1) The intelligence quotients (IQ's) of boys in a class are given below:
70, 120, 110, 101, 88, 83, 95, 98, 107, 100

Mean = 70 + 120 + 110 + 101 + 88 + 83 + 95 + 98 + 107 + 100 / 10

$= \frac{972}{10} = 97.2$

2) The following is the frequency distribution of the no. of telephone call received in 245 successive 1-minute interval at an exchange calculate the mean.

No. of calls	0	1	2	3	4	5	6	7
frequency	14	21	25	43	51	30	39	12

Sol^n

Mean $= \Sigma(x \cdot f) / \Sigma f$

$\Sigma(x \cdot f) = 0 + 21 + 50 + 129 + 204 + 200 + 234 + 84 = 922$

$\Sigma f = 245$

$\bar{x} = \frac{922}{245} = 3.763$

Q3) For given frequency distribution, calculate the mean.

Mark	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
No. of Student	6	5	8	15	7	6	3

Sol^n

Class Interval	Mid-point (m)	frequency (f)	fm
0 - 10	5	6	30
10 - 20	15	5	75
20 - 30	25	8	200
30 - 40	335	15	525
40 - 50	45	7	315
50 - 60	55	6	330
60 - 70	65	3	195
Total		50	1670

$$\bar{x} = \frac{\Sigma(f \cdot m)}{\Sigma f}$$

$$= \frac{1670}{50} = 33.4$$

Q4) Find mean using step-Deviation method

Class	10-19	20-29	30-39	40-49	50-59
Frequency	8	8	15	11	8

Soln

Class	Frequency (f)	Mid-point (m)	$u = \frac{(m-34.5)}{10}$	u·f
10-19	8	14.5	-2	-16
20-29	8	24.5	-1	-8
30-39	15	34.5	0	0
40-49	11	44.5	1	11
50-59	8	54.5	2	16
Total	50			3

$$\bar{x} = A + h(\Sigma u \cdot f)/\Sigma f$$

$$= 34.5 + 10\ \frac{3}{50} = 35.1$$

Q5) The average daily wage of all workers in a factory is Rs. 444·16 average daily wage paid to male and female workers are Rs. 480 and 360 respectively. Find the percentage of male and female workers employed by the factory.

Soln

M = no. of male worker

N = no. of female worker

Total worker = M + F

$$\text{Mean} = \frac{480M + 360F}{M + F}$$

$$444 = \frac{480M + 360F}{M+F}$$

Let $\frac{M}{M+F} = P$, $\frac{F}{M+F} = 1-P$

$$444 = 480P + 360(1-P) = 444$$

$$480p + 360p - 360p = 444$$

$$(480 - 360)p = 444 - 360$$

$$120p = 84$$

$$p = 0.7$$

Types of	percentage
Male	70 %
female	30 %

$p = 0.7 \rightarrow 70\%$ male

$1-p = 0.3 \rightarrow 30\%$ female.

3. The mean of the marks in statistics of 100 students in a class was 72. The mean of boys was 75 while their number was 70. Find the mean of marks of girls.

	No. of student	Mean marks
Boys	70	75
Girls	$(100-70) = 30$	
Total	100	72

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

$n_1 = 70$, $\bar{x}_1 = 75$

$n_2 = 30$, $\bar{x} = 72$

$$72 = \frac{70(75) + 30(x_2)}{100}$$

$$7200 = 5250 + 30x_2$$

$$30x_2 = 7200 - 5250 = 1950$$

$$\bar{x}_2 = \frac{1950}{30} = 65 \text{ (sol}^n\text{)}$$

7. Arithmetic mean height of 50 students of a college is 68 inches. The height of 30 of these is given in frequency distribution below. Arithmetic mean height of 20 students of is to be found.

