Module-4

1. By Karl Pearson's Correlation Coefficient

x	10	12	18	24	23	27
y	13	18	12	25	30	10

$\bar{x} = 19$

$\bar{y} = 18$.

$\Sigma xy = (-9)(-5) + (-7)(0) + (-1)(-6) + (5)(7) + (4)(12) + (8)(-8)$

$= 45 + 6 + 35 + 48 - 64$

$= 70$

$\Sigma x^2 = 81 + 49 + 1 + 25 + 16 + 64 = 236$

$\Sigma y^2 = 25 + 36 + 49 + 144 + 64 = 318$

$$= \frac{70}{\sqrt{236 \times 318}} = \frac{70}{\sqrt{75048}} = \frac{70}{273.94}$$

$r = 0.2555$

2)

Rank by A	1	6	5	10	3	2	4	9	7	8
Rank by B	3	5	8	4	7	10	2	1	6	9
Rank by C	6	4	9	8	1	2	3	10	5	7
$r_2 - r_1$	2	-1	3	-6	4	8	-2	-8	-1	1
$r_3 - r_1$	5	-2	4	-2	-2	0	-1	1	-2	-1
$r_3 - r_2$	3	-1	1	4	-6	-8	1	9	-1	-2
D_1^2	4	1	9	36	16	64	4	64	1	1
D_2^2	25	4	16	4	4	0	1	1	4	1
D_3^2	9	1	1	16	36	64	1	81	1	4

$$\rho_1 = 1 - \frac{6(200)}{10(99)} = -0.2121$$

$$\rho_2 = 1 - \frac{6(60)}{10(99)} = 0.6363$$

$$\rho_3 = 1 - \frac{6(214)}{10(99)} = -0.2969$$

3)

x	68	64	75	50	64	80	75	40	55	64
y	62	58	68	45	81	60	68	48	50	70
r1	4	6	2.5	9	6	1	2.5	10	8	6
r2	5	7	3.5	10	1	6	3.5	9	8	2
D	1	1	1	1	-5	5	1	0	1	-4
D^2	1	1	1	1	25	25	1	0	1	16

exr 75 repeated 2 times mean $= \frac{2+3}{2} = 2.5$

For 75 :- $\frac{2(4-1)}{12} = \frac{6}{12} = 0.5$

For 64 :- $\frac{3(9-1)}{12} = \frac{3\times 8}{12} = 2.$

For 68 = $\frac{2(4-1)}{12} = 0.5$ $\Sigma D^2 = 72$

$$1 - \frac{6(72+3)}{99(10)}$$

$$= 1 - \frac{\cancel{6}^{\,8}(\cancel{78})^{\cancel{15}\,5}}{\cancel{99}_{\cancel{33}\,11}(\cancel{10})_{2}} = 1 - \frac{5}{11}$$

$$= 0.5454$$

4) From formula for rank Correlation, we note that r is max if $\Sigma(x_i - y_i)^2$ is minimum.

The minimum of Summation of Sq elements is 0

Hence the max value of r is +1 as of formula.

$$1 - \frac{6\left(\Sigma (x_i - y_i)^2\right)}{n(n^2-1)} = 1 - 0 = 1.$$

and γ is min if $\Sigma (x_i - y_i)^2$ is max, that is, if each of $(x_i - y_i)^2$ is max. That Case occurs as the following table occurs in worst Case.

x	1	2	3	...	$n-2$	$n-1$	n
y	n	$n-1$	$n-2$	...	3	2	1

There are 2 Cases in it

Case 1:- n is odd

Values of $\Sigma (x_i - y_i) = 2m, 2m-2, 2m-4 \ldots 4, 2, 0, -2, -4 \ldots$
$-(2m-2), -2m.$

$$\Sigma (x_i - y_i)^2 = 2\left\{(2m)^2 + (2m-2)^2 + \cdots + 4^2 + 2^2\right\}$$

$$= 8\left\{m^2 + (m-1)^2 + \cdots + 1^2\right\} =$$

$$= \frac{8m(m+1)(2m+1)}{6}$$

$$\gamma = 1 - \frac{8(m)(m+1)(2m+1)}{(2m+1)\left\{(2m+1)^2 - 1\right\}}$$

$$= 1 - \frac{\cancel{8}^{\,2} m (m+1)}{\cancel{4}m^2 + \cancel{4}m} = -1$$

Case 2:- let n be even ~~[illegible]~~

So for more no of values

$$(2m-1)\ (2m-3), \ldots 1, -1, -3, \ldots -(2m-1)$$

$$= 2\left\{(2m-1)^2 + \cdots + 1^2\right\}$$

$$= 2\left[\left\{(2m)^2 + (2m-1)^2 + \cdots + 2^2 + 1^2\right\} - \left\{(2m)^2 + (2m-2)^2 + \cdots + 4^2 + 2^2\right\}\right]$$

