

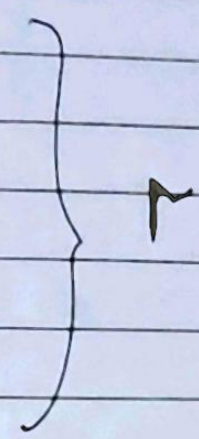
# Chapter - 14

Direct Method (without freq)

$$\textcircled{1} \quad \bar{x} = \frac{\sum x_i}{n}$$

$\textcircled{2}$  with freq

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$$



↑  
**MEAN**

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Median  
(Positional  
Avg)  
↓

without (f)

$$\text{I} > \text{Md} = \left( \frac{n+1}{2} \right)^{\text{th}} \text{ } \left. \begin{array}{l} \text{odd} \end{array} \right\}$$

$$\text{II} > \text{Md} = \frac{\left( \frac{n}{2} \right)^{\text{th}} + \left( \frac{n}{2} + 1 \right)^{\text{th}}}{2} \left. \begin{array}{l} \text{even} \end{array} \right\}$$

with (f)

$$L + \frac{\frac{N}{2} - C_m}{f} \times i \left. \begin{array}{l} \text{contin} \\ \text{ually} \\ \text{series} \end{array} \right\}$$



# MODE (Maximum times)

## Discrete data

16 f

3 6

5 8

9 17

7 17

8 52

10 4

15 8

$$8 + 17 + 17$$

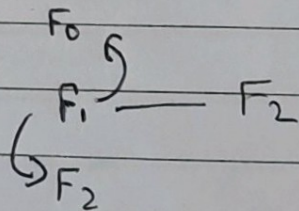
$$= 42$$

$$17 + 17 + 2$$

$$= 36$$

## Group data

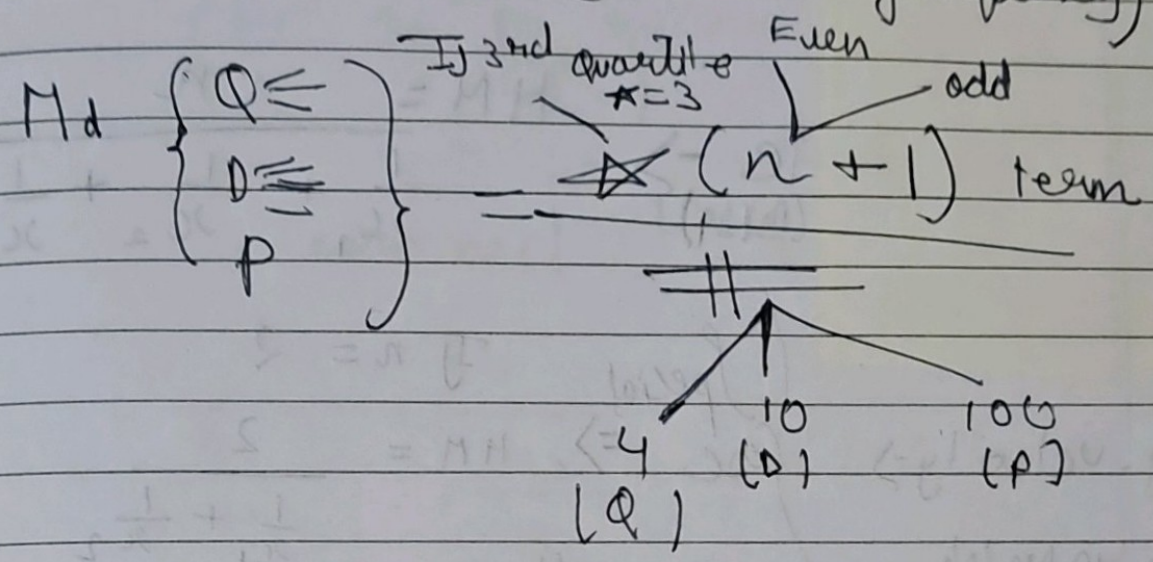
$$Z = L + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$