Height (inch)	5'4"	5'6"	5'8"	5'10"	6'0"
frequency	4	12	4	8	2

Sol

Height	frequency	fx Height
64	4	256
66	12	~~792~~ 792
68	4	272
70	8	560
72	2	144
Total	30	2024

Mean of 50 student = 68 inches

Total = $68 \times 50 = 3400$

Total remaining 20 student = $3400 - 2024 = 1376$

$$\bar{X} = \frac{1376}{20} = 68.8 \text{ inches}$$

8. The following are the percentage of marks in an examination.

Subject	Marks(X_i)	Weight (W_i)
English	60	1
Hindi	75	2
Math	63	1
~~Phy~~ physics	59	3
Chemistry	55	3

Subject	X_i	W_i	$W_i X_i$
English	60	1	60
Hindi	75	2	150
Math	63	1	63
physics	59	3	177
Chemistry	55	3	165
Total		10	615

$$\bar{X} = \frac{615}{10} = 61.5$$

Show that the Weighted Arithmetic Mean of the first 'n' natural number whose weights are equal to the corresponding number is equal to $(2n+1)/3$

$1, 2, \ldots n.$

$$\bar{X} = \frac{\Sigma(W_i X_i)}{\Sigma W_i} = \frac{\Sigma(i \cdot i)}{\Sigma i} = \frac{\Sigma i^2}{\Sigma i}$$

$$\Sigma i = 1+2+3+\ldots+n = \frac{n(n+1)}{2}$$

$$\Sigma i^2 = 1^2+2^2+3^2+\ldots+n^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\bar{X} = \frac{\frac{n(n+1)(2n+1)}{6}}{\frac{n(n+1)}{2}}$$

$$\bar{X} = \frac{n(n+1)(2n+1)}{6} \times \frac{2}{n(n+1)}$$

$$\bar{X} = \frac{2(2n+1)}{6} = \frac{2n+1}{3}$$

$$\bar{X} = \frac{2n+1}{3}$$

10) Given mean is 1.46 bore the following frequency distribution

No. of accident	0	1	2	3	4	5	Total
frequency	46	?	?	25	10	5	200

Sol^n

f_1 = for 1 accident, f_2 = For 2 accident

$$48 + f_1 + f_2 + 25 + 10 + 5 = 200$$

$$f_1 + f_2 = 114 \quad \text{— (1)}$$

$$\bar{x} = \frac{\Sigma(xf)}{\Sigma f}$$

Mean = 1.46, $\Sigma f = 200$

$$\Sigma(x \cdot f) = 1.46 \times 200 = 292$$

X	f	X x f
0	46	0
3	25	75
4	10	40
5	5	25
Total		140

$$1 \times f_1 + 2 \times f_2 = 292 - 140 = 152$$

~~$f_1 + 2f_2$~~ $f_1 + 2f_2 = 152$ — (2)

Solve eqn (1) & (2)

$$f_1 + f_2 = 114$$
$$f_1 + 2f_2 = 152$$

$$f_2 = 38$$

putting the value of f_2 in eqn (1)

$$f_1 + 38 = 114$$
$$f_1 = 76$$

$(f_2 = 38, f_1 = 76)$ Ans

For the following data given mean is 15.38

Size	10	12	14	16	18	20
Frequency	3	7	?	20	8	5

Missing frequency $= x$

$\Sigma f = 3+7+x+20+8+5 = 43+x$

$\Sigma(xf) = 678+14x$

$$\bar{x} = \frac{\Sigma(xf)}{\Sigma f}$$

$$15.38 = \frac{678+14x}{43+x}$$

$15.38 \times (43+x) = 678+14x$

$= 661.34 + 15.38x = 678+14x$

$= 15.38 - 14x = 678 - 661.34$

$= 1.38x = 16.66$

$x = \frac{16.66}{1.38} = 12.07$

$x = 12$ (approx)

35, 12, 40, 60

12, 35, 40, 60

Median. $n = 4$

Median = ~~2nd value~~ $\frac{2^{nd} \text{ value} + 3^{rd} \text{ value}}{2}$

$= \frac{35+40}{2} = \frac{75}{2} = 37.5$

Median = 37.5

13. 35, 12, 40, 60, 50

Sol^n

12, 35, 40, 60, 50, 60

$n = 5$

Median $= \frac{5+1}{2} = 3rd$

Median = 40

14. 8 coins are tossed the no. of head result was noted and operation was repeated 256 times.

No. of heads	0	1	2	3	4	5	6	7	8
frequency	1	9	26	59	72	52	29	7	1

Sol^n

X	F	CF
0	1	1
1	9	10
2	26	36
3	59	95
4	72	167
5	52	219
6	29	248
7	7	255
8	1	256
Total	256	

Median $= \frac{N+1}{2} = \frac{256+1}{2} = 128.5$

128.5th lies betn 95 and 16 → corresponding $x = 4$

Median no. of head = 4

Age distribution of a particular region. Find the median.

