RD Sharma Solutions Class 11 Maths Chapter 32 Ex 32.1

Statistics Ex 32.1 Q1(i)

First arrange the given numbers in ascending order

write these numbers in ascending order

3011, 2780, 3020, 2354, 3541, 4150, 5000

we get 2354, 2780, 3011, 3020, 3541, 4150, 5000

Clearly, the middle number is median, 3020

Calculation of Mean Deviations

x_i	$\lvert d_i\rvert = \lvert x_i - 3020\rvert$
3011	9
2780	240
3020	0
2354	666
3541	521
4150	1130
5000	1980
Total	$d_i = \sum\lvert x_i - 3020\rvert = 4546$

$$\text{M.D} = \frac{\sum d_i}{n} = \frac{4546}{7} = 649.428$$

Statistics Ex 32.1 Q1(ii)

Clearly, the middle observations are 46 and 48. So, median = 47

34
38
42
44
46
48
54
55
63
70

We have,

$$\Sigma\lvert x_i - 47\rvert = \Sigma d_i = 86$$

$$\therefore \quad \text{M.D} = \frac{1}{n}\Sigma\lvert d_i\rvert = \frac{1}{10}[86] = 8.6$$

Statistics Ex 32.1 Q1(iii)

Arranging the observations in ascending order of magnitude, we have

30
34
38
40
42
44
50
51
60
66

Clearly, the middle observations are 42 and 44. So, median = 43

We have,

$$\Sigma |x_i - 43| = \Sigma d_i = 87$$

$$\therefore \quad \text{M.D} = \frac{1}{n}\Sigma |d_i| = \frac{1}{10}[87] = 8.7$$

Statistics Ex 32.1 Q1(iv)

Arranging the observations in ascending order of magnitude, we have

22
24
25
27
28
29
30
31
41
42

Clearly, the middle observations are 28 and 29 . So, median=28.5

Calculation of Mean Deviation

X-values	Deviation from Median
22	6.5
24	4.5
30	1.5
27	1.5
29	0.5
31	2.5
25	3.5
28	0.5
41	12.5
42	13.5
Total	47

Clearly, the middle observation is . So, median=47.5

Calculation of Mean Deviation

X-values	Deviation from Median
38	9.5
70	22.5
48	0.5
34	13.5
63	15.5
42	5.5
55	7.5
44	3.5
53	5.5
47	0.5
Total	84

We have,

$$\Sigma |x_i - 47.5| = \Sigma d_i = 84$$

$$\therefore \quad \text{M.D} = \frac{1}{n}\Sigma |d_i| = \frac{1}{10}[84] = 8.4$$

Statistics Ex 32.1 Q2(i)

$$\text{Mean} = \frac{1}{n}\Sigma |x_i| = \frac{80}{8} = 10$$

Calculation of Mean Deviation

X-values	Deviation From Mean
4	6
7	3
8	2
9	1
10	0
12	2
13	3
17	7
Total	24

We have,

$$\Sigma |x_i - 10| = \Sigma d_i = 24$$

$$\therefore \quad \text{M.D} = \frac{1}{n}\Sigma |d_i| = \frac{1}{8}[24] = 3$$

Statistics Ex 32.1 Q2(ii)

$$\text{Mean} = \frac{1}{n}\Sigma|x_i| = \frac{168}{12} = 14$$

Calculation of Mean Deviation

X-values	Deviation From Mean
13	1
17	3
16	2
14	0
11	3
13	1
10	4
16	2
11	3
18	4
12	2
17	3
Total	28

We have,

$$\Sigma|x_i - 14| = \Sigma d_i = 28$$

$$\therefore \quad \text{M.D} = \frac{1}{n}\Sigma|d_i| = \frac{1}{12}[28] = 2.33$$

