Aims

1. **Calculate the variance and standard deviation of the following continuous frequency distribution**

Class Interval	**30-40**	**40-50**	**50-60**	**60-70**	**70-80**	**80-90**	**90-100**
Frequency	**3**	**7**	**12**	**15**	**8**	**3**	**2**

Sol:

Class Interval C.I	Frequency (f_i)	Mid values (x_i)	$d_i = \left(\frac{x_i - A}{c}\right)$	${d_i}^2$	$f_i d_i$	$f_i {d_i}^2$
30 - 40	3	35	-3	9	-9	27
40 – 50	7	45	-2	4	-14	28
50 – 60	12	55	-1	1	-12	12
60 – 70	**15**	**65(A)**	**0**	**0**	**0**	**0**
70 – 80	8	75	1	1	8	8
80 – 90	3	85	2	4	6	12
90 - 100	2	95	3	9	6	18
					$\sum f_i d_i = -15$	$\sum f_i {d_i}^2 = 105$

Here N=50,

A=65,

C=10,

$(\sum f_i d_i) = -15,$

$\sum f_i {d_i}^2 = 105$

$$\boldsymbol{mean(\bar{x}) = A + \left(\frac{\sum f_i d_i}{N}\right) \times C}$$

$= 65 + \left(-\frac{15}{50}\right) \times 10$

$= 65 - 3$

$= 62$

Variance$=\frac{C^2}{N^2}[N(\sum f_i {d_i}^2) - (\sum f_i d_i)^2]$

$= \frac{10^2}{50^2}[50(105) - (-15)^2]$

$= \frac{100}{2500}[5250 - 225]$

$= \frac{1}{25}[5025] = 201$

S.D$=\sqrt{201} = 14.18$

Aims

2. Calculate the variance and standard deviation of the following discrete frequency distribution

x_i	4	8	11	17	20	24	32
Frequency	**3**	**5**	**9**	**5**	**4**	**3**	**1**

Sol:

x_i	Frequency (f_i)	$f_i x_i$	$(x_i - \overline{x})$	$(x_i - \overline{x})^2$	$f_i(x_i - \overline{x})^2$
4	3	12	-10	100	300
8	5	40	-6	36	180
11	9	99	-3	9	81
17	5	85	3	9	45
20	4	80	6	36	144
24	3	72	10	100	300
32	1	32	18	324	324
		$\sum f_i x_i = 420$			$\sum f_i(x_i - \overline{x})^2 = 1374$

Here N=30,

$\sum f_i x_i = 420$

$\sum f_i(x_i - \overline{x})^2 = 1374$

$$\boldsymbol{mean}(\overline{\boldsymbol{x}}) = \left(\frac{\sum \boldsymbol{f_i x_i}}{\boldsymbol{N}}\right)$$

$= \frac{420}{30}$

$= 14$

Variance$= \frac{\sum f_i(x_i - \overline{x})^2}{N}$

$= \frac{1374}{30} = 45.8$

S.D$= \sqrt{45.8} = 6.77$

Aims

3. **The following table gives daily wages of workers in a factory. Calculate the standard deviation and coefficient of variation of the wages of the workers.**

wages	125-175	175-225	225-275	275-325	325-375	375-425	425-475	475-525	525-575
No of workers	2	22	19	14	3	4	6	1	1

Sol:

Class Interval C.I	Frequency (f_i)	Mid values (x_i)	$d_i = \left(\frac{x_i - A}{c}\right)$	${d_i}^2$	$f_i d_i$	$f_i {d_i}^2$
125-175	2	150	-3	9	-6	18
175-225	22	200	-2	4	-44	88
225-275	19	250	-1	1	-19	19
275-325	**14**	**300(A)**	**0**	**0**	**0**	**0**
325-375	3	350	1	1	3	3
375-425	4	400	2	4	8	16
425-475	6	450	3	9	18	54
475-525	1	500	4	16	4	16
525-575	1	550	5	25	5	25
					$\sum f_i d_i = -31$	$\sum f_i {d_i}^2 = 239$

Here N=72,

A=300,

C=50,

$(\sum f_i d_i) = -31,$

$\sum f_i {d_i}^2 = 239$

$$\boldsymbol{mean}(\bar{x}) = \boldsymbol{A} + \left(\frac{\sum \boldsymbol{f_i d_i}}{\boldsymbol{N}}\right) \times \boldsymbol{C}$$