Age (in years)	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70 and over
No of person	2	3	4	3	2	1	0.5	0.1

Age	f	c.f
0-10	2	2
10-20	3	5
20-30	4	9
30-40	3	12
40-50	2	14
50-60	1	15
60-70	0.5	15.5
70 and over	0.1	15.6
Total	15.6	

$$M = L + \left(\frac{\frac{N}{2} - C.F}{F}\right) \times h$$

$$M = 20 + \left(\frac{7.8 - 5}{4}\right) \times 10 \quad \left(\frac{N}{2} = \frac{15.6}{2} = 7.8\right)$$

$$M = 20 + 0.7 \times 10$$

$$\boxed{M = 27}$$

In the frequency distribution of 100 families, given below are the no. of families corresponding to expenditure groups are missing from the table. Median is known to be 50. Find the missing frequency.

Expenditure	0-20	20-40	40-60	60-80	80-100
No. of families	14	?	27	?	15

Expenditure	f	c.f
0 - 20	14	14
20 - 40	f_1	$14 + f_1$
40 - 60	27	$41 + f_1$
60 - 80	f_2	$41 + f_1 + f_2$
80 - 100	15	$56 + f_1 + f_2$
Total	100	

Given
$M = 50$
$L = 40$
$\frac{N}{2} = \frac{100}{2} = 50$
~~$n = 60$~~

$$N = 14 + f_1 + 27 + f_2 + 15 = 100$$

$$56 + f_1 + f_2 = 100$$

$$f_1 + f_2 = 44 \quad \text{--- (1)}$$

$$50 = 40 + \left(\frac{50-(14+f_1)}{27}\right)\times 20$$

$$50-40 = \left(\frac{50-14-f_1}{27}\right)\times 20$$

$$10 = \frac{36-f_1}{27}\times 20$$

$$\frac{10\times 27}{20} = 36-f_1$$

$$\frac{270}{20} = 36-f_1$$

$$13.5 = 36-f_1$$

$$f_1 = 36-13.5 = 22.5$$

Putting the value of f_1 in equn (1)

$$f_1+f_2 = 44$$

$$22.5+f_2 = 44$$

$$f_2 = 21.5$$

The missing frequency are $f_1 = 22.5$ & $f_2 = 21.5$

Q17) find the quartiles and percentile. Q_2, D_8 and P_{85}

Income	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
No of families	75	250	350	192	68	35	24	6

Sol^n

Income	f	C.f
0-5	75	75
5-10	250	325
10-15	350	675
15-20	192	867
20-25	68	935
25-30	35	970
30-35	24	994
35-40	6	1000

$N = 1000$, $h = 5$, $CF_b = 325$, $f_{Q_2} = 350$, $L = 10$

$$Q_2 = \frac{2N}{4} = \frac{1000}{2} = 500\text{th term}$$

$$Q_2 = L + \left(\frac{\frac{2N}{4}-CF_b}{f_{Q_2}}\right)\times h$$

$Q_1 = 10 + \left(\frac{500 - 305}{366}\right) \times 5$

$Q_1 = 10 + \left(\frac{175}{366}\right) \times 5$

$Q_1 = 10 + (0.6) \times 5$

$Q_1 = 10 + 2.5$

$Q_1 = 12.5$

D_8: $L = 15$, $CF_b = 675$, $f_{D_8} = 192$, $h = 5$

$D_8 = L + \left(\frac{\frac{8N}{10} - CF_b}{f_{D_8}}\right) \times h$

$D_8 = 15 + \left(\frac{800 - 675}{192}\right) \times 5$

$D_8 = 15 + (0.6510) \times 5$

$D_8 = 15 + 3.255 = 18.26$

$P_{85} = \frac{85N}{100} = \frac{85 \times 1000}{100}$ = 850th term, $L = 15$, $CF_b = 675$, $f_{P_{85}} = 192$, $h = 5$

