CLASS XI MATHS

STATISTICS

1) Mean($\bar{x}$) Formula:

***Ungrouped Data*: Mean($\bar{x}$)** $= \dfrac{\text{sum of all observations}}{\text{number of observations}}$

Grouped Data:

Discrete frequency distribution: $\bar{x} = \dfrac{\sum_{1}^{n} f_i x_i}{\sum_{1}^{n} f_i}$

Continuous frequency distribution: $\bar{x} = \dfrac{\sum_{1}^{n} f_i x_i}{\sum_{1}^{n} f_i}$ here, x_i **represents class mark (mid-value).**

Step-deviation method for mean

$$\bar{x} = A + \frac{\sum_{1}^{n} f_i d_i}{\sum_{1}^{n} f_i} \times h \quad \text{where } d_i = \frac{x_i - A}{h}$$

2) Median(M) Formula:

***Ungrouped Data*: Median(M) = value of** $\left(\dfrac{n+1}{2}\right)^{th}$ observation, if n is odd.

=mean of the values of $\left(\dfrac{n}{2}\right)^{th}$ and $\left(\dfrac{n+2}{2}\right)^{th}$ observations, if n is even.

Grouped Data

Discrete frequency distribution: Write the cumulative frequency and then find $\dfrac{N}{2}$**.**

Locate the C.F. just greater than $\dfrac{N}{2}$**. The x_i value corresponding to that C.F. is the median.**

Continuous frequency distribution: M = $L + \left(\dfrac{\frac{N}{2} - C}{f}\right) \times h$

L - lower limit of median class
C - c.f. of preceding class
f - frequency of median class
h - class- size
N – total of frequency

3) Mean Deviation(M.D.)

A. *Ungrouped Data*:

M.D.($\bar{x}$) $= \dfrac{1}{n}\sum_{i=1}^{n} |x_i - \bar{x}|$

M.D.(M) $= \dfrac{1}{n}\sum_{i=1}^{n} |x_i - M|$

B. *Grouped Data:*

i. Discrete frequency distribution

M.D.($\bar{x}$) $= \dfrac{\sum_{i=1}^{n} f_i |x_i - \bar{x}|}{\sum_{i=1}^{n} f_i}$ or $\dfrac{1}{N}\sum_{i=1}^{n} f_i |x_i - \bar{x}|$

M.D.(M) $= \dfrac{\sum_{i=1}^{n} f_i |x_i - M|}{\sum_{i=1}^{n} f_i}$ or $\dfrac{1}{N}\sum_{i=1}^{n} f_i |x_i - M|$

ii. Continuous frequency distribution

M.D.($\bar{x}$) $= \dfrac{\sum_{i=1}^{n} f_i|x_i-\bar{x}|}{\sum_{i=1}^{n} f_i}$ *or* $\dfrac{1}{N}\sum_{i=1}^{n} f_i|x_i-\bar{x}|$ **M.D.(M)** $= \dfrac{\sum_{i=1}^{n} f_i|x_i-M|}{\sum_{i=1}^{n} f_i}$ *or* $\dfrac{1}{N}\sum_{i=1}^{n} f_i|x_i-M|$

where x_i is the class mark(mid value of class interval)

1) Variance(σ^2):

i) *Ungrouped Data*: $\sigma^2 = \dfrac{1}{n}\sum_{1}^{n}(x_i-\bar{x})^2$

ii) *Grouped Data:* $\sigma^2 = \dfrac{\sum_{1}^{n} f_i(x_i-\bar{x})^2}{\sum_{1}^{n} f_i}$ OR $\sigma^2 = \dfrac{\sum_{1}^{n} f_i x_i^2}{\sum_{1}^{n} f_i} - \dfrac{\left(\sum_{1}^{n} f_i x_i\right)^2}{\left(\sum_{1}^{n} f_i\right)^2} = \dfrac{1}{N^2}\left[N\sum_{1}^{n} f_i x_i^2 - \left(\sum_{1}^{n} f_i x_i\right)^2\right]$

shortcut method: $\sigma^2 = h^2\left[\dfrac{\sum_{1}^{n} f_i d_i^2}{\sum_{1}^{n} f_i} - \dfrac{\left(\sum_{1}^{n} f_i d_i\right)^2}{\left(\sum_{1}^{n} f_i\right)^2}\right] = \dfrac{h^2}{N^2}\left[N\sum_{1}^{n} f_i d_i^2 - \left(\sum_{1}^{n} f_i d_i\right)^2\right]$

2) Standard Deviation(σ):

S.D. = $\sigma = \sqrt{Variance}$

$$\sigma = \frac{h}{N}\sqrt{N\sum_{1}^{n} f_i d_i^2 - \left(\sum_{1}^{n} f_i d_i\right)^2}$$