# (Statistics Formula Sheet )

**Frequency Distribution:**

$$\textbf{Total no: of class intervals} = \frac{\textbf{Range}}{\textbf{Width of class intervals}} \qquad \textbf{Range} = \textbf{Max value} - \textbf{Min value}$$

**Measure of Central Tendency:**

$$\textbf{Arithmetic mean} = \bar{x} = \frac{\Sigma x}{n} \ \textbf{(Ungrouped)} \qquad \textbf{Arithmetic mean} = \bar{x} = \frac{\Sigma fx}{\Sigma f} \ (\textbf{Grouped})$$

$$\textbf{Geometric mean} = \textbf{antilog}\left[\frac{\Sigma \log x}{n}\right](\textbf{Ungrouped}) \qquad \textbf{Geometric mean} = \textbf{antilog}\left[\frac{\Sigma f \log x}{\Sigma f}\right](\textbf{Grouped})$$

$$\textbf{Harmonic mean} = \frac{n}{\Sigma\, {}^{1}/_{x}}(\textbf{Ungrouped}) \qquad \textbf{Harmonic mean} = \frac{\Sigma f}{\Sigma f\ {}^{1}/_{x}}(\textbf{Grouped})$$

$$\textbf{Median} = \left(\frac{n+1}{2}\right)^{th}\textbf{value}(\textbf{Ungrouped} \ \& \ \textbf{odd}) \qquad \textbf{Median} = \frac{1}{2}\left[\left(\frac{n}{2}\right)^{th}\textbf{value} + \left(\frac{n+2}{2}\right)^{th}\textbf{value}\right]$$

$$(\textbf{Ungrouped} \ \& \ even)$$

$$\textbf{Median} = l + \frac{h}{f}\left(\frac{\Sigma f}{2} - c.f\right)(\textbf{Grouped}) \qquad \textbf{Mode} = l + h\left(\frac{f_m - f_1}{2f_m - f_1 - f_2}\right) \quad (\textbf{Grouped})$$

$$\textbf{Mode} = 3\,\textbf{median} - 2\,\textbf{mean} \qquad \textbf{Weighted mean} = \bar{x}_w = \frac{\Sigma wx}{\Sigma w}$$

$$\textbf{Weighted geometric mean} = \textbf{antilog}\left[\frac{\Sigma w \log x}{\Sigma w}\right] \qquad \textbf{Weighted harmonic mean} = \frac{\Sigma w}{\Sigma({}^{w}/_{x})}$$

$$\textbf{Quartile} = Q_i = i\left(\frac{n+1}{4}\right)^{th}\textbf{value} \ \textbf{(Ungrouped)} \qquad \textbf{Quartile} = Q_i = l + \frac{h}{f}\left(\frac{i\Sigma f}{4} - c.f\right)\textbf{(Grouped)}$$

$$\textbf{Decile} = D_i = i\left(\frac{n+1}{10}\right)^{th}\textbf{value} \ \textbf{(Ungrouped)} \qquad \textbf{Decile} = D_i = l + \frac{h}{f}\left(\frac{i\Sigma f}{10} - c.f\right) \textbf{(Grouped)}$$

$$\textbf{Percentile} = P_i = i\left(\frac{n+1}{100}\right)^{th}\textbf{value} \ \textbf{(Ungrouped)} \qquad \textbf{Percentile} = P_i = l + \frac{h}{f}\left(\frac{i\Sigma f}{100} - c.f\right) \ \textbf{(Grouped)}$$

$$\textbf{Quartile} = Q_i = i\left(\frac{\Sigma f+1}{4}\right)^{th}\textbf{value}\textbf{(Ungrouped with frequency)}$$

$$\textbf{Decile} = D_i = i\left(\frac{\Sigma f+1}{10}\right)^{th}\textbf{value} \ \textbf{(Ungrouped with frequency)}$$

$$\textbf{Percentile} = P_i = i\left(\frac{\Sigma f+1}{100}\right)^{th}\textbf{value} \qquad \textbf{(Ungrouped with frequency)}$$

$$\textbf{Median} = Q_2 = D_5 = P_{50} \qquad \textbf{Quartile deviation=} \ = \frac{\mathrm{Q3}-\mathrm{Q1}}{2}$$