$= 300 + \left(-\frac{31}{72}\right) \times 50$

$= 300 - \frac{1550}{72}$

$= 278.47$

Variance$= \frac{C^2}{N^2}[N(\sum f_i {d_i}^2) - (\sum f_i d_i)^2]$

S.D$= \sqrt{\frac{50^2}{72^2}[72(239) - (-31)^2]}$

$= 88.52$

$coefficient\ of\ variation$

$= \frac{S.D}{\bar{x}} \times 100 = 31.79$

4. **The scores of two cricketers A and B in 10 innings are given below, find who is better run getter and who is a more consistent player.**

Scores of A: x_i	**40**	**25**	**19**	**80**	**38**	**8**	**67**	**121**	**66**	**76**
Scores of B: y_i	**28**	**70**	**31**	**0**	**14**	**111**	**66**	**31**	**25**	**4**

5. Sol:

(x_i)	$(x_i-\overline{x})$	$(x_i-\overline{x})^2$		(y_i)	$(y_i-\overline{y})$	$(y_i-\overline{y})^2$
40	-14	196		28	-10	100
25	-29	841		70	32	1024
19	-35	1225		31	-7	49
80	26	676		0	-38	1444
38	-16	256		14	-24	576
8	-46	2116		111	73	5329
67	13	169		66	28	784
121	67	4489		31	-7	49
66	12	144		25	-13	169
76	22	484		4	-34	1156
$\sum x_i$=540		$\sum(x_i-\overline{x})^2$ = 10596		$\sum y_i$ =380		$\sum(y_i-\overline{y})^2$ = 10680

For cricketer A: $\overline{x}=\frac{\sum x_i}{N}=\frac{540}{10}=54;\ S.D=\sqrt{\frac{\sum(x_i-\overline{x})^2}{N}}=\sqrt{\frac{10596}{10}}=\sqrt{1059.6}=32.55$

For cricketer B: $\overline{y}=\frac{\sum y_i}{N}=\frac{380}{10}=38;\ S.D=\sqrt{\frac{\sum(y_i-\overline{y})^2}{N}}=\sqrt{\frac{10680}{10}}=\sqrt{1068}=32.68$

C.V of A = $\frac{\sigma_x}{\overline{x}}\times 100=\frac{32.55}{54}\times 100=60.28$ and **C.V of B =** $\frac{\sigma_y}{\overline{y}}\times 100=\frac{32.68}{38}\times 100=86$

Since $\overline{x}>\overline{y}$, ***crickete A is a better run getter***

And C.V of A >C.V of B , A is also more consistent player.

Aims

5. **Find the mean deviation from the mean of the following continuous frequency distribution**

Class Interval	**0-10**	**10-20**	**20-30**	**30-40**	**40-50**
Frequency	**3**	**7**	**12**	**15**	**8**

Sol:

Class Interval C.I	Frequency (f_i)	Mid values (x_i)	$d_i = \left(\frac{x_i - A}{c}\right)$	$f_i d_i$	$\lvert x_i - \bar{x}\rvert$	$f_i \lvert x_i - \bar{x}\rvert$
0 - 10	5	5	-2	-10	22	110
10 – 20	8	15	-1	-8	12	96
20 – 30	15	25(A)	0	0	2	30
30 – 40	16	35	1	16	8	128
40 – 50	6	45	2	12	18	108
	N=50			$\sum f_i d_i$ =10		$f_i \lvert x_i - \bar{x}\rvert$ = 472

Here N=50,

A=25,

C=10,

$(\sum f_i d_i) = 10$,

$f_i \lvert x_i - \bar{x}\rvert = 472$

$$\boldsymbol{mean(\bar{x}) = A + \left(\frac{\sum f_i d_i}{N}\right) \times C}$$

$\bar{x} = 65 + \left(-\frac{15}{50}\right) \times 10$

$\bar{x} = 65 - 3$

$\bar{x} = 62$

Mean D from mean $= \frac{f_i \lvert x_i - \bar{x}\rvert}{N}$

$= \frac{472}{50}$

$= 9.44$

Aims

6. Find the mean deviation from the mean of the following continuous frequency distribution

Class Interval	**40-50**	**50-60**	**60-70**	**70-80**	**80-90**	**90-100**
Frequency	**5**	**15**	**25**	**30**	**20**	**5**

