13 STATISTICS

1 VSAQ + 1 LAQ [2M + 8 M = 10 M]

CONCEPTS & FORMULAS

In the lower classes, we learnt that Mean, Median, Mode, G.M and H.M are called Measures of Central Tendency. These measures give a rough idea about where the given data points are centred.

I) Mean($\bar{x}$) and Median (M)

Data type	Mean($\bar{x}$)	Median(M)
a) Ungrouped data	$\bar{x} = \frac{\text{Sum of items}}{\text{No. of items}}$	$M = \left(\frac{n+1}{2}\right)^{th}$ item , for **odd n** M= Average of $\frac{n}{2}, \frac{n+2}{2}$ items, for **even n**
b) Grouped data (Discrete)	$\bar{x} = \frac{\Sigma f_i x_i}{N}$ $N=\Sigma f_i$	M = The x_i whose c.f is equal or just greater than $\frac{N}{2}$; $N=\Sigma f_i$
c) Grouped data (Continuous)	$\bar{x} = \frac{\Sigma f_i x_i}{N}$ $N=\Sigma f_i$ x_i = Midpoints of class intervals	$M = l + \frac{h}{f}\left(\frac{N}{2} - C\right)$ Median class = class of $\frac{N}{2}^{th}$ item l = lower limit of median class h = width of class interval f = frequency of median class. C = cumulative frequency of the class just preceeding the median class

II) Mean from Step deviation Method (Shortcut Method):

$\bar{x} = A + h\left(\frac{\Sigma f_i d_i}{N}\right)$

(or) $\bar{x} = A + h\bar{d}$

where, A = Assumed mean (Generally any of mid values)

h = width of class interval

$d_i = \frac{x_i - A}{h}$

$\bar{d} = \frac{\Sigma f_i d_i}{N}$

Mean Deviation, Variation, Standard Deviation and Coefficient of Variation are called Measures of Dispersion. These measures describe the spread of the individual values around the central value.

III) Mean Deviation(M.D):

Data type	About Mean	About Median
a) Ungrouped data	$M.D(\bar{x}) = \frac{\Sigma \lvert x_i - \bar{x} \rvert}{n}$	$M.D(M) = \frac{\Sigma \lvert x_i - M \rvert}{n}$
b) Grouped data (Discrete)	$M.D(\bar{x}) = \frac{\Sigma f_i \lvert x_i - \bar{x} \rvert}{N}$ $N = \Sigma f_i ; \bar{x} = \frac{\Sigma f_i x_i}{N}$	$M.D(M) = \frac{\Sigma f_i \lvert x_i - M \rvert}{N}$ M= The x_i whose c.f is equal or just greater than $\frac{N}{2}$; $N=\Sigma f_i$
c) Grouped data (Continuous)	$M.D(\bar{x}) = \frac{\Sigma f_i \lvert x_i - \bar{x} \rvert}{N}$ Here $\bar{x}$ is calculated using step deviation method	$M = l + \frac{h}{f}\left(\frac{N}{2} - C\right)$ $M.D(M) = \frac{\Sigma f_i \lvert x_i - M \rvert}{N}$

IV) Variation (σ^2) and Standard Deviation (σ):

Data type	Variation (σ^2)	Standard Deviation(σ)
a) Grouped data (Discrete)	$\sigma^2 = \frac{\Sigma(x_i - \bar{x})^2}{n}$ (or) $\sigma^2 = \frac{\Sigma x_i^2}{n} - \bar{x}^2$	$\sigma = \sqrt{\frac{\Sigma(x_i - \bar{x})^2}{n}}$ $\sigma = \sqrt{\frac{\Sigma x_i^2}{n} - \bar{x}^2}$
b) Grouped data (Continuous)	$\sigma^2 = h^2\left[\frac{\Sigma f_i d_i^2}{N} - \bar{d}^2\right]$ h = Width of the interval $N = \Sigma f_i$ $d_i = \frac{x_i - A}{h}$, A=Assumed mean $\bar{d} = \frac{\Sigma f_i d_i}{N}$	$\sigma = h\sqrt{\left[\frac{\Sigma f_i d_i^2}{N} - \bar{d}^2\right]}$ C = Width of the interval $N = \Sigma f_i$ $d_i = \frac{x_i - A}{h}$, A=Assumed mean $\bar{d} = \frac{\Sigma f_i d_i}{N}$

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