Standard deviation: (S.D)

Standard deviation is the square root of the mean of the squared deviations from their arithmetic mean. So it is also known as root mean square deviation. It is denoted by σ (sigma).

Formula:

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

Coefficient of variation (C.V) $= \frac{\sigma}{\bar{x}} \times 100$

where σ = Standard deviation

$\bar{x}$ = Mean

Deviation from Actual Mean:

This method is used when the value of mean is whole number then

$$\sigma = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n}}$$

Deviation from Assumed Mean:

This method is applied when the mean value is in fractions then

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

where $d = x - A$

$$\bar{x} = A + \frac{\Sigma fd}{N}$$

Problem : 1

Compute the standard deviation and coefficient of variation for the following data.

1, 5, 4, 2, 3, 8, 6, 2, 8

Solution :

x	x^2
1	1
5	25
4	16
2	4
3	9
8	64
6	36
2	4
8	64
$\Sigma x = 39$	$\Sigma x^2 = 223$

$$\bar{x} = \frac{39}{9} = 4.33 \quad , \quad n = 9$$

The standard deviation is,

$$\sigma = \sqrt{\frac{\Sigma x^2}{n} - \left[\frac{\Sigma x}{n}\right]^2}$$

$$= \sqrt{\frac{223}{9} - \left[\frac{39}{9}\right]^2}$$

$$= \sqrt{24.77 - (4.33)^2}$$

$$= \sqrt{24.8 - 18.7489}$$

$$= \sqrt{6.05}$$

$$\sigma = 2.46$$

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

$$= \frac{2.46}{4.33} \times 100$$

$$= 56.81$$

Coefficient of variation = 56.81