Relation between Measures of Dispersion-

In normal distribution there is fixed relationship between the three most commonly used measures of dispersion. The quartile deviation is smallest, the mean deviation next and standard deviation is largest.

$Q.D = \frac{2}{3}\sigma$ or $\sigma = \frac{3}{2}Q.D$ and

$M.D = \frac{4}{5}\sigma$ or $\sigma = \frac{5}{4}M.D.$

$\bar{x} \pm Q.D$ includes 50% of the items

$\bar{x} \pm M.D.$ includes 57.31% of the items

$\bar{x} \pm \sigma$ includes 68.27% or about two third of items.

Coefficient of variation

The S.D. is an absolute measure of dispersion. and coefficient of variation is relative measure of dispersion. This measure is also developed by Karl Pearson. It is used in such problems where to compare the variability of two or more than two series.

According to Karl Pearson the C.V is always in percentage.

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

Variance –

The term variance was used to describe the square of the standard deviation by R.A. Fisher in 1913.

$$\text{variance} = \frac{\Sigma (x - \bar{x})^2}{N}$$

Thus, variance is nothing but the square of the S.D.

$$\text{variance} = \sigma^2$$

$$\sigma = \sqrt{\text{variance}}$$

In a frequency distribution where deviations are taken from assumed mean, then variance is

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

where $d = (x + A)$ and i = class interval