measures of Central Tendency

Arithmatic mean $= \frac{\Sigma x_i}{N}$

- Direct method: $\bar{x} = \frac{\Sigma f_i x_i}{N}$
- Assumed mean method: $\bar{x} = A + \frac{\Sigma f_i d_i}{N}$, $d_i = x_i - A$
- step deviation method: $\bar{x} = A + \frac{\Sigma f_i u_i}{N} \times H$, $u_i = \frac{x_i - A}{H}$

P.T.R

① if all the observation are same (let say K), ther arithmatic mean = K.

② $\Sigma(x_i - \bar{x}) = 0$

Combined mean

$\Rightarrow x_{12} = \frac{N_1\bar{x_1} + N_2\bar{x_2}}{N_1 + N_2}$

Weighted Arithmatic mean

$\Rightarrow \frac{\Sigma w_i x_i}{\Sigma w_i}$

median

① For odd / even in individual series.

$= \left(\frac{n+1}{2}\right)^{th}$ term

② $m = l + \left(\frac{\frac{n}{2} - c.f}{f}\right) \times H$

$\Rightarrow \frac{n}{2}$ locate in c.f

P.T.R

① $\Sigma |x_i - A|$ is minimum, where A = median } sum of all absolute deviation of all observation is minimum.

② $\Sigma(x_i - A)^2$ is minimum, where A = Arithmatic mean } sum of square of deviation of all observation is minimum.

mode

$m = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times H$

Quartile

① Individual | Discrete

$Q_1 \Rightarrow \left(\frac{N+1}{4}\right)^{th}$

$Q_3 = \left[3\left(\frac{N+1}{4}\right)\right]^{th}$

② Continuous series

$Q_1 = l + \left(\frac{\frac{N}{4} - C.F}{f}\right) \times H$

$Q_3 = l + \left(\frac{\frac{3N}{4} - C.F}{f}\right) \times H$

Percentile

$Q_1 = \left(\frac{N+1}{100}\right)^{th}$

$Q_3 = \left(\frac{3N+1}{100}\right)^{th}$

Decile

$Q_1 = \left(\frac{N+1}{10}\right)^{th}$

$Q_3 = \left(\frac{3N+1}{10}\right)^{th}$

3 median = mode (+) 2 mean

Geometric mean (G.M)

$G.M = (x_1 \times x_2 \times x_3 \ldots x_n)^{\frac{1}{n}}$

$G.M(x,y) = G.M \text{ of } x \times G.M \text{ of } y$

$G.M\left(\frac{x}{y}\right) = \frac{G.M \text{ of } x}{G.M \text{ of } y}$

Harmonic mean (H.M)

$H.M = \frac{N}{\frac{1}{x_1} + \frac{1}{x_2} + \frac{1}{x_3} \ldots}$

$AM \times HM = (G.M)^2$

$H.M = \frac{N}{\Sigma\left(\frac{f_i}{x_i}\right)}$

Combined H.M

$= \frac{N_1 + N_2}{\frac{N_1}{H_1} + \frac{N_2}{H_2}}$

weighted H.M

$\Rightarrow \frac{\Sigma w_i}{\Sigma\left(\frac{w_i}{x_i}\right)}$

Range = L - S

Coefficient of range $= \frac{L-S}{L+S} \times 100$

Quartile Deviation $= \frac{Q_3 - Q_1}{2}$

Inter quartile range $= Q_3 - Q_1$

Semi quartile range $= \frac{Q_3 - Q_1}{2}$

Coefficient of Quartile Range $= \frac{Q_3 - Q_1}{Q_3 + Q_1} \times 100$

Coefficient of Quartile (median) Range $= \frac{Q.D}{\text{median}} \times 100$

S.D of first 'n' natural number

$\Rightarrow \sqrt{\frac{n^2-1}{12}}$

Variance $(\sigma^2) = (S.D)^2 (\sigma)$

$\sqrt{\text{Variance } (\sigma^2)} = S.D (\sigma)$

Mean deviation

$\Rightarrow \frac{\Sigma f_i |x_i - \bar{x}|}{N}$

Median deviation

$= \frac{\Sigma f_i |x_i - M|}{N}$

Coefficient of mean deviation

$\Rightarrow \frac{M.D}{\bar{x}} \times 100$

Coefficient of median deviation

$= \frac{M.D}{M} \times 100$

standard deviation

$S.D (\sigma) = \sqrt{\frac{\Sigma f_i (x_i - \bar{x})^2}{N}}$

$S.D (\sigma) = \sqrt{\frac{\Sigma f_i x_i^2}{\Sigma f_i} - \left(\frac{\Sigma f_i x_i}{N}\right)^2}$

$S.D (\sigma) = \sqrt{\frac{\Sigma f_i d_i^2}{N} - \left(\frac{\Sigma f_i d_i}{N}\right)^2}$

$S.D (\sigma) = \sqrt{\frac{\Sigma f_i u_i^2}{N} - \left(\frac{\Sigma f_i u_i}{N}\right)^2}$

Coefficient of Variation

$CoV \Rightarrow \frac{S.D(\sigma)}{\text{Mean}(\bar{x})} \times 100$

Q.D : M.D : S.D = 10 : 12 : 15

S.D of a & b

$\Rightarrow \frac{|a-b|}{2}$

	change in origin	change of scale
mean	✓	✓
median	✓	✓
mode	✓	✓
Range	✗	✓
Q.D	✗	✓
M.D	✗	✓
S.D	✗	✓