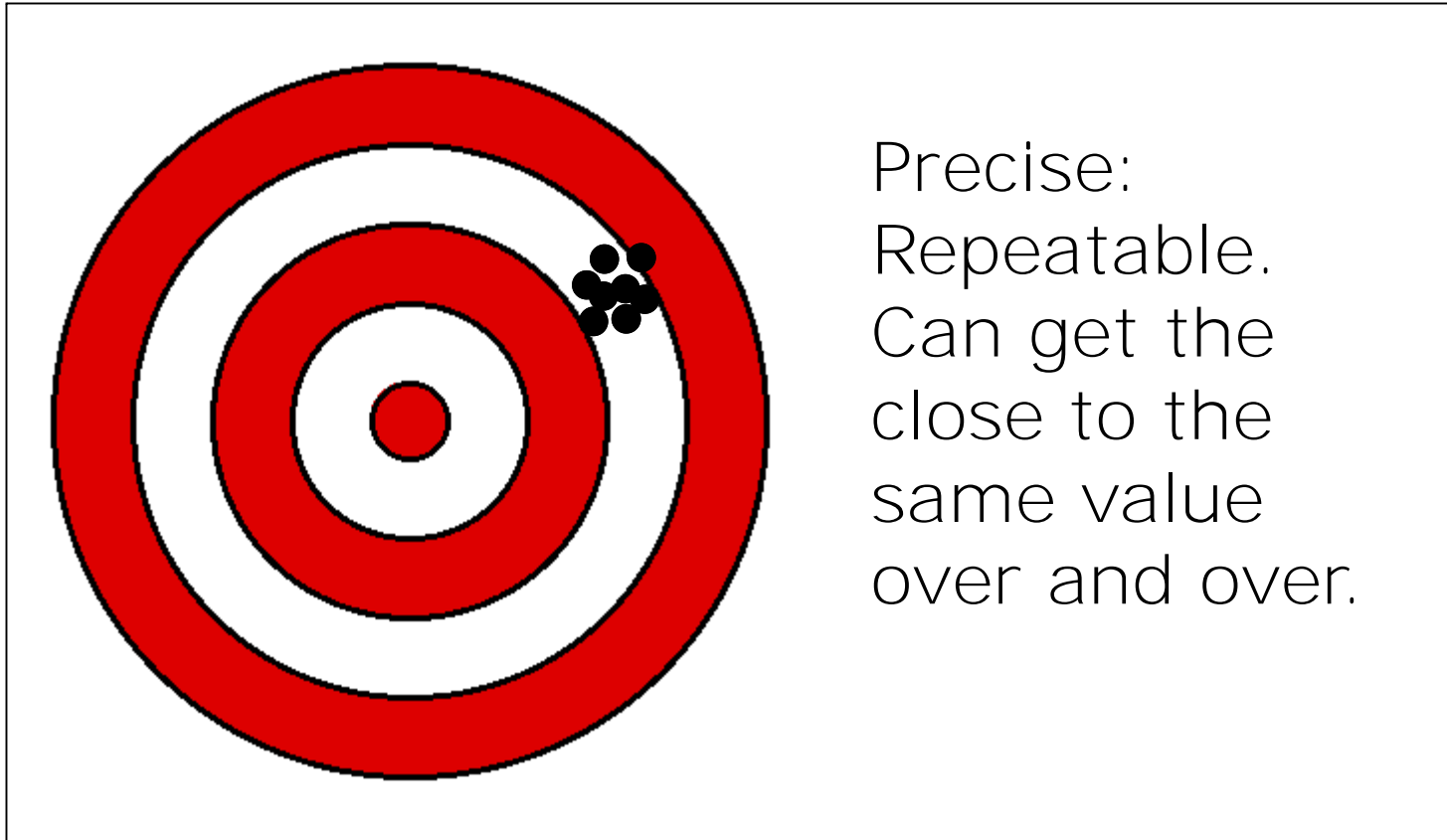
An engineering design project data
is used to validate the project meets
the requirements.

Let's start with
something
everyone
understands...