**Measure of Dispersion:**

$$M.D_{(\bar{x})} = \frac{\Sigma|x-\bar{x}|}{n} \qquad (\textbf{Ungrouped})$$

$$M.D_{(\bar{x})} = \frac{\Sigma f\,|x-\bar{x}|}{\Sigma f} \qquad \textbf{(Grouped \& ungrouped with frequency)}$$

$$M.D_{(\tilde{x})} = \frac{\Sigma|x-\tilde{x}|}{n} \qquad (\textbf{Ungrouped})$$

$$M.D_{(\tilde{x})} = \frac{\Sigma f\,|x-\tilde{x}|}{\Sigma f} \qquad \textbf{(Grouped \& ungrouped with frequency)}$$

$$M.D_{(\hat{x})} = \frac{\Sigma|x-\hat{x}|}{n} \qquad (Ungrouped)$$

$$M.D_{(\hat{x})} = \frac{\Sigma f\,|x-\hat{x}|}{\Sigma f} \qquad \textbf{(Grouped \& ungrouped with frequency)}$$

$$Sample\ variance = s^2 = \frac{\Sigma(x-\bar{x})^2}{n-1} \qquad (Ungrouped)$$

$$Population\ variance = \sigma^2 = \frac{\Sigma(x-\bar{x})^2}{n} \qquad (Ungrouped)$$

**OR**

$$Population\ variance = \sigma^2 = \frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2 \qquad (Ungrouped)$$

$$Population\ variance = \sigma^2 = \frac{\Sigma f\,(x-\bar{x})^2}{\Sigma f} \qquad (Grouped)$$

**OR**

$$Population\ variance = \sigma^2 = \frac{\Sigma f x^2}{\Sigma f} - \left(\frac{\Sigma f x}{\Sigma f}\right)^2 \qquad (Grouped)$$

$$Standard\ deviation = \sigma = \sqrt{\sigma^2} = \sqrt{variance}$$

**Relative Measure of Dispersion:**

$$co\text{–}efficient\ of\ range = \frac{\max\ value - \min value}{\max\ value + \min value} \times 100$$

$$co\text{–}efficient\ of\ M.D_{(\bar{x})} = \frac{M.D_{(\bar{x})}}{\bar{x}} \times 100$$

$$co\text{–}efficient\ of\ M.D_{(\tilde{x})} = \frac{M.D_{(\tilde{x})}}{\tilde{x}} \times 100$$

$$co\text{–}efficient\ of\ M.D_{(\hat{x})} = \frac{M.D_{(\hat{x})}}{\hat{x}} \times 100$$

$$co\text{–}efficient\ of\ variance = \frac{\sigma}{\bar{x}} \times 100$$

$$co\text{–}efficient\ of\ quartile\ deviation = \frac{Q_3 - Q_1}{Q_3 + Q_1} \times 100$$

**Measure of Skewness:**

$$First\ Pearson's\ co\text{–}efficient\ of\ skewness = \frac{mean - mode}{\sigma}$$

$$Second\ Pearson's\ co\text{–}efficient\ of\ skewness = \frac{3(mean - median)}{\sigma}$$

$$Quartile\ co\text{–}efficient\ of\ skewness = \frac{Q_3 + Q_1 - 2Q_2}{Q_3 - Q_1}$$

$$Moment\ co\text{–}efficient\ of\ skewness = \beta_1 = \frac{\mu_3^2}{\mu_2^3}$$

Kurtosis$co\text{–}efficient\ of\ kurtosis = \beta_2 = \frac{\mu_4}{\mu_2^2}$