

BASIC STATISTICAL CONCEPTS

- Definition of Statistics
- Types of Datasets: Cross sectional data, Time Series data, Panel data
- Variable types
 - Nominal, Ordinal, Interval, Ratio
 - Qualitative, Quantitative
 - Categorical, Discrete, Continuous
 - Metric, Non metric
 - Likert Scale measures
- Tabulation and frequency distribution of categorical, discrete and continuous data
- Diagrammatic Representations: Simple Bar chart, Pie Chart, Histogram, Line Chart, Box Plot, Scatter Plot, Multiple Bar, Subdivided bar, Bi-Axis charts, Pareto Chart, Bubble plot, Radar Chart
- Measures of location: Mean, Median, Mode, Percentiles, Deciles, Quartiles, Quintiles & Quantiles.
- Measures of variability: Variance, Standard deviation, Range, Inter quartile range, coefficient of variation
- Chebyshev's inequality, z - score
- Outlier, Capping and Flooring method
- Methods of sampling: Simple random sampling, Stratified random sampling, cluster sampling, systematic sampling, convenience sampling, judgemental sampling
- Covariance, Correlation coefficient, Advantage of Correlation coefficient over covariance
- Weighted Mean
- Introduction to Probability: Random Experiment, Event, Mutually exclusive events, exhaustive events, conditional probability, marginal probability, joint probability, Bayes theorem
- Permutation, Combination
- Random variable, Probability Mass Function(pmf), Probability Density Function(pdf), Cumulative Distribution function, Expectation, Variance
- Discrete Distribution: Binomial Distribution, Poisson distribution, Negative Binomial distribution, geometric distribution, hyper geometric distribution, Discrete Uniform distribution
- Continuous distribution: Continuous uniform distribution, exponential distribution, normal distribution, one parameter gamma, two parameter gamma, weibull distribution, lognormal distribution, beta distribution of first kind, beta distribution of second kind, bivariate normal distribution, double exponential distribution, cauchy distribution, t distribution, F distribution, chi-square distribution
- Fitting of distribution & test for goodness of fit
- Relationship between distributions
- Sampling distribution, Central Limit Theorem
- Point estimation, Standard error, Interval Estimation
- Framing of statistical hypothesis, type I error, type II error, power, testing for one population mean, variance, proportion, correlation coefficient
- Testing for two independent population mean, proportion, variance
- Testing for difference in one population observed under two different conditions
- OC-Curve, Power Analysis – Determination of sample size for a specified type I error and power
- Non – Parametric tests: Sign test, Mann-whitney wilcoxon test, wilcoxon signed – rank test, tet for rank correlation, krushkall wallis test, Mc-Nemar test
- Simple Linear regression, Multiple Linear regression, Goodness of fit, Interpretation of regression coefficient, F test for overall significance, t test for individual regression coefficients, outlier detection, MAE,MAPE.
- Chi-square test of Independence
- Partial Correlation, Multiple correlation, Kappa Statistic, Kendaul tau
- Curve fitting: linear, quadratic, cubic, logarathimic, exponential, power etc.
- Index numbers: price relatives, aggregate price indexes, consumer price index, producer price index, Dow Jones price index and other concepts.
- Basic Time Series Forecasting: Components of time series, additive model, multiplicative model, method of moving average, deseasonalization, weighted moving average, exponential smoothing
- Design and Analysis of Experiments: CRD, Need for Blocking, RBD, LSD, 2^2 , 2^3 , 3^2 , 3^3 Factorial Designs, Interaction between effects, Confounding factorial effects.
- Control Charts: X-bar chart, R chart,S chart,p chart,np chart,c chart,u chart,Multivariate control ellipse, Process capability analysis, C_{pk} , C_{pu} , C_{pm} , OC-Curve, Concept of Six-sigma