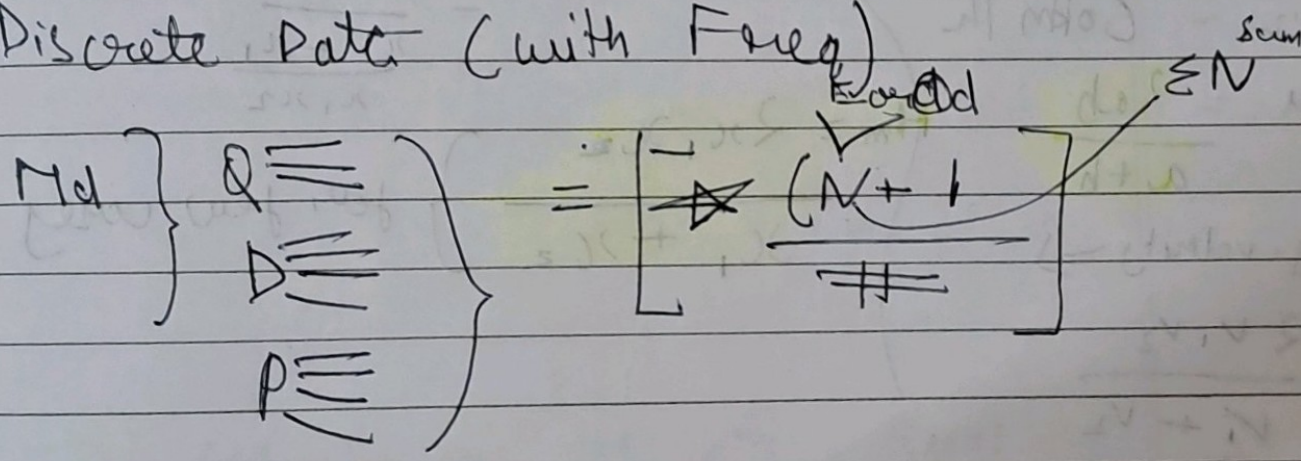


Quartile / Decile / Percentile  
 4 part / 10 parts / 100 parts

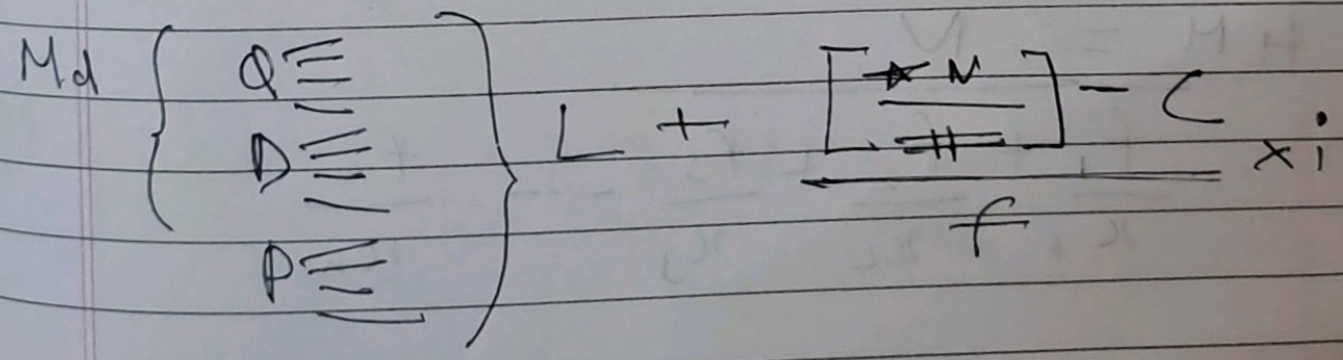
① Individual Data (without frequency)



③ Discrete Data (with Freq)



④ for Group data (C-I)





Q.74  
Pg 141

Aug velocity  $\rightarrow \frac{f_1 + f_2}{\frac{f_1}{x_1} + \frac{f_2}{x_2}}$

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

Note : Combined HM (Pg 142)

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

Note  $\rightarrow$  Calculation of  $n^{\text{th}}$  Root by normal / common cal.

