

* H.W. Sums / Assg 1. / Lec 1

comit & bdpicu e; scwos oni roitordimoxg tonit o+i (e)

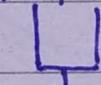
① Find Mean, Median & Mode of 5, 7, 4, 5, 6, 4, 7, 6

18.8.08 to 28.8.08 sum 28 to 28.8.08 to 28.8.08

$$A) \text{ Mean} = \frac{5+7+4+5+6+4}{6} = \frac{31}{6} = 5.1667 \text{ approx. } \underline{\text{Mean}} = 5.1667$$

$$\text{Median: } 0.81 + 0.87 + 0.8 = (0.81 + (0.87) + (0.8)) = \frac{2.54}{3} = 0.847$$

Sort $\rightarrow 4, 4, 5, 5, 6, 7$



$$\frac{5+5}{2} = \frac{10}{2} = 5$$

$$\therefore \underline{\text{Median}} = 5$$

Mode =

$$\text{Mean} - \text{mode} = 3(\text{mean} - \text{median}) \quad \text{comit } 8 \leftarrow F$$

$$\therefore \text{Mean} - 3(\text{mean} - \text{median}) = \text{mode} \quad \text{comit } 7 \leftarrow E$$

O.R.

numbers with highest frequency i.e. 5, 4, 7, 6

smif 8 $\leftarrow 11$

$$\therefore \underline{\text{Mode}} = 5, 4, 7, 6$$

(2) Data 4, 7, 9, 2 have frequency 3, 2, 4 & 1 find A.M.

$$A.M. = \frac{4(3) + 7(2) + 9(4) + 2(1)}{3+2+4+1} = \frac{12+14+36+2}{10} = \frac{64}{10} = 6.4$$

$$\therefore \underline{\underline{A.M. = 6.4}}$$

(3) If a final examination in a course is weighed 2 times as much as a quiz and a student has a final examination grade of 85 and quiz grades of 60 & 80.

$$Find \text{ mean grade. } \bar{x} = \frac{1(85) + 2(60) + 2(80)}{3+2+2} = \frac{130}{7} = 18.5$$

$$A.M. = \bar{x} = \frac{1(60) + 1(80) + 2(65)}{1+1+2} = \frac{60+80+130}{4} = \frac{270}{4} = 67.5$$

$$\therefore \underline{\underline{\bar{x} = 67.5}}$$

(4) 7, 9, 10, 13, 11, 7, 9, 19, 12, 11, 9, 7, 9, 10, 11, find Mode.

7 → 3 times

9 → 4 times

10 → 2 times

13 → 1 time

11 → 3 time

12, 19, → 1 time

$$\therefore \underline{\underline{\text{Mode} = 9}}$$

(5) 7 weeks: 62, 18, 39, 13, 16, 37, 25

$$\therefore \text{Mean} = \frac{62+18+39+13+16+37+25}{7} = 27.143 \approx 30$$

$$\therefore \underline{\text{Mean}} = 27.143 \approx 30$$

(6) 35, 49, 225, 50, 30, 65, 40, 55, 52, 76, 48, 325, 47, 32, 60.

A):

$$\text{Mean} = \frac{\sum \text{Data}}{\text{No. of Data}} = \frac{1189}{15} = 79.2667.$$

Median =

30 32 35 40 47 48 49 (50)

52 55 60 65 76 225 325

$\therefore \text{Median} = 50$

$$\text{Mode} = 3\text{Median} - 2\text{Mean}$$

$$= 3(50) - 2(79.2667)$$

$$\therefore \text{Mode} = 150 - 158.5334.$$

$$\therefore \underline{\text{Mode}} = -8.5334. \text{ NO Mode Possible.}$$

07) $20 \rightarrow 4$

$40 \rightarrow 5$

$30 \rightarrow 6$

$10 \rightarrow 7$

$$\therefore \text{Mean} = \frac{20(4) + 40(5) + 30(6) + 10(7)}{4+5+6+7} =$$

$$\frac{80 + 200 + 180 + 70}{22} = \frac{530}{22} = 24.1.$$

$$\therefore \underline{\text{A.M.}} = 24.1$$

08) $4 \rightarrow 20$ $\therefore \text{Mean} = \frac{4(20) + 5(40) + 6(30) + 7(10)}{20+40+30+10} = \frac{530}{100} = 5.3$

