Populations and samples:  
\( N \) (usually) is number of individuals in population  
\( n \) is number of individuals in sample  
\( n_i \) is number of individuals in \( i \)th sample  

Summation:  
\[
\sum_{i=1}^{n} X_i = X_1 + X_2 + \cdots + X_n \quad \text{e.g.,} \quad \sum_{i=1}^{4} X_i = X_1 + X_2 + X_3 + X_4
\]
\[
\sum_{j=1}^{A} X_{i,j} = X_{i,1} + X_{i,2} + \cdots + X_{i,n} \quad \text{e.g.,} \quad \sum_{j=1}^{4} X_{i,j} = X_{i,1} + X_{i,2} + X_{i,3} + X_{i,4}
\]
\[
\sum_{a}^{A} \sum_{b}^{B} X_{a,b} = (X_{1,1} + X_{1,2} + \cdots + X_{1,n}) + (X_{2,1} + \cdots + X_{2,n}) + \cdots
\]

Means:  
population mean:  
\[ \mu = \frac{\sum_{i=1}^{N} X_i}{N} \]

sample mean:  
\[ \bar{X} = \frac{\sum_{i=1}^{n} X_i}{n} \]

Median:  
middle measurement in ordered set of data (central data point)  
\[ M = X_{(n+1)/2} \quad \text{if} \ N \text{ even, average of } 2 \]

Geometric mean (GM):  
\[ \bar{X}_G = \sqrt[n]{X_1 X_2 X_3 \cdots X_n} = \sqrt[n]{\prod_{i=1}^{n} X_i} \]

Variance:  
population variance:  
\[ \sigma^2 = \frac{\sum (X_i - \mu)^2}{N} \]

sample variance:  
\[ s^2 = \frac{\sum (X_i - \bar{X})^2}{n-1} \]

Standard Deviation (SD):  
population SD:  
\[ \sigma = \sqrt{\sigma^2} = \sqrt{\frac{\sum (X_i - \mu)^2}{N}} \]

sample SD:  
\[ s = \sqrt{s^2} = \sqrt{\frac{\sum (X_i - \bar{X})^2}{n-1}} \]

Coefficient of Variation (CV)  
\[ CV = 100 \times \frac{s}{\bar{X}} \]

Standard Error (SE):  
SE of the mean:  
\[ s_{\bar{X}} = \sqrt{\frac{s^2}{n}} \]

Note: different formulae for SE of difference between means \( s_{\bar{X}_1 - \bar{X}_2} \), etc

1 - \( \alpha \) Confidence Interval:  
\[ \text{CI} = \bar{X} \pm t_{\alpha, \nu} \times \text{SE} \]

Null hypothesis:  \( H_0 \)  
Alternative hypothesis:  \( H_A \)

Significance level:  \( \alpha = \) probability of (incorrectly) rejecting a true null hypothesis

\( P \)-value:  
Given a true \( H_0 \), \( P \)-value is the probability of obtaining a test statistic at least as extreme as the one obtained.

Degrees of Freedom: \( \nu \)