

**EXERCISE 32.2**
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**1. Calculate the mean deviation from the median of the following frequency distribution:**

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

**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
	<b>N = 197</b>			<b>Total = 336</b>

$N=197$

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

$$= 1/197 \times 336$$

$$= 1.70$$

∴ The mean deviation is 1.70.

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

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

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			

$N = 245$

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

$$= 1/245 \times 366$$

$$= 1.49$$

$\therefore$  The mean deviation is 1.49.

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

$x_i$	<b>5</b>	<b>7</b>	<b>9</b>	<b>11</b>	<b>13</b>	<b>15</b>	<b>17</b>
$f_i$	<b>2</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>12</b>	<b>8</b>

**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.

#### 4. 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 ( $\sum f_i$ )	$ 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 ( $x_i f_i$ )	$ 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 ( $\sum f_i$ )	$ 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

**5. 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

$N = 21$

$$\begin{aligned}
 MD &= \frac{1}{n} \sum_{i=1}^n |d_i| \\
 &= 1/21 \times 108 \\
 &= 5.14
 \end{aligned}$$

$\therefore$  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)

<b>Marks obtained</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>14</b>	<b>15</b>
<b>No. of students</b>	<b>2</b>	<b>3</b>	<b>8</b>	<b>3</b>	<b>4</b>

**Solution:**

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

We know,  $N = 20$

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