

EXERCISE 32.2

Calculate the mean deviation from the median of the following frequency distribution:

Heights in inches	58	59	60	61	62	63	64	65	66
No. of students	15	20	32	35	35	22	20	10	8

Solution:

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

We know, Median is the Middle term,

So, Median = 61

Let x_i = Heights in inches

And, f_i = Number of students

x_i	f_i	Cumulative Frequency	$ d_i = x_i - M $ $= x_i - 61 $	$f_i d_i $
58	15	15	3	45
59	20	35	2	40
60	32	67	1	32
61	35	102	0	0
62	35	137	1	35
63	22	159	2	44
64	20	179	3	60
65	10	189	4	40
66	8	197	5	40
	N = 197			Total = 336

$N=197$

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

$$= 1/197 \times 336$$

$$= 1.70$$

∴ The mean deviation is 1.70.

1. The number of telephone calls received at an exchange in 245 successive on2-minute intervals is shown in the following frequency distribution:

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

Compute the mean deviation about the median.

Solution:

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

We know, Median is the even term, $(3+5)/2 = 4$

So, Median = 8

Let x_i = Number of calls

And, f_i = Frequency

x_i	f_i	Cumulative Frequency	$ d_i = x_i - M $ $= x_i - 61 $	$f_i d_i $
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
				Total = 366
	Total = 245			

$$N = 245$$

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

$$= 1/245 \times 366$$

$$= 1.49$$

∴ The mean deviation is 1.49.

2. Calculate the mean deviation about the median of the following frequency distribution:

x_i	5	7	9	11	13	15	17
f_i	2	4	6	8	10	12	8

Solution:

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

We know, $N = 50$

Median = $(50)/2 = 25$

So, the median Corresponding to 25 is 13

x_i	f_i	Cumulative Frequency	$ d_i = x_i - M $ $= x_i - 61 $	$f_i d_i $
5	2	2	8	16
7	4	6	6	24
9	6	12	4	24
11	8	20	2	16
13	10	30	0	0
15	12	42	2	24
17	8	50	4	32
	Total = 50			Total = 136

$N = 50$

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

$$= 1/50 \times 136$$

$$= 2.72$$

\therefore The mean deviation is 2.72.

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

(i)

x_i	5	7	9	10	12	15
f_i	8	6	2	2	2	6

Solution:

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

By using the formula,

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

x_i	f_i	Cumulative Frequency ($\sum x_i f_i$)	$ d_i = x_i - Mean $	$f_i d_i $
5	8	40	4	32
7	6	42	2	12
9	2	18	0	0
10	2	20	1	2

12	2	24	3	6
15	6	90	6	36
	Total = 26	Total = 234		Total = 88

$$\begin{aligned} \text{Mean} &= \frac{\sum f_i x_i}{f_i} \\ &= 234/26 \\ &= 9 \end{aligned}$$

$$\begin{aligned} \text{Mean deviation} &= \frac{\sum f_i |d_i|}{f_i} \\ &= 88/26 \\ &= 3.3 \end{aligned}$$

∴ The mean deviation is 3.3

(ii)

x_i	5	10	15	20	25
f_i	7	4	6	3	5

Solution:

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

By using the formula,

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

x_i	f_i	Cumulative Frequency ($\sum f_i x_i$)	$ d_i = x_i - \text{Mean} $	$f_i d_i $
5	7	35	9	63
10	4	40	4	16
15	6	90	1	6
20	3	60	6	18
25	5	125	11	55
	Total = 25	Total = 350		Total = 158

$$\begin{aligned} \text{Mean} &= \frac{\sum f_i x_i}{f_i} \\ &= 350/25 \\ &= 14 \end{aligned}$$

$$\begin{aligned} \text{Mean deviation} &= \frac{\sum f_i |d_i|}{f_i} \\ &= 158/25 \\ &= 6.32 \end{aligned}$$

∴ The mean deviation is 6.32

(iii)

x_i	10	30	50	70	90
f_i	4	24	28	16	8

Solution:

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

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

x_i	f_i	Cumulative Frequency ($\sum f_i x_i$)	$ d_i = x_i - \text{Mean} $	$f_i d_i $
10	4	40	40	160
30	24	720	20	480
50	28	1400	0	0
70	16	1120	20	320
90	8	720	40	320
	Total = 80	Total = 4000		Total = 1280

$$\begin{aligned} \text{Mean} &= \frac{\sum f_i x_i}{f_i} \\ &= 4000/80 \\ &= 50 \end{aligned}$$

$$\begin{aligned} \text{Mean deviation} &= \frac{\sum f_i |d_i|}{f_i} \\ &= 1280/80 \\ &= 16 \end{aligned}$$

∴ The mean deviation is 16

4. Find the mean deviation from the median for the following data :

(i)

x_i	15	21	27	30
f_i	3	5	6	7

Solution:

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

We know, $N = 21$

Median = $(21)/2 = 10.5$

So, the median Corresponding to 10.5 is 27

x_i	f_i	Cumulative Frequency	$ d_i = x_i - M $	$f_i d_i $
15	3	3	15	45
21	5	8	9	45
27	6	14	3	18
30	7	21	0	0
	Total = 21	Total = 46		Total = 108

$N = 21$

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

$$= 1/21 \times 108$$

$$= 5.14$$

\therefore The mean deviation is 5.14

(ii)

x_i	74	89	42	54	91	94	35
f_i	20	12	2	4	5	3	4

Solution:

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

We know, $N = 50$

Median = $(50)/2 = 25$

So, the median Corresponding to 25 is 74

x_i	f_i	Cumulative Frequency	$ d_i = x_i - M $	$f_i d_i $
74	20	4	39	156
89	12	6	32	64
42	2	10	20	80

54	4	30	0	0
91	5	42	15	180
94	3	47	17	85
35	4	50	20	60
	Total = 50	Total = 189		Total = 625

$$N = 50$$

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

$$= 1/50 \times 625$$

$$= 12.5$$

∴ The mean deviation is 12.5

(iii)

Marks obtained	10	11	12	14	15
No. of students	2	3	8	3	4

Solution:

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

We know, $N = 20$

$$\text{Median} = (20)/2 = 10$$

So, the median Corresponding to 10 is 12

x_i	f_i	Cumulative Frequency	$ d_i = x_i - M $	$f_i d_i $
10	2	2	2	4
11	3	5	1	3
12	8	13	0	0
14	3	16	2	6
15	4	20	3	12
	Total = 20			Total = 25

$$N = 20$$

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

$$= 1/20 \times 25$$

$$= 1.25$$

∴ The mean deviation is 1.25