15.. STATISTICS

SYNOPSIS

Measures of dispersion – Range, quartile deviation, mean deviation, standard deviation and variance are different measures of dispersion.

- Range = Maximum value – Minimum value.
- Mean Deviation for ungrouped data

  M.D $(\bar{x})$ = $\sum \frac{|x_i - \bar{x}|}{n}$; M.D (M) = $\sum \frac{|x_i - M|}{n}$
- Mean deviation for grouped data

  M.D $(\bar{x})$ = $\frac{\sum f_i|x_i - \bar{x}|}{N}$; M.D (M) = $\frac{\sum f_i|x_i - M|}{N}$, where $N = \sum f_i$.
- Variance and standard deviation for ungrouped data:

  $\sigma^2 = \frac{1}{n}\sum(x_i - \bar{x})^2$ And $\sigma = \sqrt{\frac{1}{n}\sum(x_i - \bar{x})^2}$
- Variance and standard deviation for a grouped frequency distribution:
- $\sigma^2 = \frac{1}{N}\sum f_i(x_i - \bar{x})^2$, $\sigma = \sqrt{\frac{1}{N}\sum f_i\,(x_i - \bar{x})^2}$
- Variance and standard deviation for a continuous frequency distribution:

  $\sigma^2 = \frac{1}{N}\sum f_i(x_i - \bar{x})^2$, $\sigma = \frac{1}{N}\sqrt{N\sum f_i{x_i}^2 - \left(\sum f_i x_i\right)^2}$
- Shortcut method to find variance and standard deviation

  $\sigma^2 = \frac{h^2}{N^2}\left[N\sum f_i{u_i}^2 - \left(\sum f_i u_i\right)^2\right]$, $\sigma = \frac{h}{N}\sqrt{N\sum f_i{u_i}^2 - \left(\sum f_i u_i\right)^2}$ where $u_i = \frac{x_i - A}{h}$
- Coefficient of variation (C.V) = $\frac{\sigma}{\bar{x}} \times 100$, $\bar{x} \neq 0$

For series with equal means the series with lesser standard deviation is more consistent or less scattered.

SECTION A (1 mark)

Multiple Choice Questions

1. When tested, the lives (in hours) of 5 bulbs were noted as follows 1357,1090,1666,1494,1623. The mean deviation from their mean is _____

a. 178 b. 179 c. 220 d. 356

2. The mean deviation of the data 3,10,10,4,7,10,5 from the mean is _____

a.2 b.2.57 c.3 d.3.75

3. Following are the marks obtained by 9 students in a Mathematics test

50,69,20,33,53,39,40,65,59 the mean deviation about the median is _____

a.9 b. 10.5 c.12.67 d.14.76

4. The standard deviation of the data 6.5.9.13.12.8.10. is _____

a. √**52/7 b. 52/7 c. √6 d. 6**

5. Standard deviation for the first 10 natural numbers is

a. 5.5 b. 3.87 c. 2.97 d. 2.87

6. Consider the numbers 1,2,3,4,5,6,7,8,9,10. If 1 is added to each number, the variance of the numbers so obtained is

a. 6.5 b. 2.87 c. 3.87 d. 8.25

7. The median of 10,14,11,9,8,12,6 is

a. 14 b. 11 c. 10 d. 12

8. In a test, 11 students scored 3,9,5,3,12,10,17,4,7,19,21 marks respectively. The range is _____

a. 21 b. 3 c. 18 d.7

II. FILL IN THE BLANKS

9. The mean deviation about the mean of the following data is 3,6,11,12,18 is _____

10. The mean deviation about the median of the following data 3,6,11,12,18 is _____

11. The variance for the following data 3,6,11,12,18 is _____

12. The coefficient of variation of a distribution is 75 and standard deviation is 27, then the arithmetic mean is _____

13. If the variance of monthly wages paid to workers by two firms A and B are 100 and 81 respectively and if the firms have same average monthly wages, then the _____ firms shows greater wages.

