CHAPTER – 15

STATISTICS

ONE MARK QUESTIONS

1. **Define Range.**
2. **Find the range of given data**

   108, 107, 105, 106, 107, 104, 103, 101, 104
3. **Find the range of 16,18,18,16,18,20,17,19,16,24**
4. **Find the range of 90,50,72,69,85,100,73,85,93**
5. **Find the range of 25, 37, 11, 20, 14, 18, 16, 30, 35, 17**
6. **Find the range of 17,10,12,8,12,16,19**
7. **Compute the range of the following frequency distribution**

Marks scored out of 10	0	1	2	3	4	5	6	7	8	9	10
No. of students	2	7	10	11	22	28	10	5	3	2	0

8) Find the value of range of frequency distribution

Age in years	14	15	16	17	18	19	20
No. of students	1	2	2	2	6	4	0

9) Find the range of the following distribution

Class Interval	10-20	20-30	30-40	40-50	50-60
Frequency	8	10	15	18	19

10) Find the range of the following data

Profit	0-10	10-20	20-30	30-40	40-50
No. of firms	0	6	0	7	15

11) Calculate the range for the distribution given below

Height in cms	150	151	152	154	159	160	165	166
No. of Boys	2	2	9	15	18	10	4	1

12) Find the mean of the following data

-3, -2,-1,0,1,2,3,4,

13) Find the mean of 4,6,5,9,12,3,1

14) Write the mean of given data

6,7,10,12,13,4,8,12

15) Write the mean of 6,8,10,12,14,16,18,20,22,24

16) Find the mean of the first n natural numbers.

17) Find the median for the following data

4,6,9,4,2,8,10

18) Find the median for the following data

4,6,5,9,12,3,1,10,13

19) Find the median for the series

25,20,23,32,40,27,30,25,20,10,55,41

20) Find the median for the series

5,9,10,12,6,4,2,15

21) Write the formula for mean deviation of the grouped data about mean

22) Two series A and B with equal means have standard deviations 9 and 10 respectively, which series is more consistent.

23) If the coefficient of variation and standard deviation are 60,21 respectively, What is the arithmetic mean of the distribution.

24) If variance = 4Sq.ft. Find S.D

ANSWERS

ONE MARK QUESTIONS

1) Range is the difference between the maximum and the minimum observation of the distribution.

2) Range = 108 – 101 = 7

3) Range = 24 – 16 = 8

4) Range = 100 – 50 = 50

5) Range = 37 - 11 = 26

6) Range = 19 – 8 = 11

7) Range = 10 – 0 = 10

8) Range = 19 – 4 = 5

9) Range = 60 – 10 = 50

10) Range = 50 – 10 = 40

11) Range = 166 – 150 = 16

12) Mean = $\overline{x} = \frac{\sum xi}{N} = \frac{1}{2}$

13) Mean = $\overline{x} = \frac{\sum xi}{N} = \frac{40}{7}$

14) $\overline{x} = 9$

15) $\overline{x} = 15$

16) $\overline{x} = \frac{1}{n} \frac{n(n+1)}{2} = \frac{n+1}{2}$

17) Arrange the values in ascending order

2, 4, 4, 6, 8, 9, 10

Median = 6

18) 1, 3, 4, 5, 6, 9, 10, 12, 13

Median = 6

19) Arrange the values in ascending order

10, 20, 20, 23, 25, 25, 27, 30, 32, 40, 41, 55

Median = $\frac{25+27}{2} = \frac{52}{2} = 26$

20) 2,4,5,6,9,10,12, 15

$$\text{Median} = \frac{\textit{Sum of the middle terms}}{s} = \frac{6+9}{2}$$

$$\frac{15}{2} = 7.5$$

21) M.D($\bar{x}$) = $\frac{\sum fi\,(x_1 - \bar{x})}{N}$

22) B Series

23) C.V = $\frac{\sigma}{\bar{x}} \times 100$

$$\therefore 60 = \frac{12}{\bar{x}} \times 100$$

$$\therefore \bar{x} = 35$$

24) Variance = 4

$$\therefore S.D = \sqrt{4} = 2$$

5 MARKS QUESTIONS

1) Find the mean deviation about the mean for the following data.

