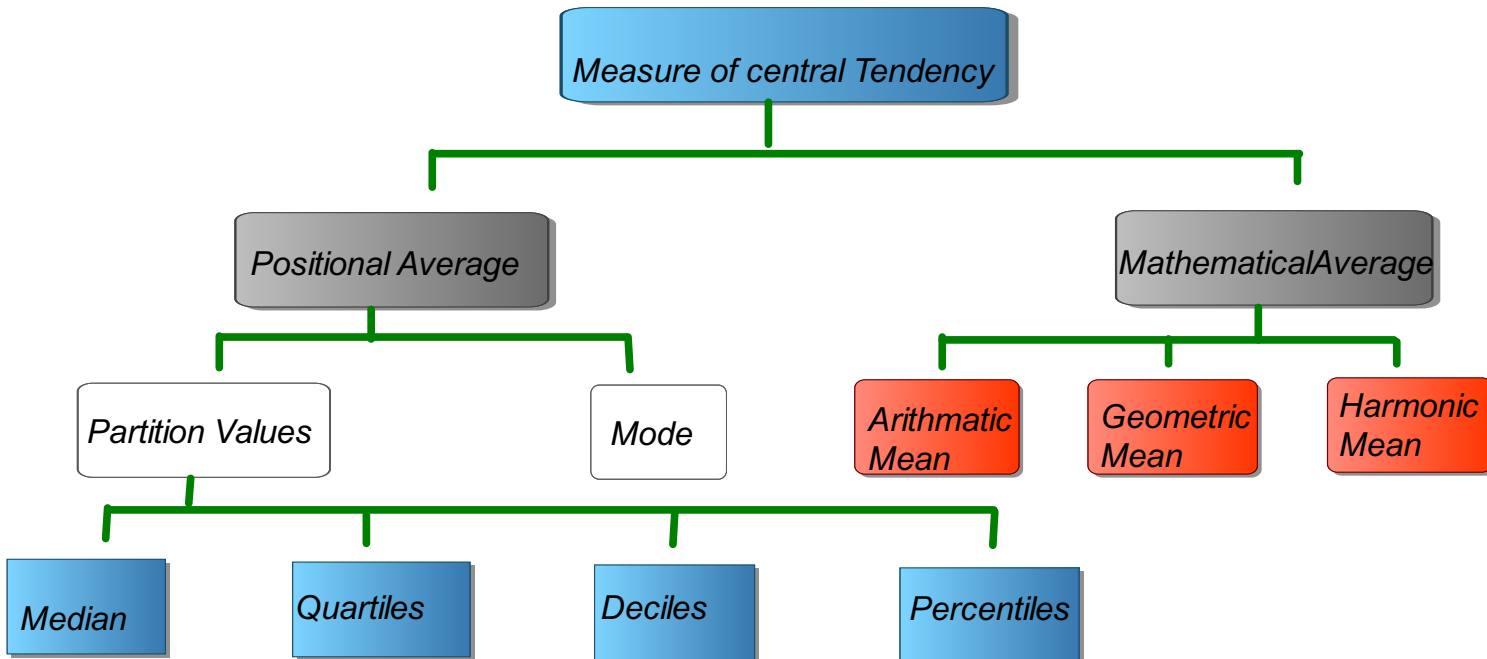


AVERAGE(MEASURE OF CENTRAL TENDENCY)

Measures of central tendency (averages) are the statistical constants which enable us to comprehend in single effort the significant of the whole.

REQUISITES OF A GOOD MEASURE OF CENTRAL TENDENCY

- 1. It should be rigidly defined.*
- 2. It should be simple to understand and easy to calculate*
- 3. It should be based on all the observations.*
- 4. It should be capable of further mathematical treatment*
- 5. It should be least affected by the fluctuations of the sampling*
- 6. It should not be affected by extreme values*
- 7. It should be easy to interpret.*



ARITHMETIC MEAN

For ungrouped data,

If a variable x takes the values $x_1, x_2, x_3, \dots, x_n$, then the Arithmetic Mean is

$$\bar{x} = \frac{x_1 + x_2 + \dots + x_n}{n}$$

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

The marks of 10 students are as follows: 25, 35, 17, 15, 45, 30, 55, 21, 47, 10. Find arithmetic mean.

$$\bar{x} = \frac{\sum x}{n}$$

$$= \frac{25 + 35 + 17 + 15 + 45 + 30 + 55 + 21 + 47 + 10}{10}$$

$$= \frac{300}{10}$$

$$= 30$$

16/10/20
Discrete Frequency distribution:

If a variable x takes values x_1, x_2, \dots, x_n with corresponding frequencies f_1, f_2, \dots, f_n respectively, then the arithmetic mean of these values is given by,

$$\bar{x} = \frac{f_1 x_1 + f_2 x_2 + \dots + f_n x_n}{f_1 + f_2 + \dots + f_n}$$

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

The pocket money allowance of 50 students given below. Find the arithmetic mean of the allowance.