$P_{85} = L + \left(\frac{\frac{85N}{100} - CF_b}{f_{P_{85}}}\right) \times h$

$P_{85} = 15 + \left(\frac{850 - 675}{192}\right) \times 5$

$P_{85} = 15 + \left(\frac{175}{192}\right) \times 5$

$P_{85} = 15 + (0.9115) \times 5$

$P_{85} = 15 + 4.5575 = 19.56$

Class	Less than 10	10-19	20-29	30-39	40-49	50-59	60-69	70-79
Frequency	5	13	20	32	60	80	90	100

Q_3, D_6 & P_{70}

Class	Frequency (f)	($c.f$)
0-10	5	5
10-19	13	18
20-29	20	38
30-39	32	70
40-49	60	130
50-59	80	210
60-69	90	300
70-79	100	400
Total	400	

$Q_3 = L + \left(\frac{3N}{4} - CF\right) \times h$

$Q_3 = 60 + \left(\frac{300 - 210}{90}\right) \times 10$

$= 60 + 10$

$= 70$

$D_6 = 60 + \left(\frac{240 - 210}{90}\right) \times 10$

$= 60 + 3.33$

$= 63.33$

$P_{70} = 60 + \left(\frac{280 - 210}{90}\right)$

$= 60 + 7.78$

$= 67.78$

Q19) Find the mode

x_i	1	2	3	4	5	6	7	8	9
f_i	3	1	19	25	40	30	22	10	6

Sol^n

$f_1 = 40,\ f_{0_1} = 25,\ f_2 = 30,\ h = 1,\ L = 4.5$

$$\text{Mode} = L + \frac{(f_1 - f_0)}{2f_1 - f_0 - f_2} \times h$$

$$= 4.5 + \frac{(40 - 25)}{2(40) - 25 - 30} \times 1$$

$$= 4.5 + \frac{15}{25} = 4.5 + 0.6 = 5.1$$

$M = 5$ (approx)

20) Find the mode for the frequency distribution

Weight (in kg)	93-97	98-102	103-107	108-112	113-117	118-122	123-127	128-13
No. of student	3	5	12	17	14	6	3	1

Sol^n

$f_1 = 17,$

$f_0 = 12,\ f_2 = 14,\ L = 107.5,\ h = 5$

$$\text{Mode} = L + \frac{(f_1 - f_0)}{2f_1 - f_0 - f_2} \times h$$

$$= 107.5 + \frac{(17 - 12)}{2(17) - 12 - 14} \times 5$$

$$= 107.5 + \frac{5}{8} \times 5 = 107.5 + 3.125 = 110.62$$

Mode = 110.62

1)

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
f_i	4	2	18	22	21	19	10	3	1

$f_1 = 22,\ f_0 = 18,\ f_2 = 21,\ L = 30,\ h = 10$

$$\text{Mode} = L + \frac{(f_1 - f_0)}{2f_1 - f_0 - f_2} \times h$$

$$= 30 + \frac{(22-18)}{2(22) - 18 - 21} \times 10$$

$$= 30 + \frac{4}{5} \times 10 = 30 + 8 = 38$$

22) Calculate the G.M and H.M of 31 person.

Weight	130	135	140	145	146	148	149	150	157
No. of person	3	4	6	6	3	5	2	1	1

$N = 31,\ \Sigma(f \log x) = 66.15$

$$\text{M.P. G.m} = \text{antilog}\left(\frac{66.15}{31}\right) = 196.3$$

$$\text{H.M} = \frac{\Sigma f}{\Sigma\left(\frac{f}{x}\right)}$$

$$\Sigma \frac{f}{x} = 0.227$$

$$\text{H.M} = \frac{31}{0.227} = 196.6.$$

23) For given frequency distribution, calculate G.M & H.M

Marks	0-10	10-20	20-30	30-40	40-50
No. of student	5	7	15	25	8

f	x	log x	f. log x
5	5	0.6990	3.495
7	15	1.1761	8.233
15	25	1.3979	20.968
25	35	1.5441	38.603
8	45	1.6532	13.226
N=60			

$$\text{Mean} = \frac{84.525}{60} = 1.409$$

$$\text{G.M} = \text{antilog}(1.409) = 25.7$$

$$\text{H.M} = \frac{\Sigma f}{\Sigma(f/x)} = \frac{60}{2.958} = 20.28$$

24) Find the Inter Quartile Range, Quartile deviation and coefficient of Quartile Deviation.

