Mean Deviation

Definition: M.D. is the average difference between the observations in a distribution and the *median* or *mean* of that series.

$$\text{Mean Deviation or M.D.} = \frac{\sum |D|}{N}$$

Where $|D|$ is the deviations from ***median*** ignoring signs.

For individual observations:

(i) Compute median of the series.

(ii) Take deviations of items from median ignoring ± signs and denote these deviations by $|D|$.

(iii) Obtain the total of these observations, $|D|$.

(iv) Divide the total obtained in step (iii) by the number of observations to get the value of ***mean deviation***.

Relative Measure of M.D. :

$$\text{Co-efficient of M.D.} = \frac{M.D.}{Median}$$

Example 5: Calculate the mean deviation of the two income groups.

I (Rs.)	**II** (Rs.)
4000	3000
4200	4000
4400	4200
4600	4400
4800	4600
	4800
	5800

Solution:

Mean deviation : **I group** $\quad \text{M.D.} = \frac{\Sigma|D|}{N}$

$\text{Median} = \frac{N+1}{2}\ th\ \text{item} = \frac{5+1}{2} = 3^{\text{rd}}$ item. Size of the 3^{rd} item = 4400.

Group I		**Group II**	
Rs.	$\|D\|$	**Rs.**	$\|D\|$
4000	400	3000	1400
4200	200	4000	400
4400	0	4200	200
4600	200	4400	0
4800	400	4600	200
		4800	400
		5800	1400
$N = 5$	$\|D\| = 1200$	N = 7	$\|D\| = 4000$

$$\text{M.D.} = \frac{1200}{5} = \mathbf{240}$$

i.e., the average deviation of the individual incomes from the median income is **Rs. 240**.

Mean deviation : **II group** $\text{M.D.} = \frac{|D|}{N}$

$$\text{Median} = \frac{N+1}{2}\ th\ \text{item} = \frac{7+1}{2} = 4^{\text{th}}\ \text{item}.$$

$$\text{Size of the } 4^{\text{th}}\ \text{item} = 4400.$$

$$\text{M.D.} = \frac{4000}{5} = 571.43$$

i.e., the average deviation of the individual incomes from the median income is **Rs. 571.43**.

Co-efficient of M.D. (I - Group) $= \frac{M.D.}{Median} = \frac{240}{4400} = 0.055$

(II- Group) $= \frac{571.43}{4400} = 0.13$

Mean deviation – Discrete Series

$$\text{M.D.} = \frac{\sum f|D|}{N}$$

(i) Compute median of the series.

(ii) Take deviations of items from median ignoring ± signs and denote these deviations by $|D|$.

(iii) Multiply these deviations by the respective frequencies and Obtain the total, $\sum f|D|$

(iv) Divide the total obtained in step (iii) by the number of observations to get the value of ***mean deviation***.

Example 6: The number of telephone calls received at an exchange in 245 successive one-minute intervals are shown in the following frequency distribution. Compute the mean deviation about the median.

Number of Calls	0	1	2	3	4	5	6	7
Frequency	14	21	25	43	51	40	39	12

Solution:

No. of Calls	*f*	*c.f.*	$\|D\|$	$f\|D\|$
0	14	14	4	56
1	21	35	3	63
2	25	60	2	50
3	43	103	1	43
4	51	154	0	0
5	40	194	1	40
6	39	233	2	78
7	12	245	3	36
	$N = 245$			$f \ \|D\| = 366$

Median = Size of $\frac{N+1}{2}$ th item $= \frac{245+1}{2} = 123^{rd}$ item .

Hence the median value is 4.

$$\text{M.D.} = \frac{\sum f|D|}{N} = \frac{366}{245} = \mathbf{1.49}$$

In Continuous Series:

We have to obtain the mid-points of the various classes and take the deviations of these **mid-points** from median.

Calculate the coefficient of mean deviation from the following data:

Marks	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of Students	2	6	12	18	25	20	10	7

Mean deviation = 12.94