

EXERCISE 32.3

Compute the mean deviation from the median of the following distribution:

Class	0-10	10-20	20-30	30-40	40-50
Frequency	5	10	20	5	10

Solution:

To find the mean deviation from the median, firstly let us calculate the median.

Median is the middle term of the X_i ,

Here, the middle term is 25

So, Median = 25

Class Interval	x_i	f_i	Cumulative Frequency	$ d_i = x_i - M $	$f_i d_i $
0-10	5	5	5	20	100
10-20	15	10	15	10	100
20-30	25	20	35	0	0
30-40	35	5	91	10	50
40-50	45	10	101	20	200
		Total = 50			Total = 450

$$\begin{aligned}
 MD &= \frac{1}{n} \sum_{i=1}^n |d_i| \\
 &= 1/50 \times 450 \\
 &= 9
 \end{aligned}$$

∴ The mean deviation is 9

1. Find the mean deviation from the mean for the following data:

(i)

Classes	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800
Frequencies	4	8	9	10	7	5	4	3

Solution:

To find the mean deviation from the mean, firstly let us calculate the mean.

By using the formula,

$$\begin{aligned}
 \text{Mean} &= \frac{\sum f_i x_i}{f_i} \\
 &= 17900/50 \\
 &= 358
 \end{aligned}$$

Class Interval	x_i	f_i	Cumulative Frequency	$ d_i = x_i - M $	$f_i d_i $
0-100	50	4	200	308	1232
100-200	150	8	1200	208	1664
200-300	250	9	2250	108	972
300-400	350	10	3500	8	80
400-500	450	7	3150	92	644
500-600	550	5	2750	192	960
600-700	650	4	2600	292	1168
700-800	750	3	2250	392	1176
		Total = 50	Total = 17900		Total = 7896

$$N = 50$$

$$MD = \frac{1}{n} \sum_{i=1}^n |d_i|$$

$$= 1/50 \times 7896$$

$$= 157.92$$

∴ The mean deviation is 157.92

(ii)

Classes	95-105	105-115	115-125	125-135	135-145	145-155
Frequencies	9	13	16	26	30	12

Solution:

To find the mean deviation from the mean, firstly let us calculate the mean.

By using the formula,

$$\text{Mean} = \frac{\sum f_i x_i}{f_i}$$

$$= 13630/106$$

$$= 128.58$$

Class Interval	x_i	f_i	Cumulative Frequency	$ d_i = x_i - M $	$f_i d_i $
95-105	100	9	900	28.58	257.22
105-115	110	13	1430	18.58	241.54
115-125	120	16	1920	8.58	137.28
125-135	130	26	3380	1.42	36.92
135-145	140	30	4200	11.42	342.6

145-155	150	12	1800	21.42	257.04
		N = 106	Total = 13630		Total = 1272.6

$$N = 106$$

$$MD = \frac{1}{n} \sum_{i=1}^n |d_i|$$

$$= 1/106 \times 1272.6$$

$$= 12.005$$

∴ The mean deviation is 12.005

2. Compute mean deviation from mean of the following distribution:

Marks	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of students	8	10	15	25	20	18	9	5

Solution:

To find the mean deviation from the mean, firstly let us calculate the mean.

By using the formula,

$$Mean = \frac{\sum f_i x_i}{f_i}$$

$$= 5390/110$$

$$= 49$$

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Class Interval	x_i	f_i	Cumulative Frequency	$ d_i = x_i - M $	$f_i d_i $
10-20	15	8	120	34	272
20-30	25	10	250	24	240
30-40	35	15	525	14	210
40-50	45	25	1125	4	100
50-60	55	20	1100	6	120
60-70	65	18	1170	16	288
70-80	75	9	675	26	234
80-90	85	5	425	36	180
		N = 110	Total = 5390		Total = 1644

$$N = 110$$

$$MD = \frac{1}{n} \sum_{i=1}^n |d_i|$$

$$= 1/110 \times 1644$$

$$= 14.94$$

∴ The mean deviation is 14.94

3. The age distribution of 100 life-insurance policy holders is as follows:

Age (on nearest birthday)	17-19.5	20-25.5	26-35.5	36-40.5	41-50.5	51-55.5	56-60.5	61-70.5
No. of persons	5	16	12	26	14	12	6	5

Calculate the mean deviation from the median age.

Solution:

To find the mean deviation from the median, firstly let us calculate the median.

$$N = 96$$

$$\text{So, } N/2 = 96/2 = 48$$

The cumulative frequency just greater than 48 is 59, and the corresponding value of x is 38.25

$$\text{So, Median} = 38.25$$

Class Interval	x_i	f_i	Cumulative Frequency	$ d_i = x_i - M $	$f_i d_i $
17-19.5	18.25	5	5	20	100
20-25.5	22.75	16	21	15.5	248
36-35.5	30.75	12	33	7.5	90
36-40.5	38.25	26	59	0	0
41-50.5	45.75	14	73	7.5	105
51-55.5	53.25	12	85	15	180
56-60.5	58.25	6	91	20	120
61-70.5	65.75	5	96	27.5	137.5
		Total = 96			Total = 980.5

$$N = 96$$

$$MD = \frac{1}{n} \sum_{i=1}^n |d_i|$$

$$= 1/96 \times 980.5$$

$$= 10.21$$

∴ The mean deviation is 10.21

4. Find the mean deviation from the mean and from a median of the following

distribution:

Marks	0-10	10-20	20-30	30-40	40-50
No. of students	5	8	15	16	6

Solution:

To find the mean deviation from the median, firstly let us calculate the median.

$$N = 50$$

$$\text{So, } N/2 = 50/2 = 25$$

The cumulative frequency just greater than 25 is 28, and the corresponding value of x is 28

$$\text{So, Median} = 28$$

By using the formula to calculate Mean,

$$\begin{aligned} \text{Mean} &= \frac{\sum f_i x_i}{f_i} \\ &= 1350/50 \\ &= 27 \end{aligned}$$

Class Interval	x_i	f_i	Cumulative Frequency	$ d_i = x_i - \text{Median} $	$f_i d_i $	$F_i X_i$	$ X_i - \text{Mean} $	$F_i X_i - \text{Mean} $
0-10	5	5	5	23	115	25	22	110
10-20	15	8	13	13	104	120	12	96
20-30	25	15	28	3	45	375	2	30
30-40	35	16	44	7	112	560	8	128
40-50	45	6	50	17	102	270	18	108
		N = 50			Total = 478	Total = 1350		Total = 472

$$\text{Mean deviation from Median} = 478/50 = 9.56$$

$$\text{And, Mean deviation from Mean} = 472/50 = 9.44$$

\therefore The Mean Deviation from the median is 9.56 and from mean is 9.44.