STATISTICS

1. **Mean:** $\overline{x} = \frac{x_1 + x_2 + ... + x_n}{n}$
2. **Median**: If the number of observations n is odd, then median is $\left(\frac{n+1}{2}\right)^{th}$ observation and if the number of observations n is even, then median is the mean of $\left(\frac{n}{2}\right)^{th}$ and $\left(\frac{n+1}{2}\right)^{th}$ observations.
3. **Measures of Dispersion, Range and Mean Deviation**
4. **Variance and Standard Deviation**
5. **Analysis of Frequency Distributions**

- **Measures of dispersion** Range, Quartile deviation, mean deviation, variance, standard deviation are measures of dispersion.
- Range = Maximum Value – Minimum Value
- **Mean deviation for ungrouped data**
  $M.D.\ (\bar{x}) = \frac{\sum |x_i - \bar{x}|}{n}$
- **Mean Deviation from Median for ungrouped data**
  $M.D.\ (M) = \frac{\sum |x_i - M|}{n}$
- **Mean deviation for grouped data**
  $M.D.\ (\bar{x}) = \frac{\sum f_i |x_i - \bar{x}|}{N}$
- **Mean Deviation from Median for grouped data**
  $M.D.\ (M) = \frac{\sum f_i |x_i - M|}{N}$ **where N** = $N = \sum f_i$
- **Variance and standard deviation for ungrouped data**
  Variance: $\sigma^2 = \frac{1}{n}\sum\ (x_i - \bar{x})^2$

  Standard deviation: $\sigma^2 = \sqrt{\frac{1}{n}\sum\ (x_1 - \bar{x})^2}$
- **Variance and standard deviation of a discrete frequency distribution**
  Variation: $\sigma^2 = \frac{1}{N}\sum (x_i - \bar{x})^2$

  Standarddeviation: $\sigma^2 = \sqrt{\frac{1}{N}\sum f_i (x_1 - \bar{x})^2}$

- **Variance and standard deviation of a continuous frequency distribution**

(i) If $\frac{x_i}{f_1}; i$ = 1, 2, 3, ..., n is a continuous frequency distribution of a variate X, then $\sigma^2 = \frac{1}{N}\sum f_i(x_i - \bar{x})^2$

(ii) If $x_1, x_2, \ldots\ldots, x_n$ be the n given observations with respective frequencies $f_1, f_2, \ldots\ldots, f_n$, then $\sigma = \frac{1}{N}\sqrt{N\sum f_i x_i^2 - \left(\sum f_i x_1\right)^2}$, where N = $\sum f_1$

(iii) If $d_i = x_i - \mathrm{A}$, where A is assumed mean, then $\sigma^2 = \frac{1}{\mathrm{N}}\sum f_i d_i^2 - \left(\frac{\sum f_i d_i}{\mathrm{N}}\right)^2$

(iv) If $u_i = \frac{x_i - \mathrm{A}}{h}$, where h is the common difference of values of x, then

$$\sigma^2 = \frac{1}{\mathrm{N}}\left[\sum f_i u_i^2 - \left(\frac{\sum f_i u_i}{\mathrm{N}}\right)^2\right]$$

- **Analysis of frequency distribution with equal means but different variances**: If the S.D. of group A < the S.D. of group B, then group A is considered more consistent or uniform.
- **Ananlysis of frequency distribution with unequal means**: In this case we compare the coefficient of variation [Coefficient of variation (C.V. = $\frac{100\times\text{S.D.}}{\text{Mean}}$. The series having greater coefficient of variation is said to be more variable than the other.
- Variance of the combined two series: $\sigma^2 = \frac{1}{n_1+n_2}\left[n_1\left(\sigma_1^2 + d_1^2\right) + n_2\left(\sigma_2^2 + d_2^2\right)\right]$ where n_1 and n_2 are the sizes of two groups, σ_1 and σ_2 are the S.D. of two groups, $d_1 = \overline{a} - \overline{x}$, $d_2 = \overline{b} - \overline{x}$ and $\overline{x} = \frac{n_1\bar{a} + n_2\bar{b}}{n_1+n_2}$