$5 \rightarrow 40$

$6 \rightarrow 30$

$7 \rightarrow 10$

$$\therefore \underline{\text{A.M.}} = 5.3$$

Sudesh-3067 Assg 1 Lect 1

Q) Calculate Q₁, Q₃, D₂, P₅ and P₉₀ for following Data:

Marks	No. of Stu.	C. F. / PI	
0-10	8	8	01-0
10-20	10	18	02-01
20-30	22	40	04-08
30-40	25	65	02-02
		75	001

$$Q_1 \text{ } N/4: 75/4 = 18.75 \rightarrow (10-20)$$

$$\therefore \text{Median} = Q_1 = L + \left[\frac{N/4 - 2f_L}{f_m} \right] C$$

$$Q_1 = 10 + \left[\frac{18.75 - 8}{18} \right] 10$$

$$= 10 + \left[\frac{10.75}{18} \right] 10$$

$$= 10 + 10.75$$

18

$$= 10 + 5.97222$$

$$Q_1 = 15.97222$$

$$Q_3 \text{ } 3N/4: 3(75)/4 = 56.25 \text{ } (30-40)$$

$$Q_3 = 30 + \left[\frac{56.25 - 66}{65} \right] 10$$

$$= 30 + \left[\frac{-9.75}{65} \right] 10$$

$$= 30 + \left[\frac{-97.5}{65} \right]$$

$$= 30 - \frac{97.5}{65}$$

$$Q_3 = 30 - 1.5 = 28.5$$

$$D_2 > 2N/10 : \frac{2(75)}{10} = \frac{150}{10} = 15 \quad (10-20)$$

$$\begin{aligned}\text{Median} &= D_2 > = 10 + \left[\frac{15 - 8}{18} \right] 10 \\ &= 10 + \frac{70}{18} \\ &= 10 + 3.888\end{aligned}$$

$$D_2 = 13.888$$

$$P_5 > \frac{5(75)}{100} = 3.75 \quad (0-10)$$

$$\begin{aligned}\text{Median} : P_5 &> = 0 + \left[\frac{3.75 - 0}{8} \right] 10 \\ &= \frac{37.5}{8}\end{aligned}$$

$$P_5 = 4.6875.$$

$$P_{90} > \frac{90(75)}{100} = \frac{6750}{100} = 67.5 \quad (30-40)$$

$$\begin{aligned}\text{Median} : P_{90} &> = 30 + \left[\frac{67.5 - 66}{65} \right] 10 \\ &= 30 + \frac{15}{65} \\ &= 30 + 0.230769\end{aligned}$$

$$P_{90} = 30.230769$$

Lecture Assignment - 24/11/21. (Assg 2)

Marks	Frequency
20-30	15
30-40	22
40-50	8
50-60	5

$$N = 15 + 22 + 8 + 5 = 50$$

$$A - I = b$$

f -

a -

b -

A) Marks	Frequency	x	d = x - A	fd	$\sum fd$
20-30	15	25	-10	-150	$\sum fd = -150 + 180$
30-40	22	35	0	0	$\sum fd = 30$
40-50	8	45	10	80	
50-60	5	55	20	100	

Use the frequency distribution of Marks in table A to find mean marks of 50 students.

$$A = 35$$

$$\therefore \text{Mean} = A + \frac{\sum fd}{N}$$

$$= 35 + \frac{30}{50}$$

$$= 35 + \frac{3}{5}$$

$$\therefore \text{Mean} = 35.6$$

E.S. E 8 Sudesh - 3067

(S. p. 2) . 15. MPS - Triangular soft 9/17/23

2. Find arithmetic mean of numbers 3, 5, 6, 8, 12, 14
choosing A as (1) 10 and (2) 8.

Expt M.