Marks Obtained	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of Students	2	3	8	14	8	3	2

2) Find the mean deviation about the mean for the following frequency distribution

Class Interval	0-4	4-8	8-12	12-16	16-20
Frequency	4	6	8	5	2

3) Find the mean deviation about the mean for the data

Income per day	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800
No. of persons	4	8	9	10	7	5	4	3

4) Find the mean deviation about the mean for the data

Height in cms	95-105	105-115	115-125	125-135	135-145	145-155
No. of Boys	9	13	26	30	12	10

5) Find the mean deviation about the mean for the data

Wages (in Rs.)	50	100	150	175	200	225	300
No. of Workers	5	10	15	20	10	5	5

6) Find the mean deviation about the mean for the data

Salesmen	4-8	8-12	12-16	16-20	20-24	24-28	28-32	32-36	36-40
Reports	11	13	16	14	10	9	17	6	4

7) Find the mean deviation about the mean for the data

Marks Scored	0-10	10-20	20-30	30-40	40-50
No. of Students	3	8	12	10	7

8) Find the mean deviation about median for the data

Wages (in Rs.)	0-25	25-50	50-75	75-100	100-125	125-150
No. of Persons	10	30	40	25	20	15

9) Find the mean deviation about median for the data

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of Girls	6	8	14	16	4	2

10) Find the mean deviation about median for the data

Heights (in feet)	10-12	12-14	14-16	16-18	18-20
No. of Trees	2	6	8	3	1

11) Find the mean deviation about median for the Age distribution of 100 persons given below

Age	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55
Number	5	6	12	14	26	12	16	9

12) Find the variance for the following data

x_i	6	10	14	18	24	28	30
f_i	2	4	7	12	8	4	3

13) Find the variance for the following data

x_i	4	8	11	17	20	24	32
f_i	3	5	9	5	4	3	1

14) Find the mean deviation about median for the following frequency distribution

Marks	0-10	10-20	20-30	30-40	40-50
No. of Students	5	8	15	16	6

15) Find the standard deviation (σ) & Coefficient of variance for the following series

4,6,10,12,18

16) Find the mean and variance for the following data

2,4,5,6,8,17

17) Find the mean, variance and standard deviation for the following data.

5,8,12,15,7,9,13,11

18) Find the variance and standard deviation for the following data

x	5	10	15	20	25
f	3	2	5	8	2

19) Find the mean, variance and standard deviation of first

10 multiples of 2

SOLUTIONS

5 MARK QUESTIONS

Solution 1)

Marks Obtained	No. of students	Mid points x_i	$f_i x_i$	$\lvert x_i - \bar{x} \rvert$	$f_i \lvert x_{i-} \bar{x} \rvert$
10-20	2	15	30	30	60
20-30	3	25	75	20	60
30-40	8	35	280	10	80
40-50	14	45	630	0	0
50-60	8	55	440	10	80
60-70	3	65	195	20	60
70-80	2	75	150	30	60
	N= 40		1800		400

Getting Mean = $\bar{x} = \frac{\Sigma f_i x_i}{N} = \frac{1800}{40} = 45$ = 1m

Writing first two columns --- 1m

Next two columns --- 1m

Last two columns --- 1m

M.D ($\bar{x}$) = $\frac{400}{40} = 10$ --- 1m

Solution 2)

Class Interval	Frequency f_i	Mid points x_i	$f_i x_i$	$\lvert x_i - \bar{x} \rvert$	$f_i \lvert x_i - \bar{x} \rvert$
0-4	4	2	8	7.2	28.8
4-8	6	6	36	3.2	19.2
8-12	8	10	80	0.8	6.4
12-16	5	14	70	4.8	24.0
16-20	2	18	36	8.8	17.6
	N= 25		230		96.0

Getting Mean = $\bar{x} = \frac{\Sigma f_i x_i}{N} = \frac{230}{25} = 9.2 - 1m$

Mean Deviation: M.D ($\bar{x}$) = $\frac{96}{25} = 3.84$ --- 1m

Writing first two columns --- 1m

Next two columns --- 1m

Last two columns --- 1m

Solution 3)

Income per day	No. of persons f_i	Mid points x_i	$f_i x_i$	$\lvert x_i - \bar{x} \rvert$	$f_i \lvert x_i - \bar{x} \rvert$
0-100	4	50	200	308	1232
100-200	8	150	1200	208	1664
200-300	9	250	2250	108	972
300-400	10	350	3500	8	80
400-500	7	450	3150	92	644
500-600	5	550	2750	192	960
600-700	4	650	2600	292	1168
700-800	3	750	2250	392	1176
	N=50		17900		7896