Class	0-15	15-30	30-45	45-60	60-75	75-90	90-105
frequency	8	26	30	45	20	17	4

Sol^n

Class	Frequency	C.f
0-15	8	8
15-30	26	34
30-45	30	64
45-60	45	109
60-75	20	129
75-90	17	146
90-105	4	150
	N = 150	

$$\frac{N}{4} = \frac{150}{4} = 37.5$$

So, 30-45 is Q_1 in the corresponding

$Q_1 = L + \frac{h}{f}\left(\frac{N}{4} - C\right)$

$= 30 + \frac{15}{30}(37.5 - 34)$

$= 30 + \frac{3.5}{2} = 30 + 1.75 = 31.75$

Here $\frac{3N}{4} = 112.5$

$Q_3 = L + \frac{h}{f}\left(\frac{3N}{4} - C\right)$

$= 60 + \frac{15}{20}(112.5 - 109)$

$= 62.625$

ii) IQR $= Q_3 - Q_1$

$= 62.625 - 31.75$

$= 30.875$

ii) Q.D $= \frac{Q_3 - Q_1}{2} = \frac{30.875}{2}$

$= 15.44$

iii) $C = \frac{Q_3 - Q_1}{Q_3 + Q_1}$

$= \frac{30.875}{94.375}$

$= 0.32$

Find the following for above data

10-90 percentile range

10-90 semi-percentile "

Coefficient of 10-90 percentile range.

$P_{10} = \frac{10N}{100} = \frac{10 \times 150}{100} = 15$

lies in 15-30 class, $L = 15$, $Cf = 8$, $f = 26$, $h = 15$

$P_{10} = 15 + \frac{(15-8)}{26} \times 15 = 15 + 4.04 = 19.04$

$P_{90} = \frac{150 \times 90}{100} = 135$

lies in 75-90 class, $L = 75$, $Cf = 129$, $f = 17$, $h = 15$.

$P_{90} = 75 + \frac{(135-129)}{17} \times 15 = 75 + 5.29 = 80.29$

Percentile range $= 80.29 - 19.04 = 61.25$

Semi " " $= \frac{61.25}{2} = 30.63$

Coefficient $= \frac{P_{90} - P_{10}}{P_{90} + P_{10}} = \frac{61.25}{99.33} = 0.62$

(a) (2) Calculate the M.D for mean and median

Class - Interval	2-4	4-6	6-8	8-10
frequency	3	4	2	1

Soln

class	f	Midpoint x	fx	d=x-5	fd	x-x̄	f|x-x̄|	f
2-4	3	3	9	-2	-6	2.2	6.6	6
4-6	4	5	20	0	0	0.2	0.8	0
6-8	2	7	14	2	4	1.8	3.6	4
8-90	1	9	9	4	4	3.8	3.8	4
Total	10		52				14.8	

$$\bar{x} = \frac{52}{10} = 5.2$$

$$M.d \text{ (about mean)} = \frac{1}{N} \Sigma f|x - \bar{x}|$$

$$= \frac{1}{10} \times 14.8 = 1.48$$

$$\text{Median} = L + \frac{(N/2) - (f_{prev})}{f} \times h$$

$$= 4 + \frac{(5-3)}{4} \times 2 = 4 + 1 = 5$$

$$M.D \text{ about median} = \frac{14}{10} = 1.4$$

(b) (2) Calculate the M.D for mean and median

Class	0-10	10-20	20-30	30-40	50-60	60-70
frequency	8	12	10	8	2	7

Class	f	Mid point(x)	x.f	d = x - 32	f|x - 32
0 - 10	8	5	40	27	216
10 - 20	12	15	180	17	204
20 - 30	10	25	250	7	70
30 - 40	8	35	280	3	24
40 - 50	3	45	135	13	39
50 - 60	2	55	110	23	46
60 - 70	7	65	455	33	231
Total	50		1600		Σ=830

$$\text{Mean} = \frac{1600}{50} = 32$$

$$\text{M.D (about mean)} = \frac{830}{50} = 16.6$$

$$\text{Median} = L + \left(\frac{\frac{N}{2} - Cf}{f}\right) \times h = 20 + \left(\frac{27.5 - 20}{10}\right) \times 10$$

