- Statistics Formula -

formulaBook Statistics Pranav Sir ♥ se Re #

1.) Frequency Density of a class $= \dfrac{\text{frequency of the class}}{\text{class lenght of class}}$

2.) Relative frequency $= \dfrac{\text{frequency of the class}}{\text{Total frequency of distribution.}}$

3.) Percentage frequency $= \dfrac{\text{frequency of the class}}{\text{Total frequency distribution}} \times 100$

4.) AM of Discrete series :- $\bar{x} = \dfrac{x_1 + x_2 + x_3 + \dots x_n}{n}$ OR $\bar{x} = \dfrac{\Sigma x}{n}$

\+ AM of frequency Distribution $= \bar{x} = \dfrac{\Sigma fx}{n}$

In case of grouped Distribution x = mid value.

5.) AM using Assumed mean / step deviation $= \bar{x} = A + \dfrac{\Sigma fd}{N} \times C$

where A is assumed mean, c is cl.

6.) The algebric sum of deviation of set of observation from this AM is zero

$$\Sigma (x - \bar{x}) = 0$$

7.) Combined mean :- $\bar{x}_c = \dfrac{n_1\bar{x}_1 + n_2\bar{x}_2}{n_1 + n_2}$

Median :-

median is case of discrete observation.

If odd observation → median is middle term

If even observation → median is Average of two middle.

In case of Grouped frequency :- median :-

step ①:- prepare less than type cummulative frequency.

step ②:- Calculate $\frac{N}{2}$ and check b/w which CB it will fall and call it as median.

step ③:- find l_1 (LCB of median class), N_U → cummulative frequency of median class N_L (cumm freq (CF) of pre-median class), c, class length.

① Apply formula :- $Mc = l_1 + \left[\dfrac{\frac{N}{2} - N_1}{N_U - N_L}\right] \times C$

② for a set of observation, the sum of absolute deviation is minimum when deviation taken from the median :- $\Sigma(x - \tilde{x}) = 0$ is minimum

QUARTILE —

→ Descrete series

$Q_1 \to (n+1)\frac{1}{4}$ term $\quad Q_2 \to (n+1)\frac{2}{4} \quad Q_3 \to (n+1)\frac{3}{4}$ term

→ In case of Grouped frequency.

$Q_1 \to l_1 + \left(\dfrac{\frac{N}{4} - N_1}{N_U - N_L}\right) \times C$, $Q_3 \to l_1 + \left[\dfrac{\frac{3N}{4} - N_1}{N_U - N_L}\right] \times C$

DECILE —

→ Discrete series :- $D_1 = (n+1)\frac{1}{10}$ term $\quad D_2 = (n+1)\frac{2}{10}$ term

→ Grouped frequency :-

$D_1 = l_1 + \left(\dfrac{\frac{N}{10} - N_L}{N_U - N_L}\right) \times C$, $D_9 = l_1 + \left[\dfrac{\frac{9N}{10} - N_L}{N_U - N_L}\right] \times C$

PERCENTILE —

$P_1 = (n+1)\frac{1}{100}$ term , $P_{99} = (n+1)\frac{99}{100}$ term.

→ Grouped frequency :-

$P_1 = l_1 + \left(\dfrac{\frac{N}{100} - N_L}{N_U - N_L}\right) \times C$, $P_{99} = l_1 + \left(\dfrac{\frac{99N}{100} - N_L}{N_U - N_L}\right) \times C$

MODE :-

In case of descrete observation :- observation repeating for maximum type no of time OR observation with highest frequency.

NOTE :- there can be multiple mode also. If All observation are same then there is no mode.

MODE :- In case of Grouped frequency :-

find modal class with highest frequency) then apply formula.

$$Mo = l_1 + \left(\frac{f_0 - f_1}{2f_0 - f_{-1} - f_1} \right) \times c$$

where l_1 = LCB of modal class f_0 = frequency of modal class

f_{-1} = frequency of pre-modal class

f_1 = frequency of post modal class.

c = class length of modal class

Relationship between mean, median and mode.

→ In symmetric distribution:- mean = median = mode.

→ In Moderately skewed distribution :- mean - mode = 3(mean - median)

→ Geometric mean :-

In case of discrete partial observation :- $G = (x_1 \times x_2 \times x_3 \times \dots \times x_n)^{1/n}$

In case of grouped frequency :- $G = (x_1^{f_1} \times x_2^{f_2} \times x_3^{f_3} \times \dots x_n^{f_n})^{1/n}$

→ HARMONIC MEAN:-

In case of discrete observation:- $H = \dfrac{n}{\Sigma\left(\frac{1}{x}\right)}$

In case of frequency distribution $H = \dfrac{N}{\Sigma\left(\frac{f}{x}\right)}$

combined HM = $\dfrac{n_1 + n_2}{\frac{n_1}{H_1} + \frac{n_2}{H_2}}$

→ Relationship between AM, GM & HM

situation

situation →	
1) when all observation are same	AM = GM = HM
2) when all observation are different / distinct	AM > GM > HM
3) In General	AM ≥ GM ≥ HM

Range —

In case of discrete series:-

Range = $L - S$ → Smallest series.
↑
Largest series

In case of Grouped series:-

Range = $L - S$

where L = UCB of last class Boundary.

S = LCB of first class Boundary.

cofficient of Range:-

cofficient of Range = $\frac{L-S}{L+S} \times 100$

MEAN DEVIATION:-

In case of Discrete series:- $MD_A = \frac{1}{n} \Sigma |x - A|$

where A is Appropiate Central tendency (as given)

In case of grouped series:- $MD_A = \frac{1}{n} \Sigma f |x - A|$

where A is Appropiate Central tendency

cofficient of mean Deviation:- $\frac{\text{Mean Deviation about } A}{A} \times 100$

STANDARD DEVIATION:-

In case of Discrete observation:-

$\sigma_x = SD_x = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n}}$ OR SHORTER FORMULA $SD_x = \sqrt{\frac{\Sigma x^2}{n} - \bar{x}^2}$ used

In case of grouped observation:-

$SD_x = \sqrt{\frac{\Sigma f x^2}{n} - \bar{x}^2}$

cofficient of variation:- $\frac{SD_x}{\bar{x}} \times 100$

SPECIAL FORMULA:-

If there are only 2 observation, then SD is half of Range

$SD = \frac{|a - b|}{2}$

→ Standard deviation of first n natural numbers :- $s = \sqrt{\frac{n^2-1}{12}}$

Combined SD = $SD_c = \sqrt{\frac{n_1 s_1^2 + n_2 s_2^2 + n_1 d_1^2 + n_2 d_2^2}{n_1 + n_2}}$

where $d_1 = \bar{x}_c - \bar{x}_1$

$d_2 = \bar{x}_c - \bar{x}_2$

→ ~~Imp~~ MCQ

→ If All observation are constant then SD / MD / Range is zero.

change in origin & scale :- No effect on change in origin but affected by change of scale (sign ignored)

(same thing apply for All measures of dispersion)

QUARTILE DEVIATION :-

$QD_x = \frac{Q_3 - Q_1}{2}$

cofficent of quartile deviation :-

cofficent of QD = $\frac{Q_3 - Q_1}{Q_3 + Q_1} \times 100$

Releationship between SD, MD, QD

4 SD = 5 MD = 6 QD or SD : MD : QD = 15 : 12 : 10 ✓