SECTION B (2 marks)

14. Calculate the mean deviation about the mean of first n natural numbers when n is an odd number.

15.. Calculate the possible values of x if standard deviation of the numbers 2, 3, 2x and 11 is 3.5.

16. If for a distribution $\sum(x-5)=3, \sum(x-5)^2=43$ and the total number of items is 18, find the mean and standard deviation.

17. Find the variance for the following data: 57, 64, 43, 67, 59, 44, 47, 61, 59

18. Mean and Standard Deviation of 100 items are 50 and 4 respectively. Find the sum of all the items and the sum of the squares of the items.

SECTION C (4 marks)

19. Find the variance and standard deviation for the following data;

(i)

X_i	10	15	18	20	25
F_i	3	2	5	8	2

(ii)

X_i	3	8	13	18	23
F_i	6	10	14	10	10

20. Find the mean and variance for the following frequency distribution

Class	0-10	10-20	20-30	30-40	40-50
Frequency	2	8	15	16	6

21. Two plants A and B show following results about number of workers and wages paid to them. In which plant A or B is there greater variability in individual wages?

	A	B
Number of workers	5000	6000
Average monthly wages	Rs.2500	Rs.2500
Variance	81	100

22. The means and standard deviations of heights and weights of 50 students are as follows.

	Weights	Heights
Mean	63.2 kg	63.2 inch
Standard deviation	5.6kg	11.5 inch

Which shows more variability heights or weights?

23. The mean and variance of 5 observations are 4.4 and 8.24 respectively. If three of these are 1, 2 and 6, find the other two observations.

24. For a group of 200 candidates, the mean and standard deviation of scores was found to be 40 and 15 respectively. Later it was found that the score of 43 was misread as 34. Find the correct mean and standard deviation.

25. If the standard deviation of the numbers 2, 3, 2x, 11 is 3.5, calculate the possible values of x.

26. The mean of 5 observations is 6 and the standard deviation is 2. If the three observations are 5, 7 and 9, find the other two observations.

27. The frequency distribution, where A is a positive integer, has variance 160. Find A.

X	A	2A	3A	4A	5A	6A
f	2	1	1	1	1	1

28. There are 60 students in a class. The following is the frequency distribution of the marks obtained by the students in a test:

Marks	0	1	2	3	4	5
Frequency	x-2	x	x^2	$(x+1)^2$	2x	x+1

Where x is a positive integer. Determine the mean and the Standard Deviation of the marks

SECTION D (6 marks)

29. Find the mean, variance and standard deviation of the following data:

Class	30-40	40-50	50-6-	60-70	70-8-	80-90	90-100
Frequency	3	7	12	15	8	3	2

Class	25-35	35-45	45-55	55-65	65-75
Frequency	64	132	153	140	51

30. Calculate the standard deviation and mean diameter of the circles whose diameters (in mm) in a design are given below

Diameter(mm)	33-36	37-40	41-44	45-48	49-52
No. of circles	15	17	21	22	25

31. Mean and standard deviation of 100 observations were found to be 40 and 10 respectively. If at the time of calculation two observations were wrongly taken as 30 and 70 in place of 3 and 27 respectively, find the correct standard deviation.

SCORING KEY

Q.No.	Answer
1.	b
2	b
3	c
4	a
5	d
6	a
7	c
8	c
9	4.4
10	4.2
11	26.8
12	36
13	Firm A
14	$\frac{n^2-1}{4n}$
15	3, 7/3
16	Mean = 93/18; Standard deviation = 1.54
17	Variance = 66.2
18	5000; 251600
19	a. 17; 4.12 b. 6.43
20	27; 132
21	B
22	Heights
23	4 and 9

24	40.045; 14.995
25	3 and 7/3
26	3 and 6
27	A = 7
28	X = 4; Mean = 2.8; Var = 1.26
29	a. 62, 201,14.17 b. 49.67, 135.44, 11.64
30	5.55mm; 43.5mm
31	10.249(approx.)