Q1.

		A	B			
X	Y	$(X-\bar{X})$	$(Y-\bar{Y})$	$(X-\bar{X})^2$	$Y-Y^2$	A*B
4	4	-1.6	-1.8	2.56	3.24	2.88
5	6	-0.6	0.2	0.36	0.36	-0.12
3	5	-2.6	-0.8	6.76	0.64	2.08
6	7	0.4	1.2	0.16	1.44	0.48
10	7	4.4	1.2	19.36	1.44	5.28
28	29			29.2	6.8	10.6

$$\bar{X} = \frac{28}{5} = 5.6 \qquad \bar{Y} = \frac{29}{5} = 5.8$$

$$S_X = \sqrt{\frac{29.2}{4}} = 2.7 \qquad S_Y = \sqrt{\frac{6.8}{4}} = 1.3$$

$$r = \frac{10.6}{(5-1)(2.7)(1.3)} = 0.75$$

$$b = \frac{(0.75)(1.3)}{2.7} = 0.36$$

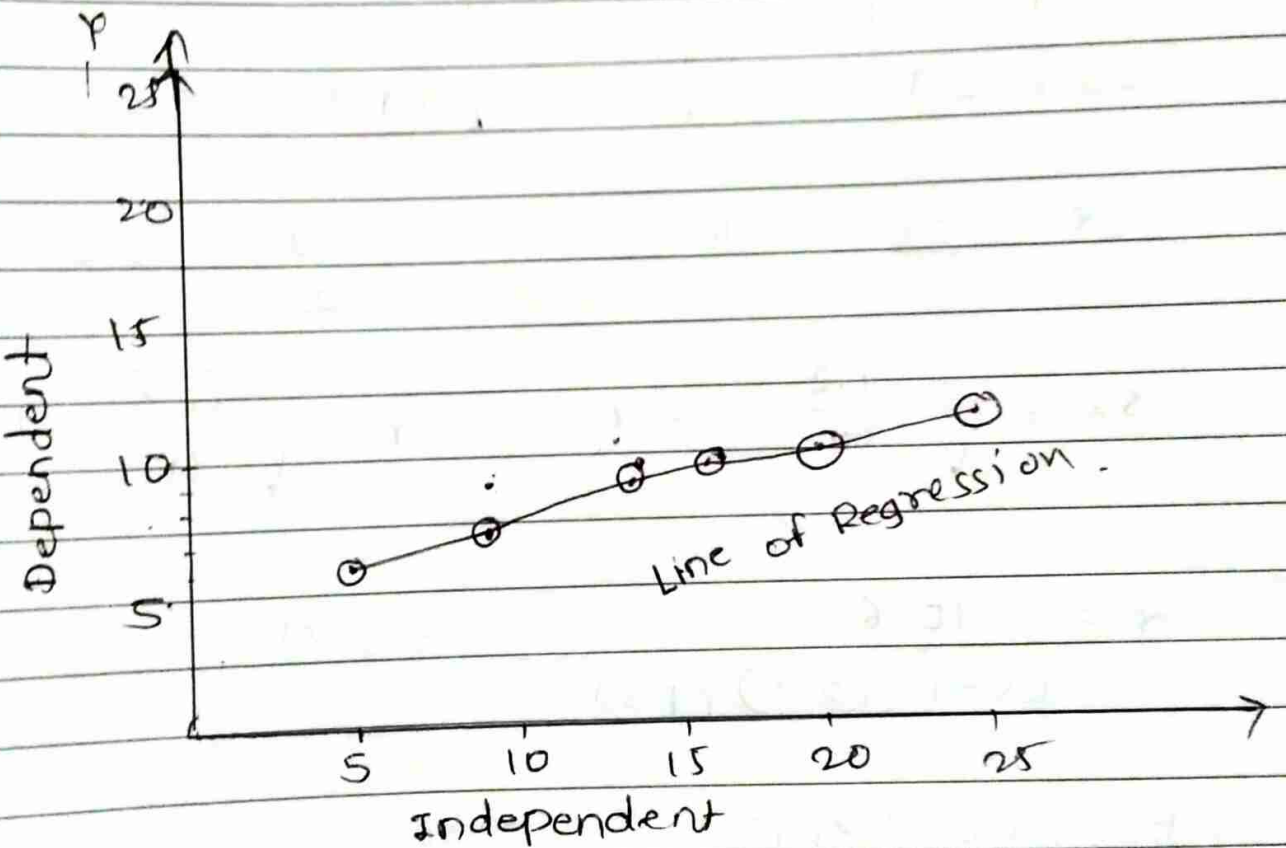
$$a = 5.8 - (0.36)(5.6)$$
$$= 3.78$$

$$\hat{Y} = 3.78 + 0.36X$$

$\hat{Y} = 3.78 + 0.36X$

Put

$x_1 = 5$	$Y_1 = 5.58$
$x_2 = 10$	$Y_2 = 7.38$
$x_3 = 14$	$Y_3 = 8.82$
$x_4 = 16$	$Y_4 = 9.54$
$x_5 = 20$	$Y_5 = 10.98$
$x_6 = 25$	$Y_6 = 12.78$



Q2.

			(A)	(B)			
Q2	X	Y	$x-\bar{x}$	$y-\bar{y}$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	A*B
	5	13	0.13	2.38	0.02	5.64	0.30
	3	15	-1.88	4.38	3.52	19.14	-8.20
	6	7	1.13	-3.63	1.27	13.14	-4.08
	3	12	-1.88	1.38	3.52	1.89	-2.58
	4	13	-0.88	2.38	0.77	5.64	-2.08
	4	11	-0.88	0.38	0.77	0.14	-0.33
	6	9	1.13	-1.63	1.27	2.64	-1.83
	8	5	3.13	-5.63	9.77	31.64	-17.58