Allowance (₹)	800	900	1000	1100	1200	1300	1400
No. of students.	5	7	9	11	9	5	4

Allowance (₹)	No. of students	fx
800	5	4000
900	7	6300
1000	9	9000
1100	11	12100
1200	9	10800
1300	5	6500
1400	4	5600
	50	54300

$$\begin{aligned} \bar{x} &= \frac{\sum fx}{\sum f} \\ &= \frac{54300}{50} \\ &= 1086 \end{aligned}$$

For continuous frequency distribution,

x can be calculated as, $x = \frac{\text{lower limit} + \text{upper limit}}{2}$

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

The following data gives the number of defective articles produced by workers in a factory in a month. Find the arithmetic mean

No. of defective articles	No. of workers
20-30	50
30-40	75
40-50	100
50-60	125
60-70	25
70-80	25

No. of defective articles	No. of workers	Midpt x	fx
20-30	50	$25 = \frac{(20+30)}{2}$	1250
30-40	75	35	2625
40-50	100	45	4500
50-60	125	55	6875
60-70	25	65	1625
70-80	25	75	1875
Total	400		18750

$$\bar{x} = \frac{\sum fx}{\sum f} = \frac{18750}{400} =$$

19/10/20

The owner of the 'PET HOUSE' is interested in building a new store. He will build it only if the average number of animals sold per month during the first half of 2000 is at least 200 and the monthly average for the whole year is at least 180. The data for the year are

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
220	150	150	250	240	190	160	170	180	210	160	150

2230

what will be the owner's decision?

$$\bar{x} = \frac{\sum x}{n}$$

$$\text{Average of first six months} = \frac{220 + 150 + 150 + 250 + 240 + 190}{6}$$

$$= \frac{1200}{6}$$

$$= 200$$

$$\text{Average of whole year} = \frac{2230}{12}$$

$$= 185.8$$

The owner's decision is 'Yes'.

Mr. X works as a sales representative for a text publisher. He is paid a commission related to volumes. His quarterly earnings for the last three years are given below.

	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4
YEAR 1	15000	6000	10000	8000
YEAR 2	21000	8000	15000	10000
YEAR 3	24000	10000	20000	15000

- Calculate his average earnings for each quarter
- Calculate quarterly average for each year

$$\bar{x} = \frac{\sum x}{n}$$

	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4	Total	Average: Tot/4
YEAR 1	15000	6000	10000	8000	39000	9750
YEAR 2	21000	8000	15000	10000	54000	13500
YEAR 3	24000	10000	20000	15000	69000	17250
Total	60000	24000	45000	33000		
Average	$60000/3 = 20000$	$24000/3 = 8000$	15000	11000		

$$\begin{aligned} \text{Average earning for quarter 1} &= \frac{15000 + 21000 + 24000}{3} \\ &= \frac{60,000}{3} \\ &= 20,000 \end{aligned}$$

$$\begin{aligned} \text{Quarterly average for year 1} &= \frac{15000 + 6000 + 10000 + 8000}{4} \\ &= \frac{39000}{4} \\ &= 9750 \end{aligned}$$

Find the missing frequency. Given that the arithmetic mean of advertising expenditure is Rs. 5625.

Adv. Exp. (₹)	No. of companies
2000-3000	10
3000-4000	15
4000-5000	30
5000-6000	-
6000-7000	65
7000-8000	25

Adv. Exp. (₹)	No. of companies	Midpt(x)	fx
2000-3000	10	2500	25000
3000-4000	15	3500	52500
4000-5000	30	4500	135000
5000-6000	- a (say)	5500	5500a
6000-7000	65	6500	422500
7000-8000	25	7500	187500
Total	145 + a		822500 + 5500a

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

$$\bar{x} = \frac{\sum fx}{\sum f} = 5625$$

$$\frac{822500 + 5500a}{145 + a} = 5625$$

$$822500 + 5500a = 5625(145 + a) = 5625(145) + 5625a$$

$$= 815625 + 5625a$$

$$5500a - 5625a = 815625 - 822500$$

$$-125a = -6875$$

$$a = \frac{6875}{125} = 55$$

∴ Missing frequency = 55