# *The Computational Equations*

Population Mean

$$m = \frac{\sum_{i=1}^{N} X_i}{N}$$

Population Variance

$$s^2 = \frac{\sum_{i=1}^{N} \left(X_i - m\right)^2}{N}$$

Population Standard Deviation

$$s = \sqrt{\frac{\sum_{i=1}^{N} \left(X_i - m\right)^2}{N}}$$

Sample Mean

$$\hat{m} = \bar{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

Sample Variance

$$\hat{s}^2 = s^2 = \frac{\sum_{i=1}^{n} \left(X_i - \bar{X}\right)^2}{n-1}$$

Sample Standard Deviation

$$\hat{s} = s = \sqrt{\frac{\sum_{i=1}^{n} \left(X_i - \bar{X}\right)^2}{n-1}}$$

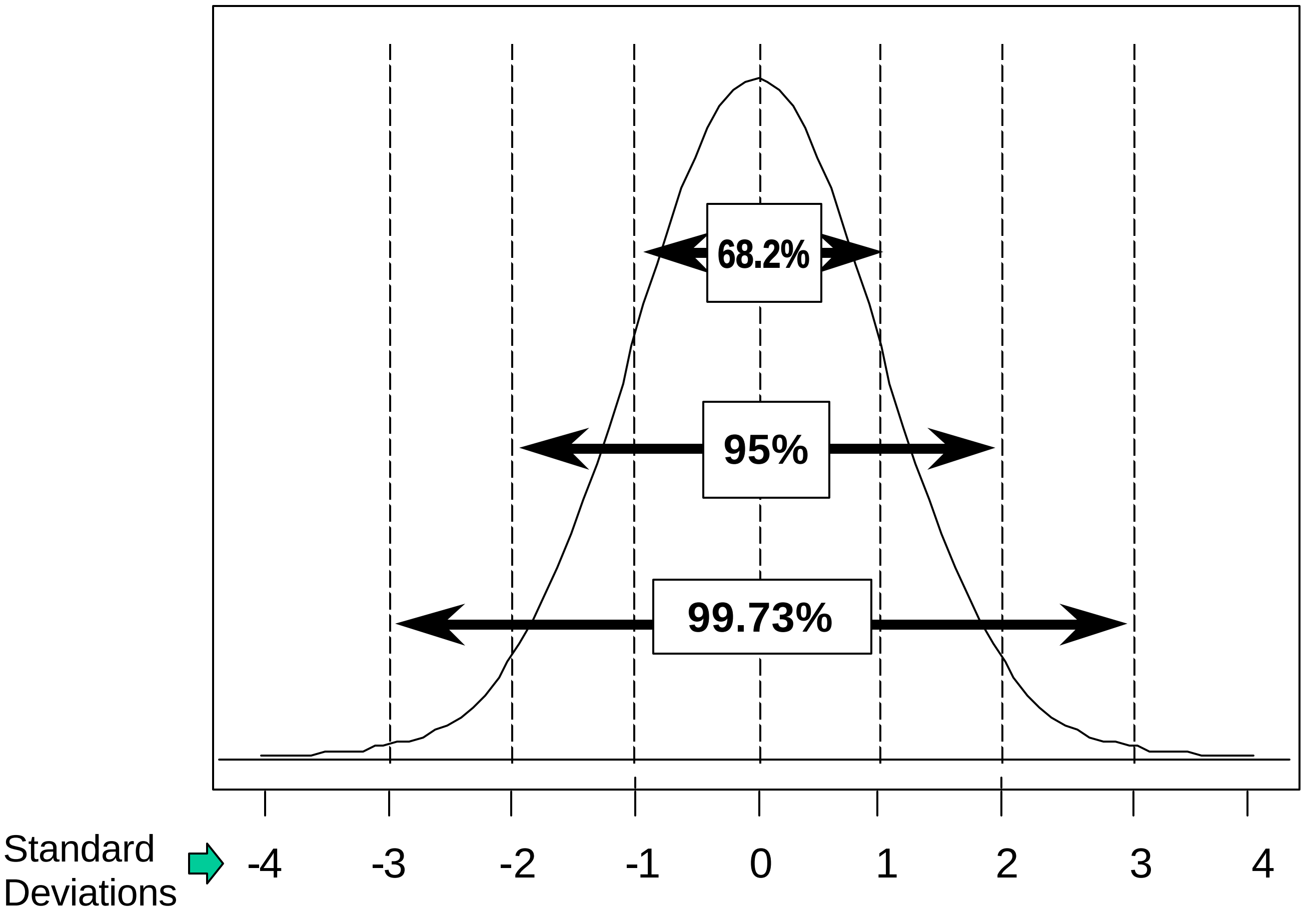
The difference between population and sample

- population has all the data points, N
- sample only has a portion of the total data points, n < N

The divisor for the population variance is the population size N, whereas the divisor for the sample variance is the sample size minus one (n-1). The divisor n-1 is used rather than N because this leads to an unbiased estimate for the population variance.

# Normal Curve & Probability Areas

### *Area Under the Curve = 1*




- *A randomly selected item has a 68.2% chance of being between -1 and 1 standard deviations from the mean.*
- *A randomly selected item has a 99.73% chance of being between -3 and 3 standard deviations from the mean.*