$$= 2\left[\frac{2m(2m+1)(4m+1)}{6} - \frac{4m(m+1)(2m+1)}{6}\right]$$

$$= \frac{1}{3}\left[2m(2m+1)\left(4m+1 - 2(m+1)\right)\right]$$

$$= \frac{1}{3}\left[2m(2m+1)\left[\overbrace{\cancel{4m} + \cancel{1} - \cancel{2m} - \cancel{2}}^{2m-1}\right]\right]$$

$$\frac{2m}{3}\left[(4m^2-1)\right]$$

$$= \frac{2m}{3}\left[4m^2-1\right].$$

$$\Rightarrow 1 - \frac{\overset{2}{\cancel{6}} \times \cancel{2m\left[4m^2-1\right]}}{\cancel{6} \times \cancel{2m(4m^2-1)}} = -1$$

5)

x	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
y	10	7	2	6	4	8	3	1	11	15	9	5	14	12	13
D	9	5	-1	2	-1	2	-4	-7	2	5	-2	-7	1	-2	-2
D^2	81	25	1	4	1	4	16	49	4	25	4	49	1	4	4

$$1-\frac{6\,\Sigma D^2}{n(n^2-1)} = 1-\frac{\overset{3}{\cancel{6}}\times 272}{\underset{5}{\cancel{15}}(\underset{112}{\cancel{224}})}$$

$$= 1-0.4857$$

$$= 0.5143$$

6.) If α is angle between 2 regression lines of 2 variables x & y then $\tan\alpha = \left(\frac{1-r^2}{r}\right)\frac{\sigma_x\sigma_y}{\sigma_x^2+\sigma_y^2}$

Eqn of 2 regression lines are

$$y-\bar{y} = r\frac{\sigma_y}{\sigma_x}(x-\bar{x}) \quad — (1)$$

and $x-\bar{x} = r\frac{\sigma_x}{\sigma_y}(y-\bar{y}) \quad — (2)$

slope of (1) $= r\frac{\sigma_y}{\sigma_x} = m_1$

slope of (2) $= r\frac{\sigma_x}{\sigma_y}$ but we can write

$m_2 = \frac{\sigma_y}{r\sigma_x}$ from (1) w.k.T $\tan\alpha = \dfrac{m_2 - m_1}{1 + m_1 m_2} = \dfrac{\frac{1}{r}\frac{\sigma_y}{\sigma_x} - r\frac{\sigma_y}{\sigma_x}}{1 + \frac{\sigma_y^2}{\sigma_x^2}} = \dfrac{\frac{\sigma_y}{\sigma_x}\left[\frac{1-r^2}{r}\right]}{\frac{\sigma_x^2+\sigma_y^2}{\sigma_x^2}}$

$$\boxed{\tan\alpha = \frac{\sigma_x \sigma_y}{\sigma_x^2+\sigma_y^2}\left[\frac{1-r^2}{r}\right]}$$

7) $\sigma_x = \sigma_y = \sigma$ and $\tan\theta = 3$.

w.k.T: $\tan\theta = \dfrac{1-r^2}{r} \cdot \dfrac{\sigma_x \sigma_y}{\sigma_x^2+\sigma_y^2}$

$3 = \dfrac{1-r^2}{r} \dfrac{\cancel{\sigma^2}}{2\cancel{\sigma^2}} \Rightarrow 6r = 1 - r^2$

$r^2 + 6r - 1 = 0.$

$\dfrac{-6 \pm \sqrt{36+4}}{2} = \dfrac{-6 \pm 2\sqrt{10}}{2}$

$= -3 \pm \sqrt{10}.$

$-3 + 3.16$ (or) $-3 - 3.16$

~~Since~~ ~~r~~ 0.1622 (or) -6.1622

8) $\sigma_y = 2\sigma_x \quad r = 0.25$

9)