Date - 08

$$A) = A.M. \text{ for } A = 10$$

	$d = x - A$
3	-7
5	-5
6	-4
8	-2
12	2
14	4
Σ	-12

$$A.M. \text{ for } A = 8$$

	$d = x - A$
3	-5
5	-3
6	-2
8	0
12	4
14	6
Σ	0

$$\therefore AM = \frac{A + \sum d}{N}$$

from to modify $\therefore AM = \frac{A + \sum d}{N}$

$$= 10 + \frac{(-12)}{6}$$

$$= 8 + \frac{0}{6}$$

$$= 8$$

$$\therefore AM = 10 - 2$$

$$\therefore \underline{\underline{AM}} = 8$$

$$\therefore \underline{\underline{AM}} = 8 + A = 8 + 2 = 10$$

3. Find the Geometric Mean and Arithmetic mean of the numbers 3, 5, 6, 6, 7, 10, 12.

$$A) = A.M. = \frac{3+5+6+6+7+10+12}{7} = \frac{49}{7} = 7 \quad \therefore \underline{\underline{AM}} = 7$$

$$GM = \sqrt[N]{\prod x_i} = \sqrt[7]{\frac{1}{3} \cdot \frac{1}{5} \cdot \frac{1}{6} \cdot \frac{1}{6} \cdot \frac{1}{7} \cdot \frac{1}{10} \cdot \frac{1}{12}} = \frac{5}{0.9666663} = 5.172415$$

$$\therefore \underline{\underline{GM}} = 5.172415$$

4. Harmonic Mean of: 3, 5, 4, 10, 12; according to formula

$$A) H.M. = \frac{N}{\sum \frac{1}{x}} = \frac{5}{\frac{1}{3} + \frac{1}{5} + \frac{1}{4} + \frac{1}{10} + \frac{1}{12}} = \frac{5}{0.3334 + 0.2 + 0.25 + 0.1 + 0.0833} = 5.172415$$

$$\therefore H.M. = 5.172415$$

3. Find Geometric Mean: 3, 5, 6, 6, 7, 10, 12.

$$G.M. = \sqrt[n]{x_1 \times x_2 \times \dots \times x_n} = \sqrt[7]{3 \times 5 \times 6 \times 6 \times 7 \times 10 \times 12} = 6.42770216$$

5. Find Mean using Shortcut Method.

Class	freq.	m	d = m - a	fd
100-120	10	110	-60	-600
120-140	8	130	-40	-320
140-160	4	150	-20	-80
160-180	3	170	0	0
180-200	1	190	20	20
200-220	2	210	40	40
220-240		230	60	120
	$\Sigma f = 32$		$\Sigma d = 0$	$\Sigma fd = -780$

$$x = A + \frac{\Sigma fd}{N} = 170 + \frac{-780}{32} = 170 - 24.375 = 145.625$$

$$\therefore x = 145.625$$

Sudesh - 3067

- 6) Mean of 25 observations were 78.4. But later on it was found it had 96 misread as 69. Find corrected mean.

$$10.0 + 7.0 + 22.0 + 8.0 + \dots = 466.0 \quad 1 + 1 + 1 + 1 + 1 = 5 \text{ units}$$

A) =

$$\text{Mean is given by : } \bar{x} = \frac{\sum x}{n} \text{ or } \sum x = n\bar{x} = 25 \times 78.4 = 1960$$

$$\bar{x} = 78.4, n = 25 \text{ (1, 7, 2, 2, 8, 10, 9, 7, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1)}$$

$$\sum x = 25 \times 78.4 = 1960$$

$\sum x$ is incorrect as 96 was 69.

$$\sum x = 1960 - 69 + 96 = 1987$$

$$\text{Mean} = 1987 / 25 = 79.48$$

$$\therefore \text{Mean} = 79.48$$

- 7) The mean height of 15 students is 154 cm. It is discovered later on that while calculating mean, reading 175 was wrongly read as 145. Find correct mean.

