(4) The Standard Deviation

The S.D. Concept was introduced by Karl Pearson in 1823. S.D. is also known as root mean square deviation for the reason that it is the square root of the mean of the squar deviation from the arithmetic mean. It measures the absolute dispersion.

Difference b/w M.D and S.D. —

Algebraic signs are ignored while calculating mean deviation whereas in the calculation of standard deviation signs are taken into account.

Mean Deviation can be computed either from median or mean. but S.D is alaways computed from the arithmetic mean because the sum of the squares of the deviation of items from arithmetic mean is the least.

Calculation of S.D - Individual Observations.

$$\boxed{\sigma = \sqrt{\frac{\Sigma x^2}{N}}}$$ where $x = (X - \bar{X})$

When deviation are taken from assumed mean the formula is

$$\sigma = \sqrt{\frac{\Sigma d^2}{N} - \left(\frac{\Sigma d}{N}\right)^2}$$

S.D for Discrete Series -

There are three method -

1. Actual mean Method
2. Assumed mean Method
3. Step deviation Method

(a) Actual mean Method -

$$\sigma = \sqrt{\frac{\Sigma f x^2}{N}}$$ where $x = (X - \bar{X})$

(b) Assumed Mean Method

$$\sigma = \sqrt{\frac{\Sigma f d^2}{N} - \left(\frac{\Sigma f d}{N}\right)^2}$$

where $d = (X - A)$

(c) Step Deviation Method

In this method, the deviation of midpoints from an assumed mean and divide these deviation by the width of class interval, i.e. "i".

$$\sigma = \sqrt{\frac{\Sigma f d^2}{N} - \left(\frac{\Sigma f d}{N}\right)^2} \times i$$

where, $d = \frac{(X - A)}{i}$

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Calculation of S.D – Continuous Series –

Any of the methods for discrete frequency distribution can be used. However in practice it is the step deviation method that is most used.

$$= \sqrt{\frac{\Sigma fd^2}{N} - \left(\frac{\Sigma fd}{N}\right)^2} \times i$$

where $d = \left(\frac{m-A}{i}\right)$, i = class interval