

CHAPTER 14

Statistics

Introduction:

We know that "Statistics" deals with collection, organization, presentation, analysis and interpretation of numerical data. We already studied the classification of given data into ungrouped and grouped frequency distribution, representation of data (Such as bar graphs, histograms, frequency polygons) and measures of central tendency (Mean, Median and Mode) for the ungrouped data. In this, we shall extend the study of measures of central tendency from ungrouped data to that of grouped data. We shall also study about cumulative frequency, cumulative frequency distribution and how to draw cumulative curves, called ogives.

Mean of grouped data:

To calculate the mean of grouped data, we have following three methods.

Methods of calculating mean of grouped data:

I. Direct method:

If $x_1, x_2, \dots, x_n$ are mid values of class intervals with frequencies $f_1, f_2, \dots, f_n$ respectively, then the arithmetic mean of the grouped data is given by,

$$\bar{x} = \frac{f_1x_1 + f_2x_2 + \dots + f_nx_n}{f_1 + f_2 + \dots + f_n}$$

(OR)

$$\frac{\sum_{i=1}^n f_i x_i}{\sum_{i=1}^n f_i}$$

$$= \frac{\sum_{i=1}^n f_i x_i}{\sum_{i=1}^n f_i}$$



(OR) **Brainbox**
learn easy

$$\bar{x} = \frac{\sum_{i=1}^n f_i x_i}{N}$$

$$(\because N = f_1 + f_2 + \dots + f_n)$$

Procedure to find mean by direct method:

Example:

Find the mean of the following frequency distribution.

Class – Interval	Frequency
0 – 20	17
20 – 40	28

40 – 60	32
60 – 80	24
80 – 100	19

Sol.

Step 1:

Write the given data in columns. In first column, write class – intervals; in second column, write their given corresponding frequencies.

Step 2:

Obtain the mid value (x_i) of each class and write them in column III.

Step 3:

Multiply each mid value (x_i) by the corresponding frequency (f_i) of the class written in column II and obtain their products separately and denote these by $f_i x_i$ to get column IV.

Step 4:

Obtain the total of $f_i x_i$ of column IV and denote it by $\sum_{i=1}^n f_i x_i$.

Step 5:

Find the total of frequencies of column II and denote it by $\sum_{i=1}^n f_i$
 (OR) N.

Step 6:

Find $\bar{x}$ using the formula $\bar{x} = \frac{\sum_{i=1}^n f_i x_i}{N}$.

Let us construct the following table for the given data.

Class – Interval	Frequency (f_i)	Class Mark (x_i)	$f_i x_i$
0 – 20	17	10	$17 \times 10 = 170$
20 – 40	28	30	$28 \times 30 = 840$
40 – 60	32	50	$32 \times 50 = 1600$
60 – 80	14	70	$14 \times 70 = 980$
80 – 100	19	90	$19 \times 90 = 1710$
Total	$\sum f_i = N = 120$		$\sum f_i x_i = 6000$

$$\text{Class Mark} = \frac{\text{Upper limit} + \text{Lower limit}}{2} = \frac{0 + 20}{2} = \frac{20}{2} = 10$$

$$\text{Class Width} = 20$$

$$\therefore \text{Mean } (\bar{x}) = \frac{\sum f_i x_i}{N}$$

$$(\bar{x}) = \frac{50 \cancel{6000}}{\cancel{120}}$$

$$\therefore (\bar{x}) = 50$$

Note:

If the given data is in discontinuous form, there is no need to convert it into continuous form, because mid value x_i would be same in each case.