10)

$$\tan\theta = \frac{1 - 0.0625}{0.25}\left[\frac{2\cancel{\sigma_x^2}}{5\cancel{\sigma_x^2}}\right]$$

$$= \frac{0.9375 \times 2}{1.25} = \frac{1.875}{1.25}$$

$$= 1.5$$

9) $y - 14.8 = 0.99 \times \frac{2.5}{3.6}(12 - 7.6)$

$$= \frac{0.99 \times 2.5 \times 4.4}{3.6}$$

$y = 3.025 + 14.8$

$y = 17.825$

10)

Price	10	12	13	12	16	15	$= 13$
Amounts	40	38	43	45	37	43	$= 41$
x	3	1	0	1	-3	-2	
y	1	3	-2	-4	4	-2	
xy	3	3	0	-4	-12	4	$= -6$
x^2	9	1	0	1	9	4	$= 24$
y^2	1	9	4	16	16	4	$= 50$

y on x $\quad y - \bar{y} = b_{yx}(x - \bar{x})$

$r = 1 - r^2$

$6r - 1 = 0$

$-3 - 3.16$

-6.16^2

$$b_{yx} = \frac{\Sigma xy}{\Sigma x^2} = \frac{-\cancel{8}\,1}{\cancel{24}\,4} = \frac{-1}{4}$$

$$= -0.25$$

$$y - 41 = -0.25\,(x - 13)$$

$$y - 41 = -0.25x + 3.25$$

$$y + 0.25x = 44.25$$

$$y = \quad + 39.25$$

Part B

1.

Maths	85	60	73	40	90
Stat	93	75	65	50	80
Math	2	4	3	5	1
Stat	1	3	4	5	2
D	1	1	-1	0	-1
D^2	1	1	1	0	1

$= 4$

$$1 - \frac{6(4)}{5(24)} = 1 - \frac{1}{5} = 0.8$$

-0.25

2.

x	12	9	8	10	11	13	7	
y	14	8	6	9	11	12	13.	
X	-2	1	2	0	-1	-3	3	
Y	-3.57	2.43	4.43	1.43	-0.57	-1.57	-2.57	
XY	7.14	2.43	8.86	0	0.57	4.71	-7.71	= 16
X^2	4	1	4	0	1	9	9	= 28
Y^2	12.74	5.90	19.62	2.04	0.32	2.46	6.60	= 49.68.

$\bar{x} = 10 \quad \bar{y} = 10.43.$

$$r = \frac{16}{\sqrt{28 \times 49.68}} = \frac{16}{37.29}$$

$$r = 0.4289 = 0.43$$

3. Rank correlation Coefficient, Commonly denoted as Spear's.man Problem ρ (rho) measures strength & direction

1. Ranges from -1 to +1 → Perfect -ve Corelation
   → Perfect +ve Corelation
   0 → no Correlation

2. Rank Correlation does not assume normal distribution.

3. The rank Correlation Coeff is symmetric.

R	1	2	3	4	5	6	7	8	9	10	
A	45	70	65	30	90	40	50	75	85	60	= 61
S	35	90	70	40	95	40	80	80	80	50	= 66
X	16	-9	-4	31	-29	21	11	-14	-24	1	
Y	31	-24	-4	26	-29	26	-14	-14	-14	16	
X^2	256	81	16	961	841	441	121	196	576	1	= 3490
Y^2	961	576	16	676	841	676	196	196	196	256	= 4590
XY	496	216	16	806	841	546	-154	196	336	16	= 3315

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}} = \frac{3315}{\sqrt{3490 \times 4590}}$$

$$r = 0.828$$

4.

W	100	101	102	102	100	99	97	98	96	= 99.44
C	98	99	99	97	95	92	95	94	98	= 95.44
X	-0.56	-1.56	-2.56	-2.56	-0.56	0.44	2.44	1.44	3.44	
Y	-2.56	-3.56	-3.56	-1.56	0.44	3.44	0.44	1.44	5.44	
X^2	0.31	2.43	6.55	6.55	0.31	0.19	5.95	2.07	11.83	= 36.19
Y^2	6.55	12.67	12.67	2.43	0.19	11.83	0.19	2.07	29.59	= 78.19
XY	1.43	5.55	9.11	3.99	-0.24	1.51	1.07	2.07	18.71	= 43.2

$$r = \frac{\Sigma XY}{\sqrt{\Sigma x^2 \Sigma Y^2}} = \frac{43.2}{\sqrt{78.19 \times 36.19}}$$

$$= 0.8191$$

5. Rank

F
P
X
Y

6)

