STATISTICS

Measures of Central Tendency

MEAN

$$\bar{x} = \frac{\sum x_i}{n}, \text{ where } n = \text{no. of observations}$$

$$\bar{x} = \frac{\sum f_i x_i}{N}, \text{ where } f = \text{Frequency and } N = \sum f_i$$

Types of Questions for Mean

- The mean of 1,2,5,6,8,9 is $\frac{1+2+5+6+8+9}{6}$

- Mean of the following is

f_i	2	4	6
x_i	5	3	2

$$\frac{2x5+4x3+6x2}{2+4+6}$$

- Mean of the following is

Class	10-20	20-30	30-40
f_i	7	4	2

$$\frac{5x7+25x4+35x2}{7+4+2}$$

- For classwise distribution, x_i = middle value as
- for $x_i \rightarrow x_i + k \Rightarrow \bar{x} = \bar{x} + k$ &
- $x_i \rightarrow x_i . k \Rightarrow \bar{x} = \bar{x} . k$

MEDIAN

Median of Individual Series

I : Arrange the data in ascending or descending order.

II **Find Median**

- If n is odd, then Median = value of the (1/2)(n + 1)th observation
- If n is even, then Median = mean of the (n/2)th and (n/2 + 1)th Observation

Median of Discrete Series

I : Arrange the data in ascending or descending order.

II : Prepare the cumulative Frequency table

III : Median is the observation whose cumulative frequency is equal to or just greater than N/2, where N = sum of frequencies.

Median of Continuous Series

I : Prepare the cumulative Frequency table

II : Find the median class, ie. in which the (N/2)th observation lies.

$$\text{Then, median} = l + \left(\frac{\frac{N}{2} - \text{c.f.}}{f}\right).h$$

- l = lower limit
- h = width of median class
- c.f. = Cumulative frequency of preceeding class
- Median class = N/2
- f = frequency of the median class
- N = Total Frequency

MODE

Mode of Individual Series

The number occurring the most frequently in the series

Mode of Discrete Series

By looking to that value of variable around which the items are most heavily concentrated.

Mode of Continuous Series

$$\text{mode} = l + \left(\frac{f_1 - f_o}{2f_1 - f_2 - f_o}\right) \times h$$

- Where l = the lower limit of the modal class i.e. the class having maximum frequency;
- f_1 = frequency of the modal class;
- f_0 = frequency of the class preceding the modal class;
- f_2 = frequency of class succeeding the modal class
- h = width of the modal class

Relation between Mean, Median and Mode

Mode = **3** Median - **2** Mean

Measure of Dispersion

Mean Deviation about any number A

$$\frac{1}{n}\sum |x_i - A| \text{ or } \frac{1}{n}\sum f_i|x_i - A|$$

A can be mean or median or any no.

Standard Deviation (σ)

$$\sqrt{\frac{\sum(x_i - \bar{x})^2}{N}} \text{ or } \sqrt{\frac{\sum(x_i - \bar{x})^2 f_i}{N}} \text{ or } \sqrt{\frac{\sum x_i^2}{N} - \bar{x}^2}$$

Variance = σ^2

- **NOTE**
  - for $x_i \rightarrow x_i + k \Rightarrow \sigma$ **doesn't** change
  - $x_i \rightarrow x_i . k \Rightarrow \sigma$ changes to **k.σ**
  - $x_i \rightarrow x_i . k \Rightarrow$ variance becomes k^2 times

Other Formulas

$\text{range} = x_{max} - x_{min}$	$C.V\% = \frac{\sigma}{\bar{x}} \times 100$

Coefficient of Variance is independent of Units