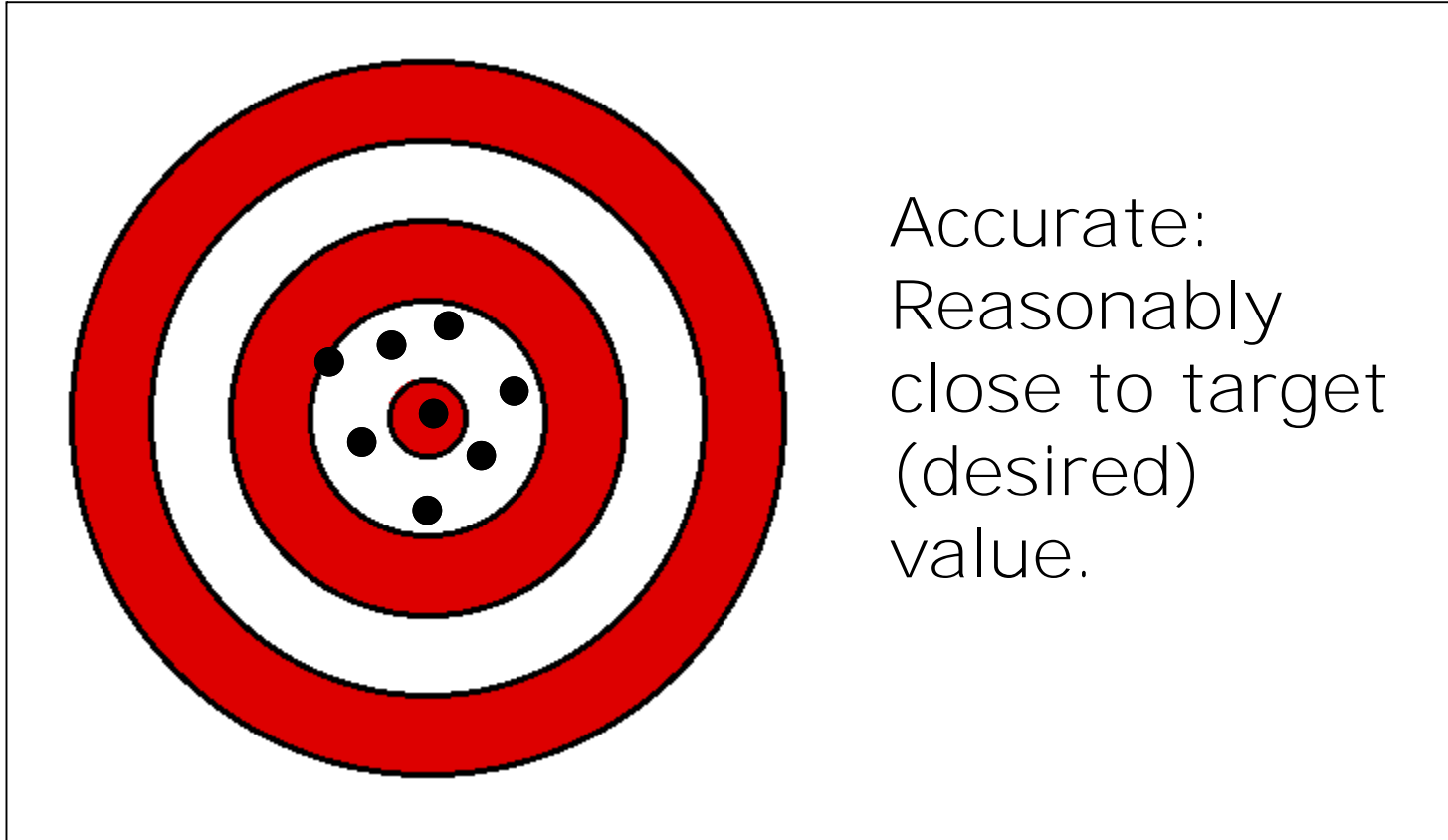
darts and targets.



