Exercise 30A

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Find the mean deviation about the mean for the following data: (Question 1 to Question 3)
Formula used:

Mean Deviation about the mean

$$M.D.(\bar{x}) = \frac{\sum_{i=1}^{n} |x_i - \bar{x}|}{n}$$

Where $\bar{x}$ = mean

Question 1: Find the mean deviation about the mean for 7, 8, 4, 13, 9, 5, 16, 18

Solution:

Step 1: Find the mean

$$\bar{x} = \frac{7+8+4+13+9+5+16+18}{8} = \frac{80}{8} = 10$$

Step 2: Mean deviation using formula

$$M.D.(\bar{x}) = \frac{\sum_{i=1}^{8} |x_i - \bar{x}|}{8}$$

$$= \frac{3+2+6+3+1+5+6+8}{8} = \frac{34}{8} = 4.25$$

Question 2: Find the mean deviation about the mean for 39, 72, 48, 41, 43, 55, 60, 45, 54, 43.

Solution:

Step 1: Find the mean

$$\bar{x} = \frac{39+72+48+41+43+55+60+45+54+43}{10} = \frac{500}{10} = 50$$

Step 2: Mean deviation using formula

$$\text{M.D.}(\bar{x}) = \frac{\sum_{i=1}^{10} |x_i - \bar{x}|}{10}$$

$$= \frac{11 + 22 + 2 + 9 + 7 + 5 + 10 + 5 + 4 + 7}{10} = \frac{82}{10} = 8.2$$

Question 3: Find the mean deviation about the mean for 17, 20, 12, 13, 15, 16, 12, 18, 15, 19, 12, 11.

Solution:

Step 1: Find the mean

$$\bar{x} = \frac{17 + 20 + 12 + 13 + 15 + 16 + 12 + 18 + 15 + 19 + 12 + 11}{12}$$

Step 2: Mean deviation using formula

$$\text{M.D.}(\bar{x}) = \frac{\sum_{i=1}^{12} |x_i - \bar{x}|}{12}$$

$$= \frac{2 + 5 + 3 + 2 + 0 + 1 + 3 + 3 + 0 + 4 + 3 + 4}{12} = \frac{30}{12} = 2.5$$

Find the mean deviation about the median for the following data: (Question 4 to Question 7)
Formula used:

Mean Deviation about the median

$$\text{M.D.}(M) = \frac{\sum_{i=1}^{n} |x_i - M|}{n}$$

Where M= median

Question 4: Find the mean deviation about the median for 12, 5, 14, 6, 11, 13, 17, 8, 10.

Solution:

Step 1: Find the median
Arranging the data into ascending order:

5, 6, 8, 10, 11, 12, 13, 14, 17

Total number of observations = 9, which is odd.

$$\text{Median(M)} = \left(\frac{9+1}{2}\right)^{\text{th}}$$

$$\text{or } 5^{\text{th}} \text{ observation} = 11$$

Step 2: Mean deviation using formula

$$\text{M.D.(M)} = \frac{\sum_{i=1}^{9} |x_i - M|}{9}$$

$$= \frac{6+5+3+1+0+1+2+3+6}{9} = \frac{27}{9} = 3$$

Question 5: Find the mean deviation about the median for 4, 15, 9, 7, 19, 13, 6, 21, 8, 25, 11.

Solution:

Step 1: Find the median
Arranging the data into ascending order:

4, 6, 7, 8, 9, 11, 13, 15, 19, 21, 25

Total number of observations = 11, which is odd.

$$\text{Median(M)} = \left(\frac{11+1}{2}\right)^{\text{th}}$$

$$\text{or } 6^{\text{th}} \text{ observation} = 11$$

Step 2: Mean deviation using formula

$$\text{M.D.(M)} = \frac{\sum_{i=1}^{11} |x_i - M|}{11}$$

$$= \frac{7+5+4+3+2+0+2+4+8+10+14}{11} = \frac{59}{11} = 5.3$$

Question 6: Find the mean deviation about the median for 34, 23, 46, 37, 40, 28, 32, 50, 35, 44.