Mean = $\frac{17900}{50} = 358$

Writing first two columns --- 1m

Next two columns --- 1m

Last two columns --- 1m

Mean = $\frac{17900}{50} = 358$ --- 1m

Mean Deviation: M.D $(\bar{x}) = \frac{7896}{50} = 157.92$ --- 1m

Solution 4

Height in cms	No. of boys f_i	Mid points x_i	$f_i x_i$	$\lvert x_i - \bar{x} \rvert$	$f_i \lvert x_i - \bar{x} \rvert$
95-105	9	100	900	25.3	227.7
105-115	13	110	1430	15.3	198.9
115-225	26	120	3120	5.3	137.9
125-135	30	130	3900	4.7	141.0
135-145	12	140	1680	14.7	176.4
145-155	10	150	1500	24.7	247.0
	N=100		12530		1128.8

Getting Mean = $\bar{x} = \frac{\Sigma f_i x_i}{N} = 125.3 - 1m$

Writing first two columns --- 1m

Next two columns --- 1m

Last two columns --- 1m

Mean Deviation: M.D $(\bar{x}) = \frac{1128.8}{100} = 11.28$ --- 1m

Solution 5

Wages in Rs. x_i	No. of boys f_i	$f_i x_i$	$\lvert x_i - \bar{x} \rvert$	$f_i \lvert x_i - \bar{x} \rvert$
50	5	250	116	580
100	10	1000	66	660
150	15	2250	16	240
175	20	3500	9	180
200	10	2000	34	340
225	5	1125	59	295
300	5	1500	134	670
	N=70	11625		2965

Getting Mean = $\bar{x} = \frac{11625}{70} = 166 - 1m$

Writing first two columns --- 1m

Next two columns --- 1m

Last two columns --- 1m

Mean Deviation: M.D $(\bar{x}) = 42.35$ --- 1m

Solution 6)

Salesmen	Reports f_i	Mid points x_i	$f_i x_i$	$\lvert x_i - \overline{x} \rvert$	$f_i \lvert x_{i-\overline{x}} \rvert$
4-8	11	6	66	13.92	153.12
8-12	13	10	130	9.92	128.96
12-16	16	14	224	5.92	94.72
16-20	14	18	252	1.92	26.88
20-24	10	22	220	2.08	20.8
24-28	9	26	234	6.08	54.72
28-32	17	30	510	10.08	171.36
32-36	6	34	204	14.08	84.48
36-40	4	38	152	18.08	72.32
	N=100		1992		807.36

Getting Mean = 19.92 --- 1m

Writing first two columns --- 1m

Next two columns --- 1m

Last two columns --- 1m

Mean Deviation: M.D $(\overline{x}) = 8.0736$ --- 1m

Solution 7)

Marks Scored	No. of students f_i	Mid points x_i	$f_i x_i$	$\lvert x_i - \bar{x} \rvert$	$f_i \lvert x_{i-} \bar{x} \rvert$
0-10	3	5	15	22.5	67.5
10-20	8	15	120	12.5	100.0
20-30	12	25	300	2.5	30.0
30-40	10	35	350	7.5	75.0
40-50	7	45	315	17.5	122.5
	N= 40		1100		395.0

Getting Mean = $\bar{x} = \frac{1100}{40} = 2$ --- 1m

Writing two columns --- 1m

Next two columns --- 1m

Last two columns --- 1m

Mean Deviation: M.D $(\bar{x}) = \frac{395}{40} = 9.875$ --- 1m

Solution 8)

Wages in Rs.	No. of Person f_i	Cummulative frequency	Mid points x_i	$\lvert x_i - M \rvert$	$f_i \lvert x_i - M \rvert$
0-25	10	10	12.5	56.25	562.5
25-50	30	40	37.5	31.5	937.5
50-75	40	80	62.5	6.25	250.00
75-100	25	105	87.5	18.75	468.75
100-125	20	125	112.5	43.75	875.00
125-150	15	140	137.5	68.75	1031.25
		N=140			4125.00