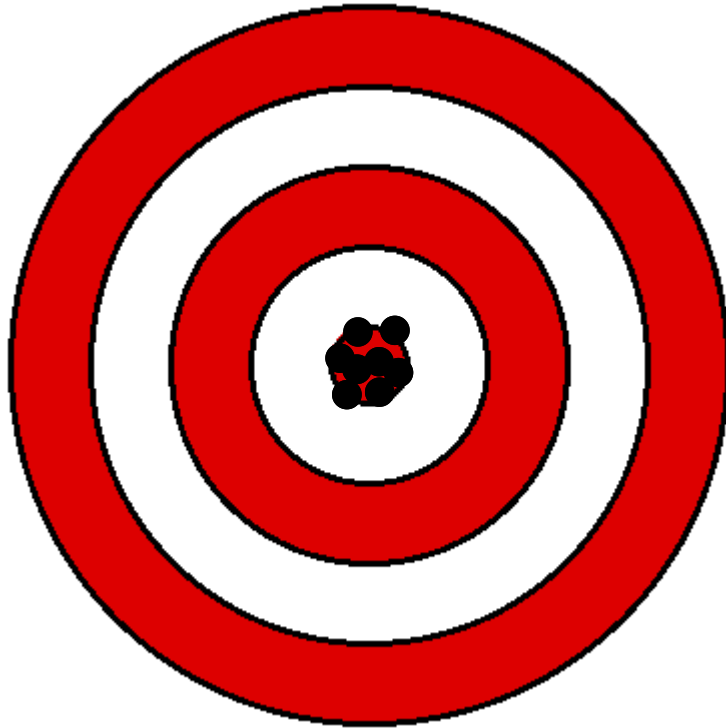
Precision



Accuracy



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 than 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