A) = Total Height of 15 students =

$$\sum x = 15 \times 154 = 2310 \text{ cm}$$

$$175 - 145 = 30 \quad 30 = 2 \times 15$$

As 175 cm was read as 145

$$\therefore \text{Correct} = 2310 - 145 + 175 = \frac{2340}{15} \text{ cm.} \quad b+3+a=10$$

(8) Four group students consisting of 15, 20, 10 & 18 individuals, reported mean weight of 162, 148, 153 & 140 pounds. Find mean weight.

$$\bar{x} = \frac{f_1m_1 + f_2m_2 + f_3m_3 + \dots + f_km_k}{f_1 + f_2 + \dots + f_m}$$

$$= \frac{15(162) + 20(148) + 10(153) + 18(140)}{15 + 20 + 10 + 18}$$

$$= \frac{2430 + 3960 + 1530 + 2520}{53} = 150.16$$

(9) Find Median income from table showing income distribution of persons in particular region.

Income	No.	Cumulative f	Median = L + $\left(\frac{n - cf}{f} \right)$
0 - 10	2	2	
10 - 20	3	5	
20 - 30	4	9	Value of $\frac{n}{2} \rightarrow$ class
30 - 40	3	12	
40 - 50	2	14	i.e. 15.6 = 7 th observation
50 - 60	1	15	
60 - 70	0.5	15.5	\therefore 20 - 30 + class
70 & over	0.1	15.6	
		N = 15.6	\therefore Median is in 20 - 30

$$\therefore L = 20, n = 15.6, cf = 2 + 3 = 5, f = 4, c = 10$$

$$\therefore \text{Median} = 20 + \frac{7.8 - 5.10}{4} = 20 + \frac{2.8 \times 10}{4} = 20 + 7$$

$$\therefore \text{Median} = 27. \quad \therefore \text{Median wage} = 27000$$

Sudesh - 3067

(10) Find median wage of 65 employees.

Wages	No.	C.f	$\frac{n}{2} = 32^{\text{nd}}$
250.00 - 259.99	8	8	
260.00 - 269.99	10	18	i.e. 270 - 279.99 class
270.00 - 279.99	16	34	
280.00 - 289.99	14	48	$\therefore L = 269.99$
290.00 - 299.99	10	58	$\therefore n = 65$
300.00 - 309.99	5	63	
310.00 - 319.99	2	65	$C.f. = 18$

$$M = L + \left(\frac{n - C_f}{f} \right) \cdot c$$

$$= 269.99 + \left(\frac{32.5 - 18}{16} \right) 10$$

$$= 269.99 + \frac{145}{16}$$

$$= 269.99 + 9.0625$$

$$\underline{M = 279.0575}$$

$$01 = 0, 1 = 1, 2 = 3 + 5 = 7, 3 = 21 = 11, 05 = 1, \dots$$

$$F = 01 \times 8.5 + 0.5 = 01.2 \times 8.5 + 0.5 = \text{Median}$$

Sudesh - 3067

E-peaf-15/11/2023

(ii)	Marks	Frequency	cf				
	10-14	4	4				
	14-19	6	10	7-0	03	22-10M	
	20-24	10	20	8	8	01-0	
	25-29	5	25	81	01	05-01	
	30-34	7	32	04	22	03-02	
	35-39	3	35	20	22	04-05	
	40-44	9	44	21	01	02-04	
	45-49	6	50	08	2	08-02	
	$N=50$						

: 10 (1)

$$\frac{N}{2} = \frac{50}{2} = 25^{\text{th}} \text{ observation.}$$

$$\text{Class: } 24.5-29.5 \quad cf. = 4 + 6 + 10 + 5 = 20 \quad c = 5$$

$$n = 30$$

$$\therefore \text{Median} = L + \frac{\frac{N}{2} - cf}{f} \cdot c$$

$$= 24.5 + \frac{5 \times 5}{5}$$

$$= 24.5 + 5$$

$$\underline{\text{Median.}} = 29.5$$

Sudesh-3067

Lecture 26/11/21 - Assg 3

* calculate $Q_1, Q_3, D_2, P_s, P_{go}$ for following data.