Age	0-
N	10
B	
E	9
O-E	-
x^2	

O = Obser

9	10	
85	60	
80	50	= 61
-24	1	= 66
-14	26	
576	1	= 3490
76	256	= 4590
6	16	= 3315

5

490 × 4590

6	= 99.44
5	= 99.44
44	
44	
83	= 36.19
59	= 78.19
71	= 43.2

43.2

78.19 × 36.19

5. Rank correlation Coeff Properties

F	15	18	20	24	30	35	40	50	= 29
P	85	93	95	105	120	130	150	160	= 117.25
x	14	11	9	5	-1	-6	-11	-21	
y	32.25	24.25	22.25	12.25	-2.75	-12.75	-32.75	-42.75	
x^2	196	121	81	25	1	36	121	441	= 1022
y^2	1040.06	588.06	495.06	150.06	7.56	162.56	1072.56	1827.56	= 5343.48
xy	451.5	266.75	200.25	61.25	-2.75	76.5	360.25	897.75	= 2311.5

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}} = \frac{2311.5}{\sqrt{1022 \times 5343.48}}$$

$$r = 0.9891$$

6) $E = N \times \frac{\text{Total no of Blind}}{\text{Total no. of People}} = N \times \frac{266}{280}$

Age	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	
N	100	60	40	36	24	11	6	3	280
B	55	40	40	40	36	22	18	15	266
E	95	57	38	34.2	22.8	10.45	5.7	2.85	
O-E	-40	-17	2	5.8	13.2	11.55	12.3	12.25	
χ^2	16.84	5.07	0.11	0.98	7.64	12.77	26.52	51.82	121.75

O = Observed = Blinded people $\qquad \chi^2 = (O-E)^2/E$

Degree of freedom = Rows − 1
= 8 − 1 = 7.

5% Significance is Considered for chi-sq.

So ~~[illegible]~~ = ~~[illegible]~~ For 0.05 the value from table for 7 is 14.07.

So there is dependencies b/w age & blindness

7

S	1	2	3	4	5	6	7	8	9	10
M	2	4	1	5	3	9	7	10	6	8
D	1	2	−2	1	−2	3	0	2	−3	−2
D^2	1	4	4	1	4	9	0	4	9	4

$D^2 = 40$

$$\rho = 1 - \frac{\overset{2}{\cancel{6}}(4\cancel{0})}{1\cancel{0}(\underset{33}{\cancel{99}})} \quad 1 - \frac{8}{33}$$

$\rho = 0.7576$

8.

M	1	2	3	4	5	6	7	8	9	10	11	12	13
S	1	10	3	4	5	7	2	6	8	11	15	9	14
D	0	8	0	0	0	1	-5	-2	-1	1	4	-3	1
D^2	0	64	0	0	0	1	25	4	1	1	16	9	1

M	14	15	16
S	12	16	13
D	-2	1	-3
D^2	4	1	9

$$1 - \frac{\cancel{6}^{\,3}(\cancel{136})\ \cancel{68}\ 17}{\cancel{16}_{\cancel{8}\,4}(\cancel{255})\ 85} = 1 - \frac{17}{85} = 1 - \frac{1}{5}$$

$$= \frac{4}{5} = 0.8$$

9.

F	65	63	67	64	68	62	70	66	68	69	71	Avg. 66.63
S	68	66	68	65	69	66	68	65	71	68	70	67.63
x	1.63	3.63	-0.37	2.63	-1.37	4.63	-3.37	0.63	-1.37	-2.37	-4.37	
y	-0.37	1.63	-0.37	2.63	-1.37	1.63	-0.37	2.63	-3.37	-0.37	-2.37	
x^2	2.65	13.17	0.13	6.91	1.87	21.43	11.35	0.39	1.87	5.61	19.09	84.47
y^2	0.13	2.65	0.13	6.91	1.87	2.65	0.13	6.91	11.35	0.13	5.61	38.47
xy	-0.60	5.91	0.13	6.91	1.87	7.54	1.24	1.65	4.61	0.87	10.35	40.48

$$r = \frac{40.48}{\sqrt{84.47 \times 38.47}} = 0.71$$

10)

x	48	33	40	9	16	16	65	24	16	57	
y	13	13	24	6	15	4	20	9	6	19	
r_1	3	5	4	10	8	8	1	6	8	2	
r_2	5.5	5.5	1	8.5	4	10	2	7	8.5	3	
D	2.5	0.5	-3	-1.5	-4	-2	1	1	0.5	1	
D^2	6.25	0.25	9	2.25	16	4	1	1	0.25	1	41