(50-75 is the median class)

$$\therefore Median = l + \frac{\frac{n}{2} - c}{f} \times h \quad = 50 + \frac{70 - 40}{40} \times 25$$

$$= 50 + \frac{3}{4} \times 25 = 50 + \frac{75}{4}$$

= 50 + 18.75 = 68.75

Writing first two columns --- 1m

Next two columns --- 1m

Last two columns --- 1m

M= Median = 68.75 --- 1m

Therefore Mean Deviation (M) = 29.46 --- 1m

Solution 9)

Marks Obtained	No. of Girls f_i	Cummulative frequency	Mid points x_i	$\lvert x_i - M \rvert$	$f_i \lvert x_i - M \rvert$
0 - 20	6	6	5	22.85	137.10
10-20	8	14	15	12.85	102.80
20-30	14	28	25	2.85	39.90
30-40	16	44	35	7.15	114.40
40-50	4	48	45	17.15	68.60
50-60	2	50	55	127.15	54.30
	N= 50				517.10

Writing two columns --- 1m

Next two columns --- 1m

Last two columns --- 1m

M= Median = 27.85 --- 1m

$$\therefore \text{M.D (M)} = \frac{1}{n} \Sigma f_i \lvert x_i - M \rvert = \frac{517.10}{50}$$

= 10.34 --- 1m

Solution 10)

Heights (in feet)	No. of trees f_i	Cummulative frequency	Mid points x_i	$\lvert x_i - M \rvert$	$f_i \lvert x_i - M \rvert$
10-12	2	2	11	3.5	7.0
12-14	6	8	13	1.5	9.0
14-16	8	16	15	0.5	4.0
16-18	3	19	17	2.5	7.5
18-20	1	20	19	4.5	4.5
	N= 20				32.0

Writing Median = M = 14.5feet --- 1m

Writing two columns --- 1m

Next two columns --- 1m

Last two columns --- 1m

$$\therefore \textbf{Mean Deviation (M)} = \frac{32}{20} = 1.6 \qquad -1 \text{ mark}$$

Solution 11)

Age	f_i	Cummulative frequency	Mid points x_i	$\lvert x_i - M \rvert$	$f_i \lvert x_i - M \rvert$
15.5-20.5	5	5	18	20	100
20.5-25.5	6	11	23	15	90
25.5-30.5	12	23	28	10	120
30.5-35.5	14	37	33	5	70
35.5-40.5	26	63	38	0	0
40.5-45.5	12	75	43	5	60
45.5-50.5	16	91	48	10	160
50.5-55.5	9	100	53	15	135
	N-100				735

N=100 Therefore class is 35.5 - 40.5

$$\therefore \frac{N}{2} = 50$$

Writing Median M=32 --- 1M

Writing two columns --- 1m

Next two columns --- 1m

Last two columns --- 1m

$$\therefore \text{Mean Deviation (M)} = \frac{735}{100} = 7.35 \quad -1 \text{ mark}$$

Solution 12)

x_i	f_i	$f_i x_i$	$\lvert x_i - \bar{x} \rvert$	$(x_i - \bar{x})^2$	$f_i (x_i - \bar{x})^2$
6	2	12	13	169	338
10	4	40	9	81	324
14	7	98	5	25	175
18	12	216	1	1	12
24	8	192	5	25	200
28	4	112	9	81	324
30	3	90	11	121	363
	40	760			1736

$$\bar{x} = \frac{\Sigma f_i x_i}{N} = \frac{760}{40} = 19 \quad -1m$$

N = 40

Variance $(\sigma^2) = \frac{1}{N} \sum_{i=1}^{7} f_i (x_i - \bar{x})^2 = \frac{1746}{40} = 43.4$ **- 1M**

Writing two columns --- 1m

Next two columns --- 1m

Last two columns --- 1m

Solution 13)

x_i	f_i	$f_i x_i$	$\lvert x_i - \bar{x} \rvert$	$(x_i - \bar{x})^2$	$f_i (x_i - \bar{x})^2$
4	3	12	10	100	300
8	5	40	6	36	180
11	9	99	3	9	81
17	5	85	3	9	45
20	4	80	6	36	144
24	3	72	10	100	300
32	1	32	18	324	324
	30	420			1374

$$\bar{x} = \frac{\Sigma f_i x_i}{N} = \frac{420}{30} = 14 \quad -1m$$

N = 30

Variance $(\sigma^2) = \frac{1}{N} \sum_{i=1}^{7} f_i (x_i - \bar{x})^2 = \frac{1374}{30} = 45.8$ **- 1M**

