Class 11

Important Formulas

Statistics

1. Dispersion means scatternedness around the central value.
2. Following are the measures of dispersion:
   (i) Range (ii) Quartile diviation (iii) Mean deviation (iv) Standard deviation
3. Range is the difference between the greatest and the least values of the variable.
4. Mean deviation is the arithmetic mean of the absolute values of deviations about some point (mean or median or mode).
   (i) For individual observation, we have

   $$\text{M.D.} = \frac{1}{n}\sum_{i=1}^{n} |x_i - a|, \text{ where } a = \text{mean, median, mode}$$

   $$\text{Also, M.D.} = a + h\left\{\frac{1}{N}\sum_{i=1}^{n} |u_i|\right\}, \text{ where } u_i = \frac{x_i - a}{h}$$

   (ii) For a discrete frequency distribution, we have

   $$\text{M.D.} = \frac{1}{N}\sum_{i=1}^{n} f_i |x_i - a|, \; a = \text{mean, median, mode}$$

   $$\text{M.D.} = a + h\left\{\frac{1}{N}\sum_{i=1}^{n} f_i u_i\right\}, \text{ where } u_i = \frac{x_i - a}{h}$$

5. Standard deviation is the positive square root of variance.
6. Variance is the arithmetic mean of the squares of deviations about mean $\overline{X}$.
   (i) For individual observations, we have

   $$\text{Variance } (X) = \frac{1}{n}\sum_{i=1}^{n} (x_i - \overline{X})^2$$

   $$\text{Also, } \quad \text{Var } (X) = \left(\frac{1}{n}\sum_{i=1}^{n} x_i^{\,2}\right) - \left(\frac{1}{n}\sum_{i=1}^{n} x_i\right)^2$$

   $$\text{and, } \quad \text{Var } (X) = h^2\left\{\left(\frac{1}{n}\sum_{i=1}^{n} u_i^{\,2}\right) - \left(\frac{1}{n}\sum_{i=1}^{n} u_i\right)^2\right\}, \text{ where } u_i = \frac{x_i - a}{h}$$

(ii) For a discrete frequency distribution, we have

$$\text{Var}(X) = \frac{1}{N} \sum_{i=1}^{n} f_i \ (x_i - \bar{X})^2$$

Also, $$\text{Var}(X) = \left(\frac{1}{N} \sum_{i=1}^{n} f_i x_i^{\,2} \right) - \left(\frac{1}{N} \sum_{i=1}^{n} f_i x_i \right)^2$$

and, $$\text{Var}(X) = h^2 \left\{ \left(\frac{1}{N} \sum_{i=1}^{n} f_i u_i^{\,2} \right) - \left(\frac{1}{N} \sum_{i=1}^{n} f_i u_i \right)^2 \right\}$$

7. In order to compare two or more frequency distributions we compare their coefficients of variations. The coefficient of variation is defined as

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

8. The distribution having greater coefficient of variation has more variability around the central value than the distribution having smaller value of the coefficient of variation.