Mean Deviation.

A defect of the range is that it is based on only two values, the highest & the lowest; it doesn't take into consideration all of the values.

The Mean Deviation Does take into consideration all of the values.

The mean of the absolute deviations of observations from mean is called Mean Deviation.

$$M.D = \frac{\sum |X - \bar{X}|}{n}$$

Here;

X : is the value of each observation

$\bar{X}$: is the mean of the values.

n : is the number of observations in the sample.

| | : indicates the absolute value.

⇒ Merits of MD:

- It is easy to calculate
- " " based on all the observations.

⇒ Demerits of MD:

- It ignores algebric sign. (− [redacted]).

⟹ Example:

45, 32, 37, 46, 39, 36, 41, 48, 36

$$\bar{X} = \frac{\Sigma X}{n}$$

$$= \frac{45+32+37+46+39+36+41+48+36}{9}$$

$$= \frac{360}{9} = 40$$

X	$X - \bar{X}$	$\lvert X - \bar{X} \rvert$
45	5	5
32	−8	8
37	−3	3
46	+6	6
39	−1	1
36	−4	4
41	1	1
48	8	8
36	4	4
		40

$$MD = \frac{\Sigma |x - \bar{x}|}{n}$$

$$= \frac{40}{9}$$

$$\boxed{MD = 4.4}$$

→ Example :

20, 40, 50, 60, 80

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

$$= \frac{20+40+50+60+80}{5}$$

$$= \frac{250}{5}$$

$$\boxed{\bar{x} = 50}$$

x	$x - \bar{x}$	$\lvert x - \bar{x} \rvert$
20	-30	30
40	-10	10
50	0	0
60	10	10
80	30	30
		80

$$MD = \frac{80}{5}$$

$$\boxed{MD = 16}$$

⟹ Example:

20, 49, 50, 51, 80

$$\bar{x} = \frac{20+49+50+51+80}{5}$$

$$= \frac{250}{5}$$

$$\boxed{\bar{x} = 50}$$

x	$x - \bar{x}$	$\lvert x - \bar{x} \rvert$
20	-30	30
49	-1	1
50	0	0
51	1	1
80	30	30
		62

$$MD = \frac{\sum |x - \bar{x}|}{n}$$

$$= \frac{62}{5}$$

$$\boxed{MD = 12.4}$$

→ Example:

88.03, 94.50, 94.90, 95.05, 84.60

$$\bar{x} = \frac{457.08}{5}$$

$$= 91.416$$

x	$x - \bar{x}$	$\lvert x - \bar{x} \rvert$
88.03	-3.386	3.386
94.50	3.084	3.084
94.90	3.484	3.484
95.05	3.634	3.634
84.60	-6.816	6.816
		20.404

$$MD = \frac{\sum \lvert x - \bar{x} \rvert}{n}$$

$$= \frac{20.404}{5} = \boxed{4.0808}$$

→ Example:

2, 5, 6, 6, 8, 9, 12, 13, 16, 23

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

$$= \frac{100}{10}$$

$$\boxed{\bar{x} = 10}$$

x	$x - \bar{x}$	$\lvert x - \bar{x} \rvert$
2	−8	8
5	−5	5
6	−4	4
6	−4	4
8	−2	2
9	−1	1
12	2	2
13	3	3
16	6	6
23	13	13
		48

$$MD = \frac{\sum |x - \bar{x}|}{n}$$

$$= \frac{48}{10}$$

$$MD = 4.8$$