Writing two columns --- 1m

Next two columns ---- 1m

Last two columns ---- 1m

Solution 14)

Marks	No. of students f_i	Cummulative frequency	Mid points x_i	$\lvert x_i - M \rvert$	$f_i \lvert x_i - M \rvert$
0-10	5	5	5	23	115
10-20	8	13	15	13	104
20-30	15	28	25	3	45
30-40	16	44	35	7	112
40-50	6	50	45	17	102
	N= 50				478

Writing Median = 28 **--- 1m**

Writing two columns --- 1m

Next two columns --- 1m

Last two columns --- 1m

$$\textbf{Mean Deviation (M)} = \frac{478}{50} = 9.56$$

$$\therefore \textbf{Co-efficient of M.D (M)} = \frac{9.56}{28} = 0.3414$$

Solution 15)

x_i	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
4	-6	36
6	-4	16
10	0	0
12	2	4
18	8	64
50		120

Table ---- 1 mark

$$\bar{x} = \frac{\sum x_i}{N} = \frac{50}{5} = 10$$ --- 1mark

$$\text{S.D.} = \sigma = \frac{\sqrt{\sum (x_i - \bar{x})^2}}{N}$$ --- 1 mark

$$= \sqrt{\frac{120}{5}} = \sqrt{24} = 4.879$$ --- 1mark

Co-efficient of variation (C.V) = $\frac{\sigma}{\bar{x}} \times 100 = 48.99$ - 1mark

Solution 16)

x_i	$x_i - \overline{x}$	$(x_i - \overline{x})^2$
2	-5	25
4	-3	9
5	-2	4
6	-1	1
8	1	1
17	10	100
$\sum x_i = 42$		140

Writing 1st Column – 1mark

$$\overline{x} = \frac{\sum x_i}{N} = \frac{42}{6} = 7$$ --- 1mark

$$\text{Variance} = \frac{\sum (x_i - \overline{x})^2}{N} = \frac{140}{6} = 23.33$$ ---- 1 mark

Solution 17)

N=8

$$Mean = \bar{x} = \frac{\sum x_i}{N}$$

$\frac{5+8+12+15+7+9+13+11}{8}$ = 10 = 1mark

$(x_i - \bar{x})$ -5,-2,2,5,-3,-1,3,1, = 1mark

$\therefore \sum(x_i - \bar{x})^2 = 25 + 4 + 4 + 25 + 9 + 1 + 9 + 1 = 78$ - 1 mark

Variance = $\sigma^2 \frac{\sum(x_i - \bar{x})^2}{N} = \frac{78}{8} = 9.75$ ---- 1 mark

$\therefore Standard\ Deviation\ \sigma = \sqrt{Varience}$

$= \sqrt{9.75}$

= 3.12 ------ 1mark

Solution 18)

x_i	f_i	$f_i x_i$	$\lvert x_i - \bar{x} \rvert$	$(x_i - \bar{x})^2$	$f_i (x_i - \bar{x})^2$
5	3	15	11	121	243
10	2	20	6	36	72
15	5	75	1	1	5
20	8	160	4	16	128
25	2	50	9	81	162
	20	320			610

Writing table --- 2m

Mean = $\frac{\Sigma f_i x_i}{N} = \frac{320}{20} = 16 \quad -1m$

Varience = $\sigma^2 = \frac{\sum f_i (x_i - \bar{x})^2}{N}$

$= \frac{610}{20} = 30.5$ **- 1 mark**

Standard deviation (σ) = $\sqrt{variience} = \sqrt{30.5}$

= 5.52 **--- 1mark**

Solution 19

$$First\ 10\ multiples\ of\ 2\ are$$

$$2, 4, 6, 8, 10, 12, 14, 16, 18, 20$$ ---- 1mark

Here N=10

$$\bar{x} = \frac{\sum x_i}{N} = \frac{110}{10} = 11$$ ---- 1mark

Varience = $\sigma^2 = \frac{\sum x^2}{N} - \left(x^2\right)$ ----

1mark

= 33 ---- 1mark

$$\therefore Standard\ Deviation\ \sigma = \sqrt{Varience}$$

$$= \sqrt{33}$$

= 5.744 ------ 1mark