

VIDYA BHAWAN BALIKA VIDYA PITH

शक्तिउत्थानआश्रमलखीसरायबिहार

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Teacher name – Ajay Kumar Sharma

Ex 15.1 Class 11 Maths Question 4.

36, 72, 46, 42, 60, 45, 53, 46, 51, 49

Solution:

Arranging the data in ascending order, we have 36, 42, 45, 46, 46, 49, 51, 53, 60, 72

Here $n = 10$ (which is even)

So median is the average of 5th and 6th observations

$$\text{Median } (M) = \frac{46 + 49}{2} = \frac{95}{2} = 47.5$$

x_i	$ x_i - 47.5 $
36	11.5
42	5.5
45	2.5
46	1.5
46	1.5
49	1.5
51	3.5
53	5.5
60	12.5
72	24.5
Total	70

$$\begin{aligned} \text{M.D. about median} &= \frac{1}{n} \sum_{i=1}^n |x_i - M| \\ &= \frac{1}{10} \times 70 = 7 \end{aligned}$$

Find the mean deviation about the mean for the data in Exercises 5 and 6.

Ex 15.1 Class 11 Maths Question 5.

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

Solution:

x_i	f_i	$f_i x_i$	$ x_i - 14 $	$f_i x_i - 14 $
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
	25	350		158

$$\text{Mean}(\bar{x}) = \frac{1}{N} \sum_{i=1}^n f_i x_i = \frac{1}{25} \times 350 = 14$$

$$\begin{aligned} \therefore \text{Mean deviation about mean} &= \frac{1}{N} \sum_{i=1}^n f_i |x_i - \bar{x}| \\ &= \frac{1}{25} \times 158 = 6.32 \end{aligned}$$

Ex 15.1 Class 11 Maths Question 6.

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

Solution:

x_i	f_i	$f_i x_i$	$ x_i - 50 $	$f_i x_i - 50 $
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
	80	4000		1280

$$\text{Mean}(\bar{x}) = \frac{1}{N} \sum_{i=1}^n f_i x_i = \frac{1}{80} \times 4000 = 50$$

$$\begin{aligned} \text{Mean deviation about mean} &= \frac{1}{N} \sum_{i=1}^n f_i |x_i - \bar{x}| \\ &= \frac{1}{80} \times 1280 = 16 \end{aligned}$$

Find the mean deviation about the median for the data in Exercises 7 and 8.

Ex 15.1 Class 11 Maths Question 7.

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

Solution:

x_i	f_i	<i>c.f.</i>	$ x_i - 7 $	$f_i x_i - 7 $
5	8	8	2	16
7	6	14	0	0
9	2	16	2	4
10	2	18	3	6
12	2	20	5	10
15	6	26	8	48
	26			84

Here, $\frac{N}{2} = \frac{26}{2} = 13$

The *c.f.* just greater than 13 is 14 and the corresponding value of x is 7.

So, Median (M) = 7

$$\begin{aligned} \therefore \text{M.D. about median} &= \frac{1}{N} \sum_{i=1}^n f_i |x_i - M| \\ &= \frac{1}{26} \times 84 = 3.23 \end{aligned}$$