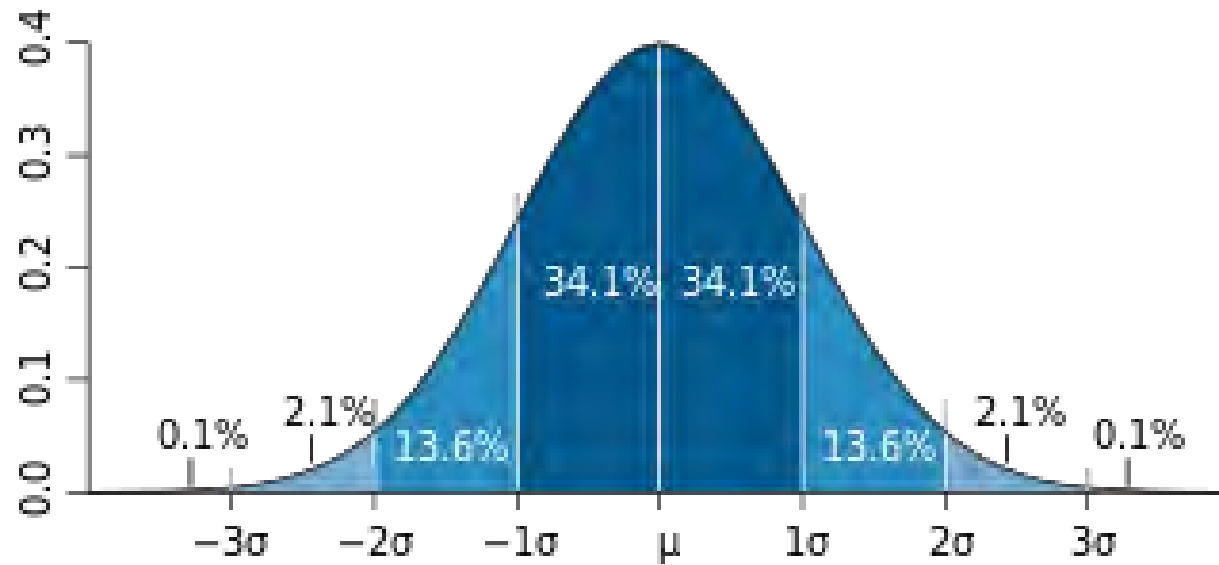
Variation

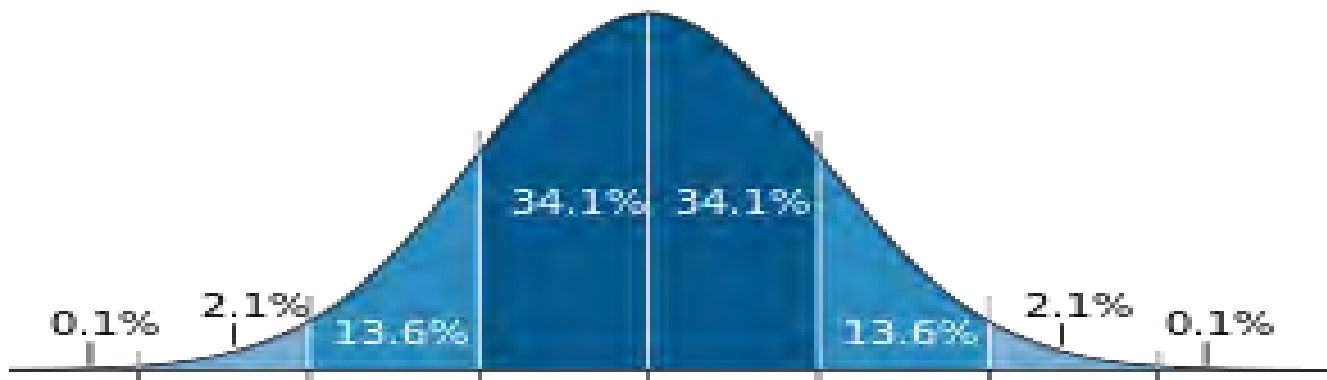
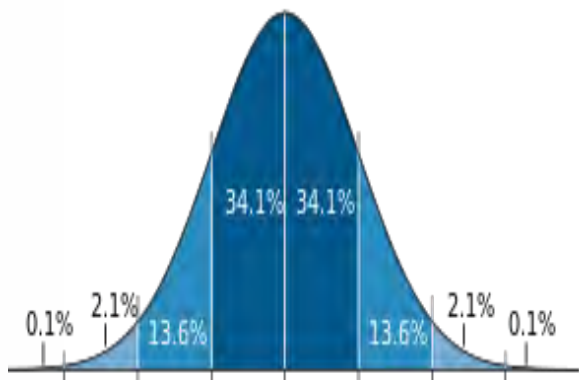
Variation is a way of describing the span of the data...

Are the data values all very close? – repeatable?

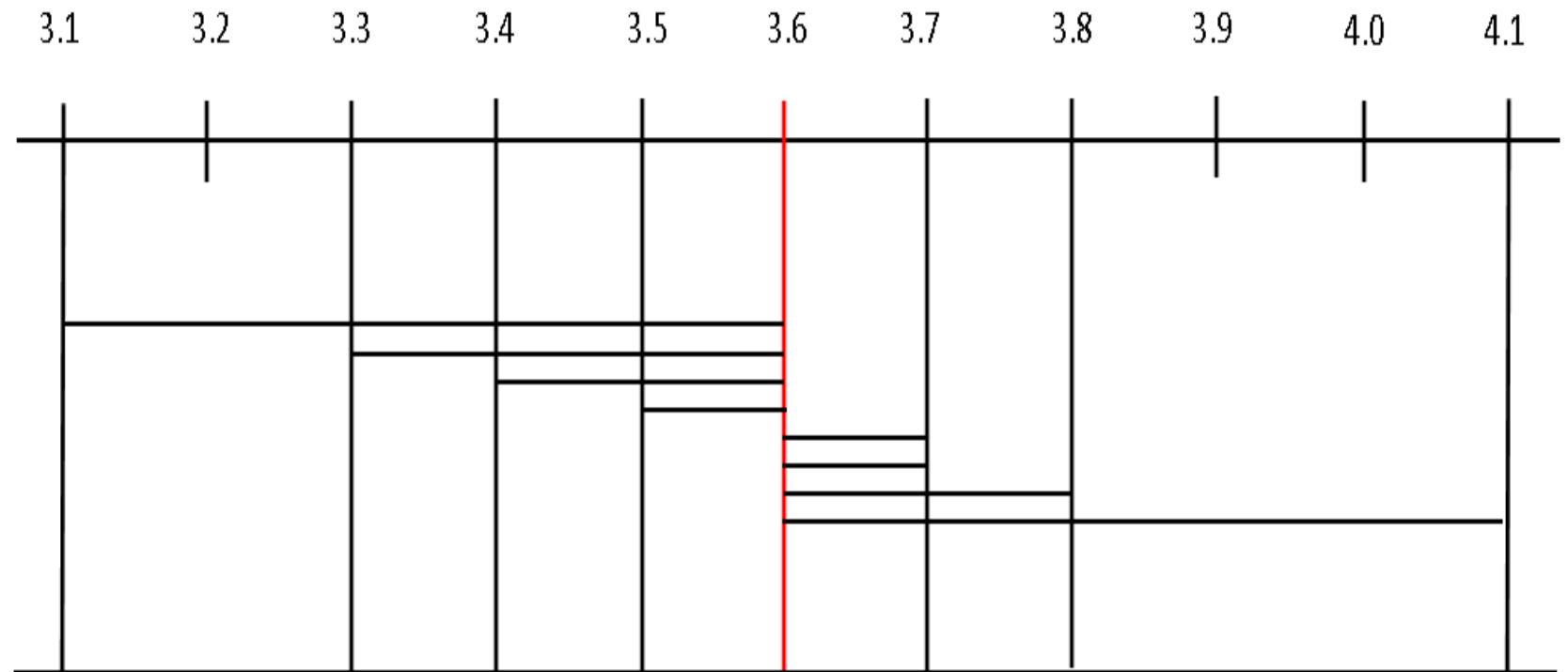
Or are the values very different?

