

Measures of central tendency

"A measure of central tendency is a typical value around which other figures congregate."

- Simpson & Kafka

Measures of central tendency are of three types -
(i) Mean (ii) Mode (iii) Median

Mean

Definition - "Arithmetic mean data के सारे का वर के क्षेत्र मान है जिसके दोनों ओर विचलन समान होता है।"

Methods of calculating Mean -

(A) In a series of individual observation
(or Mean of ungrouped data)

Direct Method -

Arithmetic Mean can be obtained by dividing the total values of the various items by their number.

Example - In an examination six students have ~~got~~ obtained the marks 50, 75, 80, 81, 85 and 25 respectively. What is the average marks obtained by them?

Formula - $\bar{X} = \frac{\sum X}{N}$ where \bar{X} = Ari. Mean
 \sum = summation or total
 X = value of item
 N = no. of items

$$\begin{aligned}\text{Here } \bar{X} &= \frac{50 + 75 + 80 + 81 + 85 + 25}{6} \\ &= \frac{396}{6} = \underline{\underline{66}} \text{ Ans.}\end{aligned}$$

data $x = 8, 7, 5, 6, 9$
 Frequency $f = 3, 3, 4, 5, 2$

Direct Method

$$\text{Formula } \bar{x} = \frac{\sum fx}{\sum f}$$

x	f	fx
8	3	24
7	3	21
5	4	20
6	5	30
9	2	18
	$\sum f = 17$	$\sum fx = 113$

$\bar{x} = \frac{113}{17}$
 $= 6.647$ Ans.

Short-cut Method

x	f	$(x-A)$ dx ($A=7$)	fdx
8	3	+1	+3
7	3	0	0
5	4	-2	-8
6	5	-1	-5
9	2	+2	+4
	$\sum f = 17$		$\sum fdx = -6$

$$\begin{aligned} \bar{x} &= A + \frac{\sum fdx}{\sum f} \\ &= 7 + \frac{(-6)}{17} \\ &= \frac{119-6}{17} = \frac{113}{17} = 6.647 \text{ Ans.} \end{aligned}$$

(B) Calculation of Mean in Continuous Series or Grouped Data

When the number of data is too much we distribute them in the groups of equal class intervals and then also write the frequencies.

Ex Find out the mean of following data

class-interval	f
2-4	3
5-7	4
8-10	5
11-13	2
14-16	2

Direct Method

$$\text{Formula} - \frac{\sum fm}{\sum f}$$

where $\sum fm$ = Total of the frequency of each class multiplied by the mid-value of respective class.

C.I.	f	mid-value (m)	fm
2-4	3	3	9
5-7	4	6	24
8-10	5	9	45
11-13	2	12	24
14-16	2	15	30
	$\sum f = 16$		$\sum fm = 132$

$$\bar{x} = \frac{\sum fm}{\sum f} = \frac{132}{16} = \underline{\underline{8.25}} \text{ Ans.}$$

Short-Cut Method [dx = m - A]

C.I.	f	m	dx (Assumed mean)	fdx
2-4	3	3	-6	-18
5-7	4	6	-3	-12
8-10	5	9	0	0
11-13	2	12	+3	6
14-16	2	15	+6	12
	$\sum f = 16$			$\sum f dx = -12$

$$\begin{aligned} \bar{x} &= A + \frac{\sum f dx}{\sum f} \\ &= 9 + \frac{(-12)}{16} = \frac{144 - 12}{16} = \frac{132}{16} = \underline{\underline{8.25}} \text{ Ans} \end{aligned}$$

Functions

- 1- To simplify complex facts - to simplify great bodies of numerical data
- 2- To provide comparative study - betⁿ past & present results
- 3- To study relationship between different facts
(relationship between age and height)
4. To formulate policies in different fields
5. To enlarge individual knowledge and experience
6. To measure the effects
7. To test a hypothesis
8. To forecast
9. To provide numerical measurement

Limitations

- 1- Statistics studies only the quantitative aspect of a problem and does not study its qualitative aspect.
- 2- It deals with averages
- 3- It does not study individuals
- 4- Its results are only approximately correct.
5. Statistical results are not always beyond doubt.
- 6 Statistics is only a means

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Merits of Arithmetic Mean —

- Importance {
1. The best expression of central tendency. It is used in all statistical calculations.
 2. Best representative of data distribution.
 3. Used in estimation of deviation, correlation etc.
 4. Mostly used in social, economic, educational data work.
 5. It can be easily calculated.
 6. Its calculations are based on all the observations.
 7. It is easy to understand.
 8. It is least affected by fluctuations in sampling.

Demerits —

1. Sometimes it gives abnormal results due to a few abnormal sizes of the item.
2. It may not be represented in actual data and so it is theoretical.
3. It cannot be calculated if all the values are not known.
4. It cannot be determined for the qualitative data such as - beauty, honesty.

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