

Measures of Dispersion

- **Range**

The difference between the largest and the smallest value of the given data.

$$\sigma_g^2 = \frac{\sum_{i=1}^n [f_i(x_i - \bar{x})^2]}{N}$$

- **Mean deviation from mean**

$$= \frac{\sum_{i=1}^n (f_i |x_i - \bar{x}|)}{N}$$

Where $N = \sum_{i=1}^n f_i$

And $\bar{x} = \frac{1}{N} \sum_{i=1}^n (f_i x_i)$

- **Mean deviation from median**

$$= \frac{\sum_{i=1}^n f_i |x_i - m|}{N}$$

Where $N = \frac{\sum_{i=1}^n f_i}{N}$

$$M = l + \frac{\frac{N}{2} - C}{f} \times i$$

- **Variance**

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

- **Standard deviation**

$$\sigma = + \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}}$$

- **Variance for grouped data**

Where x_i is the mid value of the class

And $\sigma_x^2 = h^2 \sigma_u^2$,

$$\sigma_u^2 = \frac{1}{N} \sum_{i=1}^k [f_i (u_i - \bar{u})^2]$$

$$N = \sum_{i=1}^k f_i$$

Or $\sigma_u^2 = \frac{\sum_{i=1}^k (f_i u_i^2) - \frac{[\sum_{i=1}^k (f_i u_i)]^2}{N}}{N}$ where

$$N = \sum_{i=1}^k f_i$$

- **Standard deviation for grouped data**

$$\sigma_g = + \sqrt{\sigma_g^2}$$

- If two frequency distributions have same mean, then the distribution with greater Coefficient of variation (C.V) is said to be more variable than the other.

Check your Progress

- Mean of 25 observations was found to be 78.4. But later on it was found that 96 was misread as 69. The correct mean is
(A) 79.24 (B) 79.48
(C) 80.10 (D) None of these
- Mean deviation about mean from the following data :
 x_i : 3 9 17 23 27
 f_i : 8 10 12 9 5
is -
(A) 7.15 (B) 7.09
(C) 8.05 (D) None of these
- Variance of the data given below

size of item	3.5	4.5	5.5	6.5	7.5	8.5	9.5
frequency	3	7	22	60	85	32	8

is -
(A) 1.29 (B) 2.19
(C) 1.32 (D) None of these
- A factory employs 100 workers of whom 60 work in the first shift and 40 work in the second shift. The average wage of all the 100 workers is Rs.38. If the average wage of 60 workers of the first shift is Rs.40, then the average wage of the remaining 40 workers of the second shift is -
(A) 35 (B) 40
(C) 45 (D) None of these
- If the mean of numbers 27, 31, 89, 107, 156 is 82, then the mean of 130, 126, 68, 50, 1 is -
(A) 75 (B) 157
(C) 82 (D) 80
- The scores of a batsman in ten innings are:
38, 70, 48, 34, 42, 55, 63, 46, 54, 44,
then mean deviation about the median is:
(A) 8.4 (B) 8.5
(C) 8.6 (D) 8.8
- If the Standard Deviation of a variate is σ , then the S.D. of $3x + 2$ is:
(A) σ (B) 3σ
(C) $3\sigma + 2$ (D) None of these
- For a frequency distribution, the mean deviation about mean is computed by
(A) M.D. = $\frac{\sum d_i}{\sum f_i}$
(B) M.D. = $\frac{\sum f_i d_i}{\sum f_i}$
(C) M.D. = $\frac{\sum f_i |d_i|}{\sum f_i}$
(D) M.D. = $\frac{\sum f_i}{\sum f_i |d_i|}$
- Which of the following is not a measure of dispersion ?
(A) Mean (B) Variance
(C) Mean deviation (D) Range
- The standard deviation of a variate x is σ . The standard deviation of the variable $\frac{ax+b}{c}$; a, b, c are constants, is -
(A) $\left(\frac{a}{c}\right) \sigma$ (B) $\left|\frac{a}{c}\right| \sigma$
(C) $\left(\frac{a^2}{c^2}\right) \sigma$ (D) None of these

11. The S.D. of 15 items is 6 and if each item is decreased by 1, then standard deviation will be-

- (A) 5 (B) 7
(C) 91/25 (D) 6

12. The S.D of the first n natural numbers is-

- (A) $\frac{n+1}{2}$ (B) $\sqrt{\frac{n(n+1)}{2}}$
(C) $\sqrt{\frac{n^2-1}{12}}$ (D) None of these

Each of the questions given below consists of Statement – I and Statement – II. Use the following Key to choose the appropriate answer.

- (A) If both Statement-I and Statement-II are true, and Statement-II is the correct explanation of Statement-I.
(B) If both Statement-I and Statement-II are true but Statement-II is not the correct explanation of Statement-I.
(C) If Statement-I is true but Statement-II is false.
(D) If Statement-I is false but Statement-II is true.

13. **Statement I :** The median from the following data 45, 25, 50, 60, 70, 80, 92 is 60.

Statement II: Arrange the data either in increasing or decreasing order of magnitude so the middle observation is called medium.

14. **Statement I:** The mean of first n natural numbers is $\frac{n+1}{2}$.

Statement II: If we increase or decrease in every observation by a non zero number then mean will remain same.

15. **Statement I:** The mean of group of 8 observations is 9. Two new observations 10 and 13 are added to the group. So the mean of 10 observations is 9.5

Statement II: It cannot be computed unless all the items are known.

Stretch Yourself

1. Find the Variance of the given data

Size of item	3.5	4.5	5.5	6.5	7.5	8.5	9.5
Frequency	3	7	22	60	85	32	8

2. Determine the median of the items 6, 10, 4, 3, 9, 11, 22, 18
3. Ram spends equal amounts on purchasing three kinds of pens being sold at Rs.5, Rs.10 and Rs.15 per piece. Calculate average cost of each pen.
4. The scores of a batsman in ten innings are:
38, 70, 48, 34, 42, 55, 63, 46, 54, 44, then calculate mean deviation about the median.

Hint to Check Your Progress

1 B 2 B 3 C 4 A 5 A 6 C 7 B 8 C 9 A

10 B 11 D 12 C 13 A 14 C 15 C