Variation – the bell curve





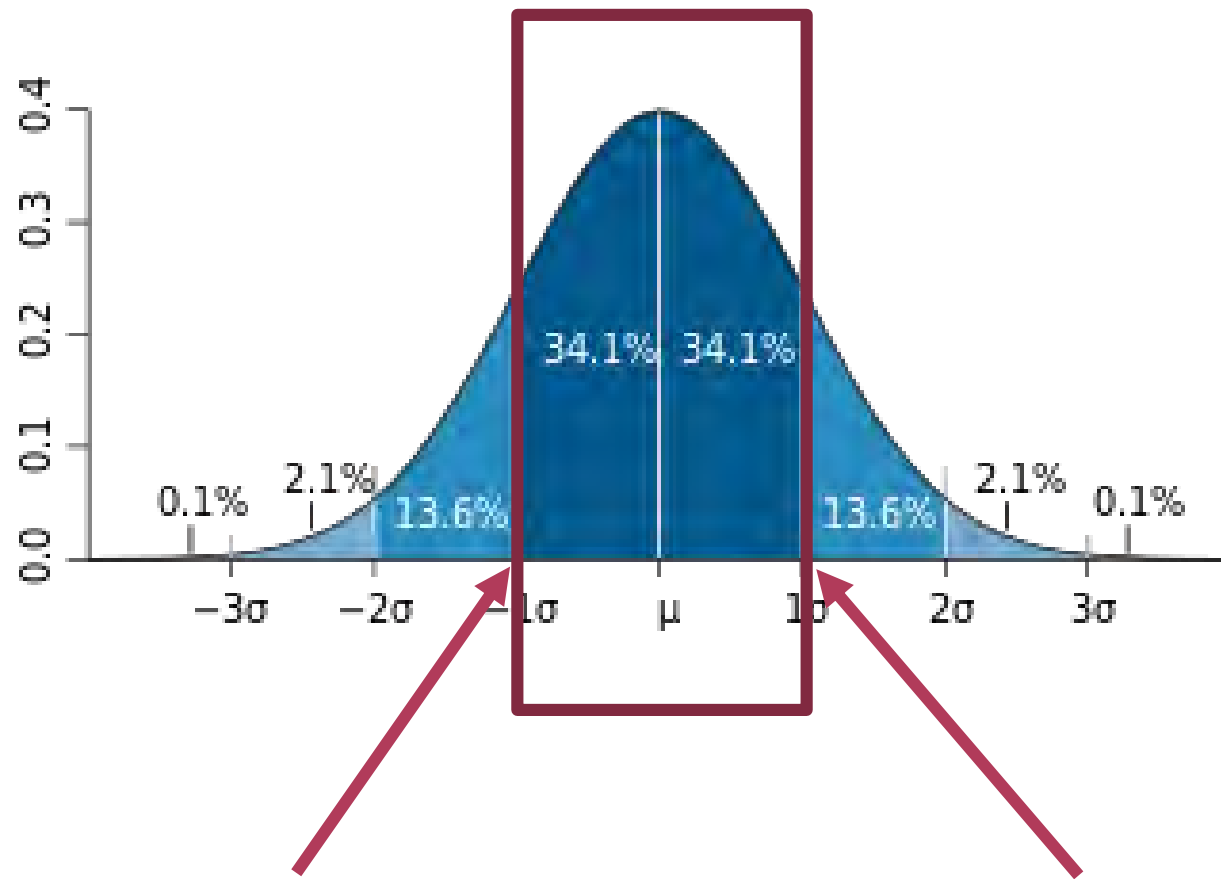
In a variation, we are describing how far away each point in the data set is from the center



Standard Deviation

- Standard deviation is the 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/>

Contact the **Science & Technology Division at Akron-Summit County Public Library**

- 330-643-9075
- stdiv@akronlibrary.org