Repeated 16 $m=3$ $C.F = \frac{m(m^2-1)}{12} = 2$

13 $m=2$ $CF = 0.5$

6 $m=2$ $CF = 0.5$

$$1 - \frac{6(41+3)}{10(99)} = 1 - \frac{\cancel{6}^{3}(\cancel{44})^{4}}{\cancel{10}_{5}(\cancel{99})_{\cancel{9}\,3}}$$

$$1 - \frac{4}{15} = 0.74$$

11)

x	10	12	13	16	17	20	25	16.14
y	10	22	24	27	29	33	37	26
X	6.14	4.14	3.14	0.14	-0.86	-3.86	-8.86	
Y	16	4	2	-1	-3	-7	-11	
x^2	37.69	17.13	9.85	0.019	0.73	14.89	78.5	= 158.80
y^2	256	16	4	1	9	49	121	= 456
xy	98.24	16.56	6.28	-0.14	2.58	27.02	97.46	= 248

12)

6	57	
6	19	
8	2	
	3	
	1	
	1	41

$\frac{m^2-1)}{2} = 2$

4

93

$= 0.74$

76.14

26

158.80

56

248

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \sum x^2}} = 0.927$$

$$b_{yx} = \frac{\sum xy}{\sum x^2} = \frac{248}{158.8} = 1.56$$

w.k.T $\sum y = na + b\sum x$

$$a = \frac{182 - 1.56 \times 113}{7}$$

$$= \frac{182 - 176.28}{7}$$

$$= 0.81$$

$y = 0.81 + 1.56x$

12)

T	0	20	40	60	80	= 200 = 40
S	54	65	75	85	96	= 375 = 75
x	40	20	0	-20	-40	
y	21	10	0	-10	-21	
x^2	1600	400	0	400	1600	= 4000
y^2	441	100	0	100	441	= 1082
xy	840	200	0	200	840	= 2080

$$r = \frac{2080}{\sqrt{4000 \times 1082}} = 0.9998$$

$b_{yx} = 0.52$

$\sum y = na + b\sum x$

$\bar{y} = na + b\bar{x}$

$$\frac{75 - 0.52 \times 40}{5} = 54.2$$

$= 87.2$

13.) $\Sigma x = 11.34$ $n = 200$

$\Sigma x^2 = 12.16$ $\Sigma y = 20.78$

$\Sigma y^2 = 84.96$ $\Sigma xy = 22.13$

$b_{yx} = \dfrac{22.13}{\sqrt{\cancel{12.16 \times 84.96}}}$ $= \cancel{0.688} \cdot 2\ 1.81$

12.16

$$\frac{20.78 - 1.819 \times 11.34}{200} = a$$

$$a = 0.0007$$

$$\cancel{y = 0.0007 + 0.688x}$$

$$y = 0.0007 + 1.819x$$

$).42 \times 200$

14) $\sigma_x = \sigma_y = \sigma$ & $\tan\theta = \frac{4}{3} = \frac{1-r^2}{r} \cdot \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}$

$$\frac{4}{3} = \frac{1-r^2}{r} \cdot \frac{\cancel{\sigma^2}}{2\cancel{\sigma^2}}$$

$$8r = 3 - 3r^2$$

$$3r^2 + 8r - 3 = 0$$

$$-3 \pm \sqrt{10}$$

$$= 0.1622 \text{ (or) } -6.1622$$

15)

x	2	4	6	8	10	12	14	= 8
y	4	2	5	10	4	11	12	= 6.85
X	6	4	2	0	-2	-4	-6	=
Y	2.85	4.85	1.85	-3.15	2.85	-4.15	-5.15	=
X^2	36	16	4	0	4	16	36	= 112
Y^2	8.12	23.52	3.42	9.92	8.12	17.22	26.52	= 96.89
XY	17.1	19.4	9.72	0	-5.7	+16.6	+30.9	= 81

