



STATISTICS

1.

Measures of Dispersion

The degree to which numerical data tend to spread about an average value is called the dispersion of the data. The four dispersions are: Range, Mean deviation, Standard deviation and Variance.

2.

Variance & standard Deviation of a discrete frequency distribution

Variance of a discrete frequency distribution

$$\text{Var}(\sigma^2) = \frac{1}{N} \sum f_i (x_i - \bar{x})^2$$

Standard Deviation (S.D.) of a discrete frequency distribution

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

where $N = \sum f_i$ and \bar{x} = mean

3.

Variance and Standard Deviation for ungrouped data

Variance of ungrouped data

$$\text{Var}(\sigma^2) = \frac{1}{n} \sum (x_i - \bar{x})^2$$

Standard Deviation (S.D.) for ungrouped data

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

4.

Coefficient of Variation

Coefficient of variation (C.V.)

$$= \frac{\sigma}{\bar{x}} \times 100; \bar{x} \neq 0$$

where \bar{x} is mean

5.

Range

The difference between the highest and the lowest element of a data called its range.

$$\text{range} = x_{\max} - x_{\min}$$

Eg: Find the range of the given data:

4, 7, 8, 9, 10, 12, 13, 17

Here, $x_{\max} = 17$ and $x_{\min} = 4$

$$\text{Range} = 17 - 4 = 13$$

6.

Mean Deviation

1. Mean Deviation (M.D.) for ungrouped data

M.D. about mean i.e., M.D. (\bar{x}) = $\frac{\sum |x_i - \bar{x}|}{n}$, where \bar{x} is mean and n = no. of terms

$$\text{M.D. about median i.e., } M.D.(M) = \frac{\sum |x_j - M|}{n}$$

n = no. of terms

2. Mean Deviation (M.D.) for grouped data

$$\text{M.D. about mean i.e., M.D. } (\bar{x}) = \frac{\sum f_i |x_i - \bar{x}|}{N} \text{ where } N = \sum f_i$$

$$\text{M.D. about median i.e., } M.D.(M) = \frac{1}{N} \sum f_i |x_i - M|$$

7.

Variance & Standard Deviation of a Continuous frequency distribution

Variance of a continuous frequency distribution

$$\text{Var}(\sigma^2) = \frac{1}{N} \sum f_i (x_i - \bar{x})^2$$

Standard deviation of a continuous frequency distribution $S.D(\sigma) = \sqrt{\frac{1}{N} \sum f_i x_i^2 - (\sum f_i x_i)^2}$

8.

Step Deviation or Shortcut Method

$$M.D. (\bar{x}) = \frac{1}{N} \sum f_i |x_i - \bar{x}|$$

$$\sum_{i=1}^n f_i d_i$$

where $\bar{x} = a + \frac{i-1}{N} \times h$

$$\text{and } d_i = \frac{x_i - a}{h}$$

Here, a = assumed mean
 h = common factor

N = sum of frequencies

$$M.D. (M) = \frac{1}{N} \sum f_i |x_i - M|$$

$$\frac{N}{2} - C$$

where, M (median) = $l + \frac{f}{2} \times h$

9.

Shortcut method to find variance and standard deviation

$$\text{Variance } (\sigma^2) = \frac{h^2}{N^2} \left[N \sum f_i y_i^2 - (\sum f_i y_i)^2 \right]$$

$$\text{Standard Deviation } \sigma = \frac{h}{N} \sqrt{N \sum f_i y_i^2 - (\sum f_i y_i)^2}$$

$$\text{where } y_i = \frac{x_i - A}{h}$$

$$N = \sum f_i$$

A = assumed mean

h = width of class interval