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

$126 \sqrt{\quad} - 1 \div 3 + 1 \quad x =$

$\downarrow$   
12 times

$\underbrace{\quad}_{12 \text{ times}}$



combined Mean ->

### HM (138)

1	2	3	...	AP
$\frac{1}{1}$	$\frac{1}{2}$	$\frac{1}{3}$	...	HP

Note ->  
(Pg 139)

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

Aug. velocity ->

$v_1 \rightarrow 40 \text{ km/ph}$   
 $v_2 = 60 \text{ km/h}$

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

Aug. velocity ->

$$\frac{2v_1v_2}{v_1 + v_2}$$

Special Case  $\Rightarrow$   $n = 2$   
 $HM = 2$

$$HM = \frac{2}{\frac{1}{x_1} + \frac{1}{x_2}} = \frac{2x_1x_2}{x_1 + x_2}$$

$$HM = \frac{2x_1x_2}{x_1 + x_2}$$

for few cases

### Data with frequency (140 pg)

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



Q.74  
Pg 141

Aug velocity  $\rightarrow \frac{f_1 + f_2}{\frac{f_1}{x_1} + \frac{f_2}{x_2}}$

or  $\frac{A+B}{\frac{D_1}{v_1} + \frac{D_2}{v_2}}$

Note : Combined HM (Pg 142)

$$\frac{h_1 + h_2}{\frac{h_1}{H_1} + \frac{h_2}{H_2}}$$

Note  $\rightarrow$  Calculation of  $n^{\text{th}}$  Root by normal / common cal:

$\sqrt[3]{116}$

$\sqrt[3]{116} = 1 \div 3 + 1 \times =$

IR time IR times



Note Calculation of log & antilog by normal calculator

$$\log(100) \Rightarrow$$

$$100 \sqrt{\quad}$$

19 times

$$- 1 \times 227695 =$$

$$\text{Ans} = 2$$

$$\log(2) = 0.3010$$

$$\log(3) = 0.4771$$

Antilog

Note  $\rightarrow$  Antilog  $\rightarrow (2) = 100$

$$2 \div 227695 + 1 \times =$$

19 times

# Antilog (3) = 1000

$$3 \div 227695 + 1 \times =$$

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
	<u>19</u>		<u>21.49</u>

Q.69 (Midpoint method)  
Kalog nikako  
jim X with f  
log = f . log X

GM = Antilog  
Mean, Median, Mode  
relation

Antilog  
 $\frac{21.49}{19} = 1.13$   
 $= 13.48$

①  $GM$  (geo. mean) = Antilog  $\left[ \frac{\sum f \log X}{n} \right]$  (Individual)

②  $GM = \sqrt[n]{\frac{\sum f \cdot X}{\sum f}}$  (Discrete data)

Relation bet<sup>n</sup> Mean, Median, Mode  
 $\bar{X}$ , Md, Z

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

#  $AM > GM > HM$  / #  $AM \geq GM \geq HM$   
 For 2 distinct no. / For the 2 num.

#  $GM = \sqrt{A \times H}$

"The geometric mean between the 2 num(s) is equal to the geometric mean of their arithmetic 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

$$MD_{\bar{x}} = \frac{\sum (x_i - \bar{x})}{n}$$

② Discrete Data

$$MD_{\bar{x}} = \frac{\sum f |x_i - \bar{x}|}{n}$$

③ COMD

$$MD_{\bar{x}} \times 100\%$$



## Standard Deviation:

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

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

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

$$(4) \sigma = \sqrt{\frac{\sum fx^2}{N} - \left(\frac{\sum fx}{N}\right)^2}$$

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



$$\underline{\underline{AM}} \geq \underline{\underline{GM}} \geq \underline{\underline{HM}}$$

for any 2 num.

$$AM > GM > HM$$

for 2 distinct num.

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