Marks	No	C.f.
0-10	8	8
10-20	10	18
20-30	22	40
30-40	25	65
40-50	10	75
50-60	5	80
Total		

$$Q_1 = \frac{80}{4} = 20^{\text{th}} \text{ item}$$

$$L_1 = 20.$$

$$P_s = 25$$

$$P_E = 08$$

$$P_E = 28$$

$$P_H = 08$$

$$P_H = 28$$

$$P_H = 28$$

$$Q_2 = 41$$

(1) $Q_1 :$

$$L_1 = 20, Q_1 = 20, \text{ Class: } 20-30, \text{ Mid value} = \frac{20+30}{2} = \frac{50}{2} = 25$$

$$Q_1 = L + \left(\frac{n}{4} - Cf \right) f = 20 + \frac{20-18}{22} \cdot 10 = 20 + \frac{2}{22} \cdot 10 = 20 + \frac{20}{22} = 20 + 0.9091 = 20.9091$$

$$= 20 + \frac{20-18}{22} \cdot 10$$

$$= 20 + \frac{2}{22} \cdot 10$$

$$= 20 + 0.9091$$

$$\underline{Q_1 = 20.9091}$$

$$2 \times 25 + 2 \cdot P_S =$$

$$2$$

$$2 + 2 \cdot P_S =$$

$$2 \cdot P_S =$$

Sudesh - 3067

$$(2) Q_3: \left(\frac{3n}{4} \right) : \frac{3 \times 80}{4} = \frac{240}{4} = \left(\frac{02 \times 02}{001} \right) = \left(\frac{02}{001} \right) + z^9 (2)$$

$$Q_3 = 60$$

$$01 - 022010$$

$$\therefore L = 30$$

$$0 = 1$$

$$Q_3 = L + \frac{\frac{3n}{4} - cf}{f} \cdot c$$

$$4.0 - 02 + 1 = 29$$

$$= 30 + \frac{60 - 40}{25} \cdot 10$$

$$01 \times 0 + 00$$

$$= 30 + \frac{20}{25} \cdot 10$$

$$2 + 0 = \\ 2 = 29$$

$$= 30 + 8$$

$$\underline{Q_3 = 38}$$

$$MSP = \left(\frac{02 \times 02}{001} \right) = \left(\frac{002}{001} \right) = 029 \quad (2)$$

$$(3) D_2 : \left(\frac{2n}{10} \right) \left(\frac{2 \cdot 80}{10} \right) = 16^{th}.$$

$$02 - 02 = 020/0029$$

$$\therefore D_2 \text{ class} = 10 - 20.$$

$$L = 10$$

$$01 - 02 + 002 + 1 = 029$$

$$D_2 = L + \frac{\frac{2n}{10} - cf}{f} \cdot c$$

$$01 \cdot (20 - 02) + 002 =$$

$$= 10 + \frac{16 - 8}{10} \cdot 10$$

$$01 \cdot f + 002 =$$

$$= 10 + 8$$

$$\underline{D_2 = 18}$$

Sudesh - 3067

$$(4) P_5 : \left(\frac{5n}{100} \right) = \left(\frac{5 \times 80}{100} \right) = 4^{\text{th}} \quad P_5 = 0.8 \times 8 : \left(\frac{0.8}{P} \right) : 80 (\text{e})$$

class 0-10

$L = 0$

$P_5 = L + \frac{5n}{100} - c \cdot f$

$\frac{100}{f} \cdot c$

$= 0 + \frac{4}{8} \times 10$

$= 0 + 5$

$\underline{P_5 = 5}$

$$(5) P_{90} = \left(\frac{90n}{100} \right) = \left(\frac{90 \times 80}{100} \right) = 72^{\text{th}}$$

 $\therefore P_{90}$ class = 40-50

$L = 40$

$$P_{90} = L + \frac{90n}{100} - c \cdot f \cdot c$$

$= 40 + \left(\frac{72-65}{10} \right) \cdot 10$

$= 40 + \frac{7}{10} \cdot 10$

$= 40 + 7$

$\underline{P_{90} = 47}$

Sudesh - 3067

30/11/2021. Measure of Dispersion.