$$= 27.5$$

$$\text{M.D about median} = \frac{760}{50} = 15.2.$$

8) calculate the standard Deviation and Variance

Value	90 - 99	80 - 89	70 - 79	60 - 69	50 - 59	40 - 49	30 - 39
frequency	2	12	22	20	14	4	1

class	x	f	$d = \frac{x - 64.5}{h}$	f.d	$f.d^2$
90 - 99	94.5	2	3	6	18
80 - 89	84.5	12	2	24	48
70 - 79	74.5	22	1	22	22
60 - 69	64.5	20	0	0	0
50 - 59	54.5	14	-1	-14	14
40 - 49	44.5	4	-2	-8	16
30 - 39	34.5	1	-3	-3	9
Total		75		27	127

$$\bar{X} = A + \frac{\Sigma f \cdot d}{\Sigma f} \times h$$

$$= 64.5 + \frac{27}{75} \times 10$$

$$= 64.5 + 3.6 = 68.1$$

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

$$\sigma = 10\sqrt{\frac{127}{75} - \left(\frac{27}{75}\right)^2}$$

$$= 10\sqrt{1699 - 0.1296}$$

$$= 10\sqrt{1.563} = 12.5$$

$$\sigma^2 = (12.5)^2 = 156.25$$

8.29) Calculate the first four moments about mean for the following and comment the nature of the distribution.

x_i	1	2	3	4	5	6	7	8	9
f_i	1	6	13	25	30	22	9	5	2

x	f	$x-\bar{x}$	$(x-\bar{x})^2$	$f(x-\bar{x})^2$	$(x-\bar{x})^3$	$f(x-\bar{x})^3$	$(x-\bar{x})^4$	$f(x-\bar{x})^4$
1	1	-3.23	13.91	13.91	-51.9	-51.9	193.7	193.7
2	6	-2.23	7.45	44.7	-120.8	-121.8	55.3	331.8
3	13	-1.23	2.99	38.9	-5.13	-67.3	8.96	116.5
4	25	-0.23	0.53	13.25	-0.39	-9.75	0.28	7.0
5	30	0.27	0.07	2.1	0.02	0.6	0.01	0.3
6	22	1.27	1.61	35.4	2.04	44.9	2.58	56.8
7	9	2.27	5.15	46.3	11.8	106.2	27	243.0
8	5	3.27	10.7	53.5	35.0	175	114	570
9	2	4.27	18.2	36.4	77.9	155.7	333	666
Total	113			274.5		231.5		2185

Mean = $\frac{534}{113} = 4.73$

$\mu_2 = \frac{\Sigma f(x - \bar{x}^2)}{N}$

$= \frac{234.6}{113} = 2.49$

$\mu_3 = \frac{231.5}{113} = 2.05$

$\mu_4 = \frac{2185}{113} = 19.33$

Skewness

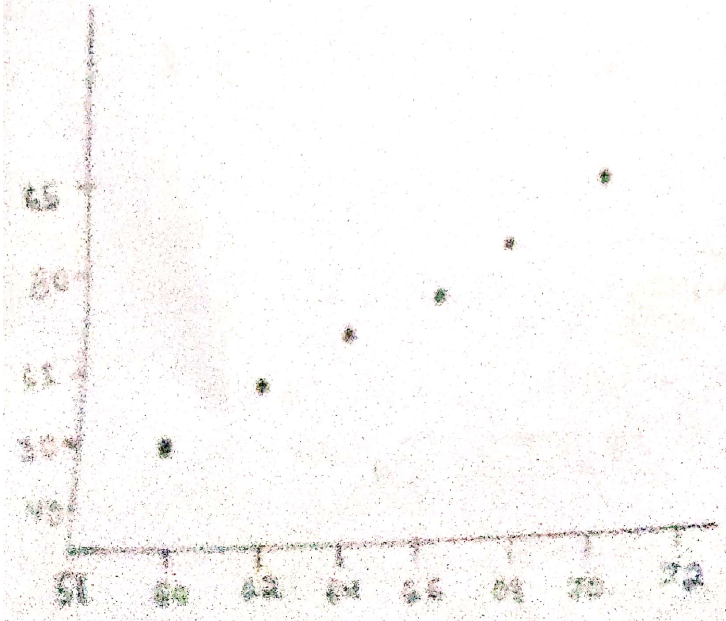
$\beta_1 = \frac{\mu_3^2}{\mu_2^3} = \frac{(2.05)^2}{(2.49)^2} = \frac{4.2}{14.36} = 0.29$

Kurtosis

$\beta_2 = \frac{\mu_4}{\mu_2^2} = \frac{19.33}{(2.49)^2} = \frac{19.33}{6.2} = 3.12$

Plot a scatter plot for the following one the height and weight of 10 student of a class.