Solution:

Step 1: Find the median
Arranging the data into ascending order:

23, 28, 32, 34, 35, 37, 40, 44, 46, 50

Total number of observations = 10, which is Even.

$$\text{Median(M)} = \left(\frac{5^{\text{th}} \text{ observation} + 6^{\text{th}} \text{ observation}}{2}\right) = \frac{35+37}{2} = 36$$

Step 2: Mean deviation using formula

$$\text{M.D.(M)} = \frac{\sum_{i=1}^{10} |x_i - M|}{10}$$

$$= \frac{13 + 8 + 4 + 2 + 1 + 1 + 4 + 8 + 10 + 14}{10} = \frac{65}{10} = 6.5$$

Question 7: Find the mean deviation about the median for 70, 34, 42, 78, 65, 45, 54, 48, 67, 50, 56, 63.

Solution:

Step 1: Find the median
Arranging the data into ascending order:

34, 42, 45, 48, 50, 54, 56, 63, 65, 67, 70, 78

Total number of observations = 12, which is Even.

$$\text{Median(M)} = \left(\frac{6^{\text{th}} \text{ observation} + 7^{\text{th}} \text{ observation}}{2}\right) = \frac{54+56}{2} = 55$$

Step 2: Mean deviation using formula

$$M.D.(M) = \frac{\sum_{i=1}^{12} |x_i - M|}{12}$$

$$= \frac{21 + 13 + 10 + 7 + 5 + 1 + 1 + 8 + 10 + 12 + 15 + 23}{12} = \frac{126}{12} = 10.5$$

Find the mean deviation about the mean for the following data: (Question 8 to Question 10)

Question 8: Find the mean deviation about the mean for below data:

x_i	6	12	18	24	30	36
f_i	5	4	11	6	4	6

Solution:

$$\text{Mean} = \bar{x} = \frac{\sum_{i=1}^{6} f_i x_i}{\sum_{i=1}^{6} f_i} = \frac{756}{36} = 21$$

x_i	f_i	$f_i x_i$	$\lvert x_i - \bar{x}\rvert$	$f_i \lvert x_i - \bar{x}\rvert$
6	5	30	15	75
12	4	48	9	36
18	11	198	3	33
24	6	144	3	18
30	4	120	9	36
36	6	216	15	90
	36	756		288

Mean Deviation about the mean

$$\bar{x} = \frac{\sum_{i=1}^{6} f_i \lvert x_i - \bar{x}\rvert}{\sum_{i=1}^{6} f_i} = \frac{288}{36} = 8$$

Question 9: Find the mean deviation about the mean for below data:

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

Solution:

$$\text{Mean} = \bar{x} = \frac{\sum_{i=1}^{6} f_i x_i}{\sum_{i=1}^{6} f_i} = \frac{300}{40} = 7.5$$

x_i	f_i	$f_i x_i$	$\lvert x_i - \bar{x}\rvert$	$f_i \lvert x_i - \bar{x}\rvert$
2	2	4	5.5	11
5	8	40	2.5	20
6	10	60	1.5	15
8	7	56	0.5	3.5
10	8	80	2.5	20
12	5	60	4.5	22.5
	40	300		92

Mean Deviation about the mean

$$\bar{x} = \frac{\sum_{i=1}^{6} f_i \lvert x_i - \bar{x}\rvert}{\sum_{i=1}^{6} f_i} = \frac{92}{40} = 2.3$$

Question 10: Find the mean deviation about the mean for below data:

x_i	3	5	7	9	11	13
f_i	6	8	15	25	8	4

Solution:

Mean $= \bar{x} = \frac{\sum_{i=1}^{6} f_i x_i}{\sum_{i=1}^{6} f_i} = \frac{528}{66} = 8$

x_i	f_i	$f_i x_i$	$\lvert x_i - \bar{x}\rvert$	$f_i \lvert x_i - \bar{x}\rvert$
3	6	18	5	30
5	8	40	3	24
7	15	105	1	15
9	25	225	1	25
11	8	88	3	24
13	4	52	5	20
	66	528		138

Mean Deviation about the mean

$$\bar{x} = \frac{\sum_{i=1}^{6} f_i \lvert x_i - \bar{x}\rvert}{\sum_{i=1}^{6} f_i} = \frac{138}{66} = 2.09$$