Statistics Ex 32.1 Q2(iii)

$$\text{Mean} = \frac{1}{n}\Sigma|x_i| = \frac{500}{10} = 50$$

Calculation of Mean Deviation

X-values	Deviation From Mean
38	12
70	20
48	2
40	10
42	8
55	5
63	13
46	4
54	4
44	6
Total	84

We have,

$$\Sigma |x_i - 50| = \Sigma d_i = 84$$

$$\therefore \quad \text{M.D} = \frac{1}{n}\Sigma |d_i| = \frac{1}{10}[84] = 8.4$$

Statistics Ex 32.1 Q2(iv)

$$\text{Mean} = \frac{1}{n}\Sigma |x_i| = \frac{500}{10} = 50$$

Calculation of Mean Deviation

X-values	Deviation From Mean
38	12
70	20
48	2
40	10
42	8
55	5
63	13
46	4
54	4
44	6
Total	84

We have,

$$\Sigma |x_i - 50| = \Sigma d_i = 72$$

$$\therefore \quad \text{M.D} = \frac{1}{n}\Sigma |d_i| = \frac{1}{10}[72] = 7.2$$

Statistics Ex 32.1 Q2(v)

First arrange the given numbers in ascending order

write these numbers in ascending order

57, 64, 43, 67, 49, 59, 44, 47, 61, 59

we get 43, 44, 47, 49, 57, 59, 59, 61, 64, 67

Let X be the mean of given data, we get

$$X=\frac{43+44+47+49+57+59+59+61+64+67}{10}=55$$

Calculation of Mean Deviations from mean

x_i	$\lvert d_i\rvert=\lvert x_i-55\rvert$
43	12
44	11
47	8
49	6
57	2
59	4
59	4
61	6
64	9
67	12
Total	74

$$M.D=\frac{\sum d_i}{n}=\frac{74}{10}=7.4$$

Statistics Ex 32.1 Q3

Arrange the given data for income group I in assending order, middle observation is 4400.

So, median = 4400.

Mean deviation for group I

x_i	$\lvert d_i\rvert=\lvert x_i-4400\rvert$
4000	400
4200	200
4400	0
4600	200
4800	400
Total	$\sum\lvert d_i\rvert=1000$

$$M.D.=\frac{1}{n}\sum\lvert d_i\rvert=\frac{1000}{5}=200$$

Arrange the given data for income group II in assending order, middle observation is 4400.
So, median = 4400.
Mean deviation for group II

x_i	$\|d_i\| = \|x_i - 4400\|$
3800	600
4000	400
4200	200
4400	0
4600	200
4800	400
5800	1400
Total	$\sum\|d_i\| = 3200$

$$\text{M.D.} = \frac{1}{n}\sum|d_i| = \frac{3200}{7} = 457.14$$

Note: Answer given in the book is incorrect.

Statistics Ex 32.1 Q4

First arrange the given numbers in ascending order
write these numbers in ascending order
40.0, 52.3, 55.2, 72.9, 52.8, 79.0, 32.5, 15.2, 27.9, 30.2
we get 15.2, 27.9, 30.2, 32.5, 40.0, 52.3, 52.8, 55.2, 72.9, 79.0

$$\text{Clearly, Median} = \frac{40.0+52.3}{2} = 46.15$$

Let $\overline{X}$ be the mean of given data, we get

$$\overline{X} = \frac{15.2+27.9+30.2+32.5+40.0+52.3+52.8+55.2+72.9+79.0}{10} = 45.8$$

Calculation of Mean Deviations from mean and median

x_i	$\|d_i\| = \|x_i - 46.15\|$	$\|d_i\| = \|x_i - 45.8\|$
40.0	6.15	5.8
52.3	6.15	6.5
55.2	9.05	9.4
72.9	26.75	27.1
52.8	6.65	7
79.0	32.85	33.2
32.5	13.65	13.3
15.2	30.95	30.6
27.9	19.25	17.9
30.2	15.95	15.6
Total	167.4	166.4

$$\text{(i) M.D} = \frac{\sum d_i}{n} = \frac{167.4}{10} = 16.74$$

$$\text{(ii) M.D} = \frac{\sum d_i}{n} = \frac{166.4}{10} = 16.64$$

Statistics Ex 32.1 Q5(i)