(1) Q13) Mean Deviation.

Find mean deviation from mean for foll.

Marks	No.	f_x	$ x - \bar{x} $	$f \cdot x - \bar{x} $
20	2	40	8	16
18	4	72	6	24
16	9	144	4	36
14	18	252	2	36
12	27	324	0	0
10	25	250	2	50
8	14	112	4	56
6	1	6	6	6
$n = 100$		$\sum f_x = 1200$	$\sum x - \bar{x} = 224$	

$$\text{Mean} = \bar{x} = \frac{\sum f_x}{n} = \frac{1200}{100} = 12$$

Mean Deviation about mean.

$$\delta \bar{x} = \frac{\sum f |x - \bar{x}|}{n} = \frac{224}{100} = 2.24$$

$$\therefore \delta \bar{x} = 2.24$$

$$\therefore \text{Coefficient: } \frac{\delta \bar{x}}{\bar{x}} = \frac{2.24}{12} = 0.1867$$

Sudesh-3067

2) (i) Calculate mean deviation from median and its coefficient from data: 100, 150, 80, 90, 160, 200, 140.

A)=

Ascending: 80, 90, 100, 140, 150, 160, 200

$$n = 7 \text{ (odd)}$$

Since n is odd,

$$\text{Median} = \left(\frac{7+1}{2} \right)^{\text{th}} = \left(\frac{8}{2} \right)^{\text{th}} = 4^{\text{th}}$$

$$\therefore \text{Median} = 140$$

$$\therefore \text{Mean deviation} = \frac{\sum |x_i - M|}{n}$$

$$= |8-140| + |90-140| + |100-140| + |140-140| +$$

$$\underline{|150-140| + |160-140| + |200-140|}$$

$$= \frac{60 + 50 + 40 + 0 + 10 + 20 + 60}{7}$$

$$= \frac{240}{7}$$

$$= 34.28$$

$$\therefore \text{Median} = 34.28$$

$$\text{Coefficient of Mean deviation from Median: } \frac{M.D.}{\text{Median}} = \frac{34.28}{140}$$

$$\text{Coefficient} = 0.24485$$

Sudesh-3067

* Standard deviation & Variance.

$$SD : \sqrt{\frac{\sum x^2 - (\bar{x})^2}{N}}$$

1. Find S.D. of,

$$SD \quad \bar{x} = 12 + 6 + 7 + 3 + 15 + 10 + 18 + 5 = 9.5$$

$$\sigma^2 = \frac{12^2 + 6^2 + 7^2 + 3^2 + 15^2 + 10^2 + 18^2 + 5^2 - 9.5^2}{8} = 23.75$$

$$\sigma = \sqrt{23.75} = 4.87$$

2. Heights are 600mm, 470mm, 170mm, 430mm, 300mm.

$$\text{Mean} = \frac{600 + 470 + 170 + 430 + 300}{15}$$

$$= 1970/15 = 394.$$

$$\text{Variance} = \frac{206^2 + 76^2 + (-224)^2 + 36^2 + (-94)^2}{5}$$

$$= \frac{42436 + 5776 + 50176 + 1296 + 8836}{5}$$

$$= 21704.$$

$$SD = \sqrt{21704}$$

$$SD = 147.32$$

Sudesh - 3067

(3) S.D.

