

CHAPTER 14

Statistics

Central Tendency:

For any particular set of data, it is possible to select some typical value or average to represent or describe the entire set. Such a descriptive value is referred to as a measure of central tendency or location.

Mean, Median and Mode are the three measures of central tendency.

Mean of ungrouped data:

Arithmetic Mean:

The arithmetic mean (Also called the mean) is the most commonly used average or measure of central tendency.

i.e. Sum of all observations is divided by the number of observations.

- The mean of the 'n' observations $x_1, x_2, x_3 \dots x_n$ is denoted by $\bar{x}$.

$$\bar{x} = \frac{x_1 + x_2 + \dots + x_n}{N} = \frac{\text{Sum of all observations}}{\text{Number of observations}}$$

Shortly denoted by using summation notation.

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

where, $\bar{x}$ = Arithmetic mean

N = Number of observations

x_i = i^{th} observation of the variable 'x'

$\sum_{i=1}^n x_i$ = Summation of all x_i values

Example:

A batman scored the following number of runs in six innings are 36, 35, 50, 46, 60 and 55. Find mean.

Sol.

Observations are 36, 35, 50, 46, 60 and 55.

Arithmetic Mean
$$\bar{x} = \frac{\sum x_i}{N}$$

Arithmetic Mean
$$\bar{x} = \frac{36 + 35 + 50 + 46 + 60 + 55}{6}$$

$$= \frac{282}{6}$$

$$\bar{x} = 47$$

Example:

The average of 5 numbers is 27. If one number is excluded, then average becomes 25. What is the excluded number?

Sol.

Average of 5 numbers = 27

$$\Rightarrow \frac{\sum x_i}{5} = 27$$

$$\Rightarrow \sum x_i = 27 \times 5 = 135$$

One number is excluded the average of four numbers = 25

$$\Rightarrow \frac{\sum x_i}{4} = 25$$

$$\Rightarrow \sum x_i = 25 \times 4 = 100$$

$$\therefore \text{Excluded number} = 135 - 100 = 35$$

Example:

Arithmetic mean of '9' observations was calculate as 45. In doing so an observation was wrongly taken as 42 for 24. What would then be the correct mean?

Sol.

Mean of '9' observations = 45

Sum of '9' observations = $45 \times 9 = 405$

When computing mean 42 was taken instead of 24

$\therefore$ Correct sum of '9' observations = $405 - 42 + 24 = 387$

Actual mean of '9' observations = $\frac{387}{9} = 43$

Note:

- A.M is a representative value of the entire data.
- A.M depends on both number of observations and value of each observation in a data.
- It is unique value of the data.
- When all the observations of the data are increased or decreased by a certain number, the mean also increases or decreases by the same number.
- When all the observations of the data are multiplied or divided by a certain number. The mean also multiplied or divided by the same number.