Mean $= \frac{1}{n}\Sigma|x_i| = \frac{455}{10} = 45.5$

X-values	Deviation From Mean
34	11.5
66	20.5
30	15.5
38	7.5
44	1.5
50	4.5
40	5.5
60	14.5
42	3.5
51	5.5
Total	90

We have,

$\Sigma|x_i - 45.5| = \Sigma d_i = 90$

$\therefore$ M.D $= \frac{1}{n}\Sigma|d_i| = \frac{1}{10}[90] = 9$

Now,

$\overline{X}$ – M.D = 45.5 – 9 = 36.5

$\overline{X}$ + M.D = 45.5 + 9 = 54.5

$\therefore$ 6 observations lie between $\overline{X}$ – M.D and $\overline{X}$ + M.D.

Statistics Ex 32.1 Q5(ii)

Mean $= \frac{1}{n}\Sigma|x_i| = \frac{299}{10} = 29.9$

X-values	Deviation From Mean
22	7.9
24	5.9
30	0.1
27	2.9
29	0.9
31	1.1
25	4.9
28	1.9
41	11.1
42	12.1
Total	48.8

We have,

$$\Sigma |x_i - 29.9| = \Sigma d_i = 48.8$$

$$\therefore \quad \text{M.D} = \frac{1}{n}\Sigma |d_i| = \frac{1}{10}[48.8] = 4.88$$

Now,

$\overline{X} - \text{M.D} = 29.9 - 4.88 = 25.02$

$\overline{X} + \text{M.D} = 29.9 + 4.88 = 34.78$

$\therefore$ 5 observations lie between $\overline{X} - \text{M.D}$ and $\overline{X} + \text{M.D}$.

Statistics Ex 32.1 Q5(iii)

$$\text{Mean} = \frac{1}{n}\Sigma |x_i| = \frac{494}{10} = 49.4$$

38	11.4
70	20.6
48	1.4
34	15.4
63	13.6
42	7.4
55	5.6
44	5.4
53	3.6
47	2.4
	86.8

We have,

$$\Sigma |x_i - 49.4| = \Sigma d_i = 86.8$$

$$\therefore \quad \text{M.D} = \frac{1}{n}\Sigma |d_i| = \frac{1}{10}[86.8] = 8.68$$

Now,

$\overline{X} - \text{M.D} = 49.4 - 8.68 = 40.72$

$\overline{X} + \text{M.D} = 49.4 + 8.68 = 58.08$

$\therefore$ 6 observations lie between $\overline{X} - \text{M.D}$ and $\overline{X} + \text{M.D}$.

Statistics Ex 32.1 Q6

$$\sigma = \sqrt{\frac{1}{n}\sum\left(x_i - \bar{x}\right)^2}$$

$$\sigma' = \sqrt{\frac{1}{n}\sum x_i^2 - \bar{x}^2}$$

$$\left(x_i - \bar{x}\right)^2 = x_i^2 + \bar{x}^2 - 2x_i\bar{x}$$

$$\sum 2x_i\bar{x} = 2\bar{x}\sum x_i = 2n\bar{x}^2$$

$$\frac{1}{n}\sum\left(x_i - \bar{x}\right)^2 = \frac{\sum\left(x_i^2 + \bar{x}^2 - 2x_i\bar{x}\right)}{n}$$

$$= \frac{\sum x_i^2 + \sum \bar{x}^2 - \sum 2x_i\bar{x}}{n}$$

$$= \frac{1}{n}\sum x_i^2 + \frac{n\bar{x}^2 - 2n\bar{x}^2}{n}$$

$$= \frac{1}{n}\sum x_i^2 - \bar{x}^2$$