Range

The range is the difference between the largest and smallest values in the data set.

Variance and Standard Deviation

Standard deviation tells us, on average, how far away each data point is from the mean.

If we wanted to average the distances, we would take each data point, subtract the mean, and then calculate the mean. This is a slight variation of our formula for mean:

$$\frac{\sum(x-\bar{x})}{n}$$

The problem is, when we do this the value will come out very close to zero, or probably even be zero. This is because some of the data points are larger than the mean, and some are smaller.

To solve this problem, we are going to square the difference before we add them together. After we are done, we need to undo the squaring by taking the square root.

$$\sqrt{\frac{\sum(x-\bar{x})^2}{n}}$$

This is very nearly our formula. The correct formula:

	Sample	Population (sigma)
Standard Deviation	$s=\sqrt{\frac{\sum(x-\bar{x})^2}{n-1}}$	$\sigma=\sqrt{\frac{\sum(x-\mu)^2}{N}}$
Variance	$s^2=\frac{\sum(x-\bar{x})^2}{n-1}$	$\sigma^2=\frac{\sum(x-\mu)^2}{N}$

The following table can be used to calculate manually, and to get a better visual of what is happening:

n	x	$\bar{x}$	$x-\bar{x}$	$(x-\bar{x})^2$
Sum last column:				$\sum(x-\bar{x})^2$
Divide by n to get variance:				$s^2=\frac{\sum(x-\bar{x})^2}{n-1}$

Variance and Standard Deviation (cont)

A alternative for $\sum (x-\bar{x})^2$ is the computational formula:

$$\sum x^2 - \frac{\left(\sum x\right)^2}{n}$$

In table form, the calculation looks like this:

x	x^2
$\sum x$	$\sum x^2$

Square the result from the first column, divide it by n, and subtract that from the result of the second column.

This calculation, whether you use the $\sum (x-\bar{x})^2$ or the $\sum x^2 - \frac{\left(\sum x\right)^2}{n}$, is used so frequently in statistics that it is given a special name. It is called the "sum of squares" and is designated SS_x (sum of squares for x).

Using the Calculator

On most TI calculators, the data can be entered into a list, and most of the measures covered in this and the previous sections can be gotten using the "1-Var Stats" function.