Chapter - 14

Direct Method (without Freq)

① $\bar{x} = \frac{\Sigma x}{n}$

② with freq

$\bar{x} = \frac{\Sigma f x}{\Sigma f}$

MEAN

Median (Positional Avg)

without (f)

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

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

with (f)

$L + \frac{\frac{N}{2} - C_{f}}{f} \times i$ } continuous series

MODE (Maximum times)

Discrete data

x	f
3	6
5	8
9	17
7	17
8	52
10	4
15	8

$8 + 17 + 17$
$= 42$
$17 + 17 + 2$
$= 36$

Group data

$$Z = L + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$

F_0
F_1 — F_2
F_2

Quartile / Decile / Percentile

4 part — 10 parts — 100 parts

(1) Individual Data (without frequency)

$$Md \begin{cases} Q \equiv \\ D \equiv \\ P \end{cases} \quad \text{If 3rd quartile } \star = 3$$

Even / odd

$$\star\,(n+1)\ \text{term}$$

4 (Q) — 10 (D) — 100 (P)

(3) Discrete Data (with Freq)

$$Md \begin{cases} Q \equiv \\ D \equiv \\ P \equiv \end{cases} = \left[\star\,\frac{(N+1)}{\#}\right]$$

Even / odd

N = sum

(4) for Group data (C-I)

$$Md \begin{cases} Q \equiv \\ D \equiv \\ P \equiv \end{cases} L + \frac{\left[\star\,\frac{N}{\#}\right] - C}{f} \times i$$

Q.74 / Pg 141 Avg velocity $\rightarrow \dfrac{f_1 + f_2}{\frac{f_1}{x_1} + \frac{f_2}{x_2}}$

A+Q or $\dfrac{D_1 + D_2}{\left(\frac{D_1}{V_1} + \frac{D_2}{V_2}\right)}$

Note : Combined HM (Pg 142)

$$\frac{n_1 + n_2}{\frac{n_1}{H_1} + \frac{n_2}{H_2}}$$

Note -> Calculation of n^{th} Root by normal / casio cal. (Pg 143)

$(126)^{\frac{1}{3}}$ / $\sqrt[3]{126}$

126 $\sqrt{}$ (12 times) $-1 \div$ 3 $+1$ $\times =$ (12 times)

Combined Mean ->

HM (138)

1, 2, 3 - - - AP

$\frac{1}{1}, \frac{1}{2}, \frac{1}{3}$ - - - HP

Note -> (Pg 139)

$$HM = \frac{n}{\frac{1}{x_1} + \frac{1}{x_2} + \frac{1}{x_3} \cdots \frac{1}{x_n}}$$

Special case => If $n = 2$

$$HM = \frac{2}{\frac{1}{x_1} + \frac{1}{x_2}}$$

$$Hm = \frac{2}{\frac{x_2 + x_1}{x_1 x_2}}$$

$$Hm = \frac{2 x_1 x_2}{x_1 + x_2}$$ } for few cases

Avg. velocity ->

$v_1 \rightarrow 40$ km/ph

$v_2 = 60$ km/h

$$HM = \frac{2ab}{a+b}$$

Avg. velocity ->

$$\frac{2 v_1 v_2}{v_1 + v_2}$$

Data with frequency (140 pg)

$$HM = \frac{N}{\frac{f_1}{x_1} + \frac{f_2}{x_2} + \frac{f_3}{x_3} - - - \frac{f_n}{x_n}}$$

Q.74 / pg 141

Avg velocity $\rightarrow \dfrac{f_1 + f_2}{\dfrac{f_1}{x_1} + \dfrac{f_2}{x_2}}$