(a) 12, 6, 7, 3, 15, 10, 18, 5

$$\text{Mean} = \frac{12+6+7+3+15+10+18+5}{8}$$

$$= \frac{76}{8}$$

$$\text{Mean} = 9.5$$

$$\text{Variance } (\sigma^2) = \frac{(12-9.5)^2 + (6-9.5)^2 + (7-9.5)^2 + (3-9.5)^2 + (15-9.5)^2 + (10-9.5)^2 + (18-9.5)^2 + (5-9.5)^2}{8}$$

$$= \frac{(2.5)^2 + (-3.5)^2 + (-2.5)^2 + (-6.5)^2 + (5.5)^2 + (0.5)^2 + (8.5)^2 + (-4.5)^2}{8}$$

$$= \frac{6.25 + 12.25 + 6.25 + 42.25 + 30.25 + 0.25 + 72.25 + 20.25}{8}$$

$$= \frac{190}{8}$$

$$= 23.75$$

$$\text{S.D.} = \sqrt{23.75} = 4.87339717$$

Sudesh - 3067

S.D.

(b) 9, 3, 8, 8, 9, 8, 9, 18

$$\text{Mean} = \frac{9+3+8+8+9+8+9+18}{8}$$

$$= \frac{72}{8}$$

$$\text{Mean} = 9$$

$$\text{Variance} = (\sigma^2) = \frac{(9-9)^2 + (3-9)^2 + (8-9)^2 + (8-9)^2 + (9-9)^2 + (8-9)^2 + (9-9)^2 + (18-9)^2}{8}$$

$$= \frac{0+36+1+1+0+1+0+81}{8}$$

$$= \frac{36+81+3}{8}$$

$$= \frac{36+84}{8}$$

$$= \frac{120}{8}$$

$$\checkmark = 15$$

$$\therefore S.D. = \sqrt{15} = 3.87298335.$$

Sudesh - 3067

* Shortcut Method for S.D.

$$\sqrt{\frac{\sum fd^2}{N} - \left(\frac{\sum fd}{N} \right)^2}$$

Find S.D. of data

x	f	$d = x - A$ (13)	fd	d^2	fd^2
10	2	-3	-6	9	18
11	7	-2	-14	4	28
12	11	-1	-11	1	11
13	15	0	0	0	0
14	10	1	10	1	10
15	4	2	8	4	16
16	1	3	3	9	9
$\sum f = 50$			$\sum fd = -10$		$\sum fd^2 = 92$

$$A - M = \bar{x} = A + \frac{\sum fd}{n} = 13 + \frac{(-10)}{50} = 12.8$$

$$\begin{aligned}
 S.D. &= \sigma = \sqrt{\frac{\sum fd^2}{n} - \left(\frac{\sum fd}{n} \right)^2} \\
 &= \sqrt{\left(\frac{92}{50} - \left(\frac{-10}{50} \right)^2 \right)} \\
 &= \sqrt{1.84 - 0.04} \\
 &= \sqrt{1.80}
 \end{aligned}$$

$$S.D. = 1.342$$

$$\text{Coefficient: } \frac{6}{\bar{x}} \times 100 = \frac{1.342 \times 100}{12.8} = 10.4$$

* Variance

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

* Mean Deviation = $\frac{1}{n} \sum |x - \bar{x}|$

* Semi-Interquartile range = $\frac{2}{3} \times S.D.$

Relative Dispersion = $\frac{\text{Absolute Dispersion}}{\text{Average}}$

$$\text{Coefficient of } V = \frac{S}{\bar{x}}$$

* The coefficient of variations of two series are 58.1% and 69.1%. S.D. are 21.2 & 15.6.

$$C.V. = (\text{s.d.}) / \bar{x} \times 100$$

$$\text{Mean of first series } (\bar{x}_1) = 36.6$$

$$\text{Mean of second series } (\bar{x}_2) = 22.6$$

$$* \text{ Coefficient of Quartile Deviation} = \frac{Q_3 - Q_1}{Q_3 + Q_1} \times 100$$

$$\text{Properties: } S^2 = \frac{N_1 s_1^2 + N_2 s_2^2}{N_1 + N_2}$$

Sudesh - 3067

* Practice Questions for S.D., Mean, Variance:

1.

