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 INFERENTIAL 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:

$$\sigma^2 = \frac{\sum(x-\mu)^2}{N} \qquad S^2 = \frac{\sum(X-\bar{X})^2}{n} \qquad s^2 = \frac{\sum(X-\bar{X})^2}{n-1}$$