A.T.Q

or, $\dfrac{D_1 + D_2}{\left(\dfrac{D_1}{V_1} + \dfrac{D_2}{V_2}\right)}$

Note : Combined HM (pg 142)

$$\frac{n_1 + n_2}{\dfrac{n_1}{H_1} + \dfrac{n_2}{H_2}}$$

Note -> Calculation of n^{th} Root by normal / casio cal:

pg 143

$\sqrt[3]{116}$ / $\sqrt[3]{116}$

116 $\sqrt{}$ (12 times) $- 1 \div 3 + 1 \times =$ (12 times)

Harmonic Mean - 1

Note Calculation of log & antilog by normal calculator

log (100) =>

100 √ — 1 X 227695 =

↓

19 times

Ans = 2

• log(2) = 0.3010

log(3) = 0.4771

↑ Antilog

Note ⇒ Antilog → (2) = 100

2 ÷ 227695 + 1 x = (19 times)

Antilog (3) = 1000

3 ÷ 227695 + 1 x = (19 times)

logs & Antilogs FTW

Q.68] & Q.69] (Discrete series)

x	f	log x	f × log x
12	5	1.07	5.35
13	4	1.11	4.44
14	4	1.14	4.56
15	3	1.17	3.51
16	2	1.20	2.4
17	1	1.23	1.23
	19		21.49
			Σf log x

Q.69 (Mid point (x) ka log nikalo fir X with f ~~log~~ f. log x

$\frac{21.49}{19} = 1.13$

Antilog

$= 13.48$

GM = Antilog

Mean, Median, Mo Relation

① GM (geo. mean) = $\text{Antilog}\left[\frac{\Sigma \log x}{n}\right]$ (Individual) Pg(147)

② GM $\Rightarrow \left[\frac{\Sigma f \log x}{\Sigma f}\right]$ (~~geo~~ Discrete data)

Relation bet^n Mean, Medi, Mod

$\bar{x}$, Md, Z

$\bar{x} - Z = 3(\bar{x} - Md)$

AM > GM > HM (For 2 distinct no.)

AM ≥ GM ≥ HM (For the 2 num.)

$G = \sqrt{A \times H}$

" The geometric mean between the 2 num (s) is equal to the geometric mean of their arithmatic mean & Harmonic Mean "

Mean Deviation

- Mean deviation about mean → $MD_{\bar{x}}$ → $COMD_{\bar{x}}$
- Mean Deviation about median → Md_{md} → $COMD_{md}$
- Mean Deviation about MODE → Md_z → $COMd_z$

NOTE →

① Individual Data $MD_{\bigstar} = \frac{\Sigma |x - \bigstar|}{n}$ ($\bigstar$ = $\bar{x}$, md, z)

② Discrete Data $MD_{\bigstar} = \frac{\Sigma f |x - \bigstar|}{n}$ ($\bigstar$ = $\bar{x}$, md, z)

③ $COMD_{\bigstar} = \frac{MD_{\bigstar}}{\bigstar} \times 100\%$ ($\bigstar$ = $\bar{x}$, Md, z)

Standard Deviation:

"σ"

(1) $\sigma = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n}}$

(2) $\sigma = \sqrt{\frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2}$

(3) $\sigma = \sqrt{\frac{\Sigma f (x - \bar{x})^2}{\Sigma f}}$

(4) $\sigma = \sqrt{\frac{\Sigma f_i x^2}{N} - \left(\frac{\Sigma f_i x}{N}\right)^2}$

Coefficient of SD
or
Coefficient of Variation
$= \frac{\sigma}{\bar{x}} \times 100\%$

Variation $= \sigma^2$

Combined Standard Deviation

$$\sigma = \sqrt{\frac{n_1 \sigma_1^2 + n_2 \sigma_2^2 + n_1 d_1^2 + n_2 d_2^2}{n_1 + n_2}}$$

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

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

where $\bar{x} = \frac{n_1 \bar{x}_1 + n_2 \bar{x}_2}{n_1 + n_2}$

$AM \geq GM \geq HM$

for Ay 2 num.

$AM > GM > HM$

for 2 distinct num.

$G = \sqrt{A \times H}$