


# Standard Deviation Formulas ~


$$\sigma = \sqrt{\frac{\sum(x - \mu)^2}{N}}$$

This is the DEFINITION FORMULA for the DESCRIPTIVE STATISTIC called the STANDARD DEVIATION of a POPULATION. Use this when your data set is a population and you wish to "describe" your population's variability. In Excel © the formula is =STDEVP(range)



$$S = \sqrt{\frac{\sum(X - \bar{X})^2}{n}}$$

This is the DEFINITION FORMULA for the DESCRIPTIVE STATISTIC called the STANDARD DEVIATION of a SAMPLE. Use this when your data set is a sample from a population and you only wish to "describe" the sample's variability. In Excel © the formula is also =STDEVP(range) [Excel © does not distinguish between this formula(at left) and the one above left. ]



$$s = \sqrt{\frac{\sum(X - \bar{X})^2}{n-1}}$$

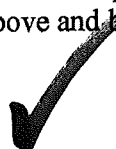
This is the DEFINITION FORMULA for the INFERENCE version of the standard deviation that calculates an ESTIMATE of the POPULATION STANDARD DEVIATION based on sample data. In Excel© the formula to use is =STDEV(range)

## NOTES:


- The value in the numerator in each case in the fractions above (under the radical) and below is variation (SS). When N, n, or n-1 divides variation it becomes variance (MS). The standard deviation is the square root of the variance. Conversely, squaring the standard deviation yields the variance.
- There are "computational formulas" for all these statistics. Computational formulas do not require the determination of *deviation scores from the mean* and therefore are often referred to as *raw score formulas*. For the purposes of this course, and for simplicity's sake, use the formulas above and below on exams.

Formulas for the various variances appear below:

$$\sigma^2 = \frac{\sum(x - \mu)^2}{N}$$



$$S^2 = \frac{\sum(X - \bar{X})^2}{n}$$



$$s^2 = \frac{\sum(X - \bar{X})^2}{n-1}$$