Chapter- 14

STATISTICS

MEAN (AVERAGE): Mean [Ungrouped Data] – Mean of n observations, $x_1, x_2, x_3 \ldots x_n$, is

$$\overline{X} = \frac{x_1 + x_2 + x_3 + \ldots + x_n}{n} = \frac{1}{n}\sum x \qquad \therefore \qquad \overline{X} = \frac{\sum x}{n}$$

MEAN [Grouped Data]: The mean for grouped data can be found by the following three methods:

(i) Direct Mean Method:

$$\overline{X} = \frac{\sum f_i x_i}{\sum f_i}$$

Class Mark = UpperClassLimit+LowerClassLimit2

Note: Frequency of a class is centred at its mid-point called class mark.

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(ii) Assumed Mean Method: In this, an arbitrary mean 'a' is chosen which is called, 'assumed mean', somewhere in the middle of all the values of x.

$$\overline{X} = a + \frac{\sum f_i d_i}{\sum f_i}$$

…[where $d_i = (x_i - a)$]

(iii) Step Deviation Method:

$$\overline{X} = a + \left[\frac{\sum f_i u_i}{\sum f_i}\right] \times h$$

….. [where ui=dih , where h is a common divisor of d_i]

MEDIAN: Median is a measure of central tendency which gives the value of the middle-most observation in the data.

(i) *Ungrouped data*: *If n is odd* $\rightarrow$ *Median* $= \left(\frac{n+1}{2}\right)^{th}$ *observation*

If n is even $\rightarrow$ *Median* $= \dfrac{\left(\frac{n}{2}\right)^{th} \text{ observation} + \left(\frac{n}{2}+1\right)^{th} \text{ observation}}{2}$

Remember! For ungrouped data, first arrange the observations in ascending order or descending order.

(ii) *Median (Grouped Data):* $\text{Median} = l + \left(\frac{\frac{n}{2} - c.f.}{f}\right) \times h$

…where[l = Lower limit of median class; n = Number of observations; f = Frequency of median class; c.f. = Cumulative frequency of preceding class; h = Class size]

(iii) Representing a cumulative frequency distribution graphically as a cumulative frequency curve, or an ogive of the less than type and of the more than type. The median of grouped data can be obtained graphically as the x-coordinate of the point of intersection of the two ogives for this data.

Mode:

(i) Ungrouped Data: The value of the observation having maximum frequency is the mode.

(ii) Grouped Data:

$$Mode = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

…where[l = Lower limit of modal class; f_1 = Frequency of modal class; f_0 = Frequency of the class preceding the modal class; f_2 = Frequency of the class succeeding the modal class; h = Size of class interval. c.f. = Cumulative frequency of preceding class; h = Class size]

Mode = 3 Median – 2 Mean

Median =(Mode+2Mean)/3

Mean = 3Median−Mode/2