Sales (Rs)	No. of Days	d = $x - A/h$	f.d	f.d ²
102	3	-3	-9	27
106	9	-2	-18	36
110	25	-1	-25	25
114	35	0	0	0
118	17	1	17	17
122	10	2	20	40
126	1	3	3	9

$$\text{Mean} = \bar{x} = A + \frac{\sum f.d \cdot h}{n}$$

$$= 114 + \frac{(-12) \cdot 4}{100}$$

$$= 114 + (-0.12) \times 4$$

$$= 114 - 0.48$$

$$\text{Mean} = 113.52$$

$$\begin{aligned} \text{S.D.} &= \sqrt{V} \\ &= \sqrt{24.6562} \\ \underline{\text{S.D.}} &= \underline{4.9655} \end{aligned}$$

$$\begin{aligned} V &= \sigma^2 = \left(\frac{\sum f.d^2 - \left(\frac{\sum f.d}{n} \right)^2}{n-1} \right) \cdot h^2 \\ &= \left(\frac{154 - (-12)^2}{100} \right) 4^2 \end{aligned}$$

$$= \frac{154 - 144}{99} \times 16$$

$$= \frac{152.56}{99} \times 16$$

$$= 1.541 \times 16$$

$$V = 24.6562$$

Sudesh - 3067

2. Calculate Mean, Median & Variance.

Height	No	$d = x - A/h$	M	f_d	$f \cdot d^2$	Σf
95-105	19	-2	100	-38	76	19
105-115	23	-1	110	-23	23	42
115-125	36	0	120(A)	0	0	78
125-135	70	1	130	70	70	148
135-145	52	2	140	104	208	200
$N = 200$			$\Sigma = 113$		$\Sigma = 377$	

$$\text{Mean} = \bar{x} = A + \frac{\sum f_d}{n} \cdot h$$

$$= 120 + \frac{113}{200} \times 10$$

$$= 120 + 0.565 \times 10$$

$$= 120 + 5.65$$

$$\text{Mean} = 125.65$$

$$\sigma^2 = \left(\frac{\sum f \cdot d^2 - (\sum f \cdot d)^2}{n} \right) \cdot h^2$$

$$= \left(\frac{377 - (113)^2 / 200}{199} \right) \cdot 10^2$$

$$= \frac{313.155 \times 100}{199}$$

$$\text{Median} : n/2 = (200/2)$$

$$= 100$$

$$= 1.5736 \times 100$$

$$\text{Class} = 125-135$$

$$\sigma^2 = 157.3643$$

$$L = 125, n = 200, cf = 78$$

$$f = 70, c = 10$$

$$M = 125 + \frac{100 - 78}{70} \cdot 10$$

$$M = 125 + \frac{22}{70} \times 10$$

$$= 125 + 3.1429$$

$$M = 128.1429$$

Sudesh - 3067

- (3) Mean and standard deviation of two distributions of 100 & 150 items are 50, 5 & 40, 6. Find S.D. of all 250 items.

$$\text{Combined Mean} = \frac{N_1 \bar{x}_1 + N_2 \bar{x}_2}{N_1 + N_2} = \frac{100 \times 50 + 150 \times 40}{100 + 150} = \frac{11000}{250} = 44$$

$$\sigma_{1,2} = \sqrt{\frac{N_1 \sigma_1^2 + N_2 \sigma_2^2 + N_1 d_1^2 + N_2 d_2^2}{N_1 + N_2}}$$

$$d_1 = 50 - 44 = 6 \quad d_2 = 40 - 44 = -4$$

$$\sigma_{1,2} = \sqrt{\frac{100(5)^2 + 150(0)^2 + 100(6)^2 + 150(-4)^2}{100 + 150}}$$

$$\begin{aligned} \sigma_{1,2} &= \sqrt{\frac{2500 + 5400 + 3600 + 2400}{250}} \\ &= \sqrt{55.6} \end{aligned}$$

$$\underline{\sigma_{1,2} = 7.456}$$