A ***sample*** is a small, representative portion of a larger ***population***  
***Mean*** = Average ***Median*** = Middle Number in Set (or Average of two middle numbers)  
 = ***Standard deviation*** s =

***Unitized/Standardized value*** z = ***Linear Regression*** Y= A+Bx where A=intercept, B=slope

***Least Squares Regression Formulas***:

***Covariance*** = ***Pearson correlation***

***Mutual Exclusivity***  is when two events cannot both occur together, such as a coin simultaneously H & T  
***Sample Space:*** total number of possible permutations of simple events. Sample space of 7 coin flips = . Also see Extended *mn* rule, where sample space = n1 \* n2 \* n3 … \* nk .

Also consider ***sampling without replacement,*** where each trial has one less option than the previous trial. Sample space for n stages in sampling without replacement, equals n!. 5! = 5\*4\*3\*2\*1.

***Permutation Combinations***   
  
If all simple events are equally likely, probability of event A = number of combinations of simple events that result in A, divided by the total number of events N. i.e. probably of exactly 1 head in 2 coin flips = 2/4 = ½, because it could be TH or HT out of {HH, TH, HT, TT}.  
  
Two events A and B are ***independent*** if A does not affect B and B does not affect A.  
***Conditional Probability.*** P(A | B) = Probability of A, Given that we know that B occurred.  
***General Multiplication Rule. .*** means “AND”.   
But when A and B are independent, **.**  
***Conditional Probability Formula P(B|A) = Bayes Rule***

***Law of Total Probability.*** Given set of events S1, S2, S3…Sk that are mutually exclusive and exhaustive,  
P(A) = P(S1)P(A|S1) + P(S2)P(A|S2) + P(S3)P(A|S3) + … P(Sk)P(A|Sk)

***Extended Form of Bayes Rule. ) =***

***Expected Value (Mean) of Discrete Random Variable: E(x) = SD:***

***Mean of Binomial Distribution: SD of Binomial Distribution:   
Prob. for Binomial Distribution Cumulative:P(X<=x)=  
Binomial Distribution:*** n independent trials, same probability each trial for exactly two possible results. Calculate number of successes x during the n trials.

***Flat Distribution:*** F(X)=0 if X<i or X>j F(X)=1 if X>i and X<j Where i<j  
***Continuous probability distribution***: probability of value between a & b = area under curve betw. a & b

***Controlled Experiment/RCT:*** Random assignment to control (“business as usual”) or other condition;  
assignment allowing valid inference, i.e. random or stratified; identical experiences except treatment  
***Quasi-Experiment:*** Same as experiment except assignment is not random or stratified  
***Stratified Sample:*** Sample randomly within each group, to condition(s)

***Central Limit Theorem:*** For some non-normal populations, if you take large random sample, the sampling distribution of the mean will be approximately normally distributed

Normal Distribution: Binomial Distribution: SE = Maximum margin of error: p=q=0.5

***CI (Z): CI (t):***

**Type I Error: False Positive:** Rejecting the Null Hypothesis when the Null Hypothesis is True:   
**Type II Error: False Negative:** Accepting the Null Hypothesis when the Null Hypothesis is False: 

***Power:*** 1-P(reject H0 when Ha is true)  + (1.96)()  - (1.96)()

***Power 95% CI bounds:***

***One-group t-test: , df = n-1 Two-group t-test(unpooled) t =***

***Use non-pooled variance when df = round down***

***Two-group t-test (pooled) t = = df =***

***Paired t-test: *********

Total SS = Total SS = SST + SSE SST = df(SST)= (k-1) df(SSE)= n-k  
= (r-1)(c-1) df(TSS) = (n-1)