.81

$$b = \frac{81}{112} = 0.723$$

$a = \bar{y} - b\bar{x} = 6.887 - 0.723 \times 8 = 1.073$

$y = 1.073 + 0.723x$

$x = a + by$

$a = \bar{x} - b\bar{y}$

$b = \frac{\Sigma xy}{\Sigma y^2} = \frac{81}{96.89} = 0.836$

$= 8 - 0.836 \times 6.85$

$= 2.27$

$x = 2.274 + 0.836y.$

i) $x = 13$,

$y = 1.073 + 0.723 \times 13 = 10.51$

ii) $y = 11.5$

$x = 2.274 + 0.836 \times 11.5 = 11.819$

4) Interpretation of Regression coefficients

1.) Slope (b)

If $b > 0$ then relations ship x ↑es y ↑es

If $b < 0$ then " x ↓es y ↑es

Intercept (a) Represents value of dependent variable (y) when independent variable x is 0.

17)

18)

.85

.27

= 16.51

S = 11.819

cuts

xTes YTes

les YTes

nt Variable

is 0.

$r = \sqrt{b_{yx} b_{xy}} = \sqrt{0.399 \times 1.212} = 0.696$

17)

	Rainfall x	Production y
Avg	30	500 kgs
S.D	5	100 kgs

r 0.8.

$y - 500 = 0.8 \times 20 (10) = 8 \times 20$

$= 160.$

$y = 660$

18)

M	62	63	64	64	65	66	68	70
D	64	65	61	69	67	68	71	65
x	3.25	2.25	1.25	1.25	0.25	-0.75	-2.75	-4.75
y	2.25	1.25	5.25	-2.75	-0.75	-1.75	-4.75	1.25
x^2	10.56	5.06	1.56	1.56	0.06	0.56	7.56	22.56
y^2	5.06	1.56	27.56	7.56	0.56	3.06	22.56	1.56
xy	7.31	2.81	8.19	-3.43	-0.18	1.31	13.06	-5.93

= 65.25

= 66.25

= 49.48

= 23.14

$b = \frac{23.14}{49.48} = 0.4676$

$a = \bar{D} - b\bar{M} = 66.25 - 0.4676 \times 65.25$

$= 37.93$

$D = 37.93 + 0.4676 M$

$M = 64.5$

$D = 37.93 + 0.4676 \times 64.5 = \cancel{3...}$

68.09

19)

P	46	42	44	40	43	41	45	= 43
Q	40	38	36	35	39	37	41	= 38
x	-3	1	-1	3	0	2	-2	= 0
y	-2	0	2	3	-1	1	-3	= 0
xy	6	0	-2	9	0	2	6	= 21
x^2	9	1	1	9	0	4	4	= 28
y^2	4	0	4	9	1	1	9	= 28

$b_{xy} = \frac{21}{28} = \frac{3}{4} = 0.75 = b_{yx} = \frac{21}{28} = 0.75$

expected marks

$Q = \bar{Q} + b(P - \bar{P})$

$y - \bar{y} = m(x - \bar{x})$

$Q - \bar{Q} = b(P - \bar{P})$

as $\Sigma x = 0$ & $\Sigma y = 0$

$= 0.75(37 - 43) + 38$

$= 33.5$

20)

8.09

= 43

= 38

= 0

= 0.

21

28

28

$\frac{21}{28} = 0.75$

$(x-\bar{x})$

$\Sigma y = 0$

~~x~~	1	5	3	2	1	1	7	3	= 2.875
~~y~~	6	1	0	0	1	2	1	5	= 2.
X	1.87	-2.13	-0.13	0.87	1.87	1.87	-4.13	-0.13	
Y	-4	1	0	0	1	0	1	-3	
x^2	3.49	4.53	0.01	0.75	3.49	3.49	17.05	0.01	= 32.82
Y^2	16	1	0	0	1	0	1	9	= 28
XY	-7.48	-2.13	0	0	1.87	0	-4.13	0.39	= -11.48

$$b_{yx} = \frac{-11.48}{32.82} = -0.3497$$

$$a = 2 + 0.3497 \times 2.875$$

$$a = 3.005.$$

$$Y = 3.005 - 0.3497\,X.$$

$$b_{xy} = \frac{-11.48}{28} = -0.41$$

$$a = 2.875 + 0.41 \times 2$$

$$= 3.695.$$

$$X = 3.695 - 0.41\,Y$$

i). $x = ?$, $y = 2.5$

$$X = 3.695 - 0.41 \times 2.5 = 2.67$$

ii) $y = ?$, when $x = 10$.

$$Y = 3.005 - 0.3497 \times 10$$

$$= -0.492$$