Sol:

Class Interval C.I	Frequency (f_i)	Mid values (x_i)	$d_i = \left(\frac{x_i - A}{c}\right)$	$f_i d_i$	$\lvert x_i - \bar{x}\rvert$	$f_i \lvert x_i - \bar{x}\rvert$
40 - 50	5	45	-2	-10	26	130
50 – 60	15	55	-1	-15	16	240
60 – 70	25	65(A)	0	0	6	150
70 – 80	30	75	1	30	4	120
80 – 90	20	85	2	40	14	280
90-100	5	95	3	15	24	120
	N=100			$\sum f_i d_i$ =60		$f_i \lvert x_i - \bar{x}\rvert$ = 1040

Here N=50,

A=25,

C=10,

$(\sum f_i d_i) = 10,$

$f_i \lvert x_i - \bar{x}\rvert = 472$

$$\boldsymbol{mean(\bar{x}) = A + \left(\frac{\sum f_i d_i}{N}\right) \times C}$$

$$\bar{x} = 65 + \left(\frac{60}{100}\right) \times 10$$

$$\bar{x} = 65 + 6$$

$$\bar{x} = 71$$

Mean D from mean $= \frac{f_i \lvert x_i - \bar{x}\rvert}{N}$

$= \frac{1040}{100}$

$= 10.4$

Aims

7. **Find the mean deviation from the median of the following continuous frequency distribution**

Class Interval	**20-25**	**25-30**	**30-35**	**35-40**	**40-45**	**45-50**	**50-55**	**55-60**
Frequency	**120**	**125**	**175**	**160**	**150**	**140**	**100**	**30**

Sol:

Class Interval C.I	Frequency (f_i)	C.F	Mid values (x_i)	$\lvert x_i - M\rvert$	$f_i\lvert x_i - \overline{x}\rvert$
20 - 25	120	120	22.5	15	1800
25 - 30	125	245	27.5	10	1250
30 – 35	175	420	32.5	5	875
35 – 40	160	580	37.5(A)	0	0
40 – 45	150	630	42,5	05	750
45 –50	140	870	47.5	10	1400
50-55	100	970	52.5	15	1500
55-60	30	1000	57.5	20	600
	N=1000				$f_i\lvert x_i - \overline{x}\rvert$ = 8175

Here N=1000,

$\frac{N}{2}$=500,

f=160, F=420

C=5, L=35

$f_i|x_i - M| = 8175$

$$\boldsymbol{median(\overline{x})} = \boldsymbol{L} + \left(\frac{\frac{N}{2} - \boldsymbol{P.C.F}}{\boldsymbol{f}}\right).\boldsymbol{C}$$

$$\boldsymbol{M} = 35 + \left(\frac{500-420}{160}\right) \times 5$$

$$\overline{\boldsymbol{x}} = 35 + \left(\frac{80}{160}\right) \times 5$$

$$\overline{\boldsymbol{x}} = 35 + 2.5 = 37.5$$

Mean D from median $= \frac{f_i|x_i - M|}{N}$

$= \frac{8175}{1000}$

$= 8.175$

Aims

8. **Find the mean deviation from the median of the following continuous frequency distribution**

Class Interval	6	9	3	12	15	13	21	22
Frequency	4	5	3	2	5	4	4	3

Sol: Arranging the observations in ascending order we get

(x_i)	3	6	9	12	13	15	21	22
(f_i)	3	4	5	2	4	5	4	3

(x_i)	(f_i)	C.F	$\lvert x_i - M\rvert$	$f_i\lvert x_i - M\rvert$
3	3	3	10	30
6	4	7	7	28
9	5	12	4	20
12	2	14	1	2
(M)13	4	18	0	0
15	5	23	2	10
21	4	27	8	32
22	3	30	9	27
	N=30			$f_i\lvert x_i - \bar{x}\rvert = 149$

Here N=30,

$\frac{N}{2}$=15, Median=13

$f_i|x_i - M| = 149$

Mean D from median

$= \frac{f_i|x_i - M|}{N}$

$= \frac{149}{30} = 4.97$