Height	62	72	68	58	65	70	66	69	60	72
Weight	50	65	63	60	54	60	61	55	54	65



2) Calculate Karl pearson's coefficient of correlation between expenditure on advertising and sales from the data given below:

Expenditure	39	65	62	90	82	75	25	98	36	78
Sales	47	53	58	86	62	68	60	91	51	84

x	y	x^2	y^2	xy
39	47	1521	2209	1833
65	53	4225	2809	3445
62	58	3844	3364	3596
90	86	8100	7396	7740
82	62	6724	3844	5084
75	68	5625	4624	5100
25	60	625	3600	1500
98	91	9604	8281	8918
36	51	1296	2601	1836
78	84	6804	7056	6552
Total		47648		

$\Sigma x = 650$, $\Sigma y = 662$, $\Sigma x^2 = 47648$, $\Sigma y^2 = 45684$, $\Sigma xy = 45392$

$$r = \frac{n\Sigma xy - \Sigma x \Sigma y}{\sqrt{(n\Sigma x^2 - (\Sigma x)^2)(n\Sigma y^2 - (\Sigma y)^2)}}$$

$$r = \frac{10(45392) - (650)(662)}{\sqrt{[10(47648) - 650^2][10(45684) - 662^2]}}$$

$$r = \frac{23620}{\sqrt{53980 \times 25096}} = \frac{23620}{25000} = 0.94$$

Calculate Spearman's Rank Correlation.

x_i	39	65	62	90	82	75	25	98	36	78
y_i	47	53	58	86	62	68	60	91	51	89

X	Rank X	Y	Rank Y	$d = R_x - R_y$	d^2
25	10	47	10	0	0
36	9	51	9	0	0
39	8	53	8	0	0
62	6	58	7	-1	1
65	5	60	6	-1	1
75	4	62	5	-1	1
78	3	68	4	-1	1
82	2	84	3	-1	1
90	1	86	2	-1	1
98	0	91	1	-1	1
					$\Sigma d^2 = 7$

$$r_s = 1 - \frac{6\Sigma d^2}{n(n^2-1)}$$

$$r_s = 1 - \frac{6 \times 7}{10(100-1)} = 1 - \frac{42}{990}$$

$$= 1 - 0.042 = 0.958$$

Q39) Calculate line of Regression Eqn:

Sales	91	97	108	121	67	124	51	73	111	57
Purchases	71	75	69	97	70	91	39	61	80	47

Soln

X	Y	$X-\bar{X}$	$Y-\bar{Y}$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})(Y-\bar{Y})$
91	71	1	1	1	1	1
97	75	7	5	49	25	35
108	69	18	-1	324	1	-18
121	97	31	27	961	729	837
67	70	-23	0	529	0	0
124	91	34	21	1156	441	714
51	39	-39	-31	1521	961	1209
73	61	-17	-9	289	81	153
111	80	21	0	441	100	210
57	47	33	23	1089	529	759
900	700			6360	2868	3906

$\bar{X} = \frac{900}{10} = 90$

$\bar{Y} = \frac{700}{10} = 70$

a) Regression of Y on X $= byx = \frac{3900}{6360} = 0.613$

b) Regression of X on Y $= bxy = \frac{3900}{2868} = 1.36$

$Y - \bar{Y} = byx (X - \bar{X})$

$Y - 70 = 0.613 (X - 90)$

$Y = 0.613X + (70 - 0.613 \times 90)$

$\boxed{Y = 0.613X + 15.83}$

$X - \bar{X} = bxy (Y - \bar{Y})$

$X - 90 = 1.36 (Y - 70)$

$X = 1.36Y + (90 - 1.36 \times 70)$

$\boxed{X = 1.36Y - 5.2}$