	39	85			20.88	79.88	-36.38

$$\bar{X} = \frac{39}{8} = 4.88 \qquad \bar{Y} = \frac{85}{8} = 10.63$$

$$S_X = \sqrt{\frac{20.88}{7}} = 1.73 \qquad S_Y = \sqrt{\frac{79.88}{7}} = 3.38$$

$$r = \frac{-36.38}{(8-1)(1.73)(3.38)} = -0.89$$

$$b = \frac{(-0.89)(3.38)}{1.73} = -1.74$$

$$a = 10.63 - (-1.74)(4.8))$$
$$= 19.12$$

$$\hat{Y} = 19.12 + (-1.74)X$$

put

$x_1 = 5$
$x_2 = 8$
$x_3 = 10$
$x_4 = 15$
$x_5 = 20$
$x_6 = 23$
$x_7 = 25$
$x_8 = 30$

$y_1 = 10.42$
$y_2 = 5.20$
$y_3 = 1.72$
$y_4 = -6.98$
$y_5 = -15.68$
$y_6 = -20.90$
$y_7 = -24.38$
$y_8 = -33.08$

Q3

		A	B			
X	Y	$X-\bar{X}$	$Y-\bar{Y}$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	A*B
4	15	0	-2	0	4	0
2	8	-2	-9	4	81	18
5	21	1	4	1	16	4
6	24	2	7	4	49	14
3	17	-1	0	1	0	0
20	85			10	150	36

$$\bar{X} = \frac{20}{5} = 4 \qquad \bar{Y} = \frac{85}{5} = 17$$

$$S_X = \sqrt{\frac{10}{4}} = 1.58 \qquad S_Y = \sqrt{\frac{150}{4}} = 6.12$$

$$r = \frac{36}{(5-1)(1.58)(6.12)} = 0.93$$

$$b = \frac{(0.93)(6.12)}{1.58} = 3.60$$

$$a = 17 - (3.60)(4)$$

$$= 2.60$$

$$\hat{Y} = 2.60 + 3.60X$$

$\hat{Y} = 2.60 + 3.60X$

put

$X_1 = 5$ $\quad Y_1 = 20.6$

$X_2 = 8$ $\quad Y_2 = 31.4$

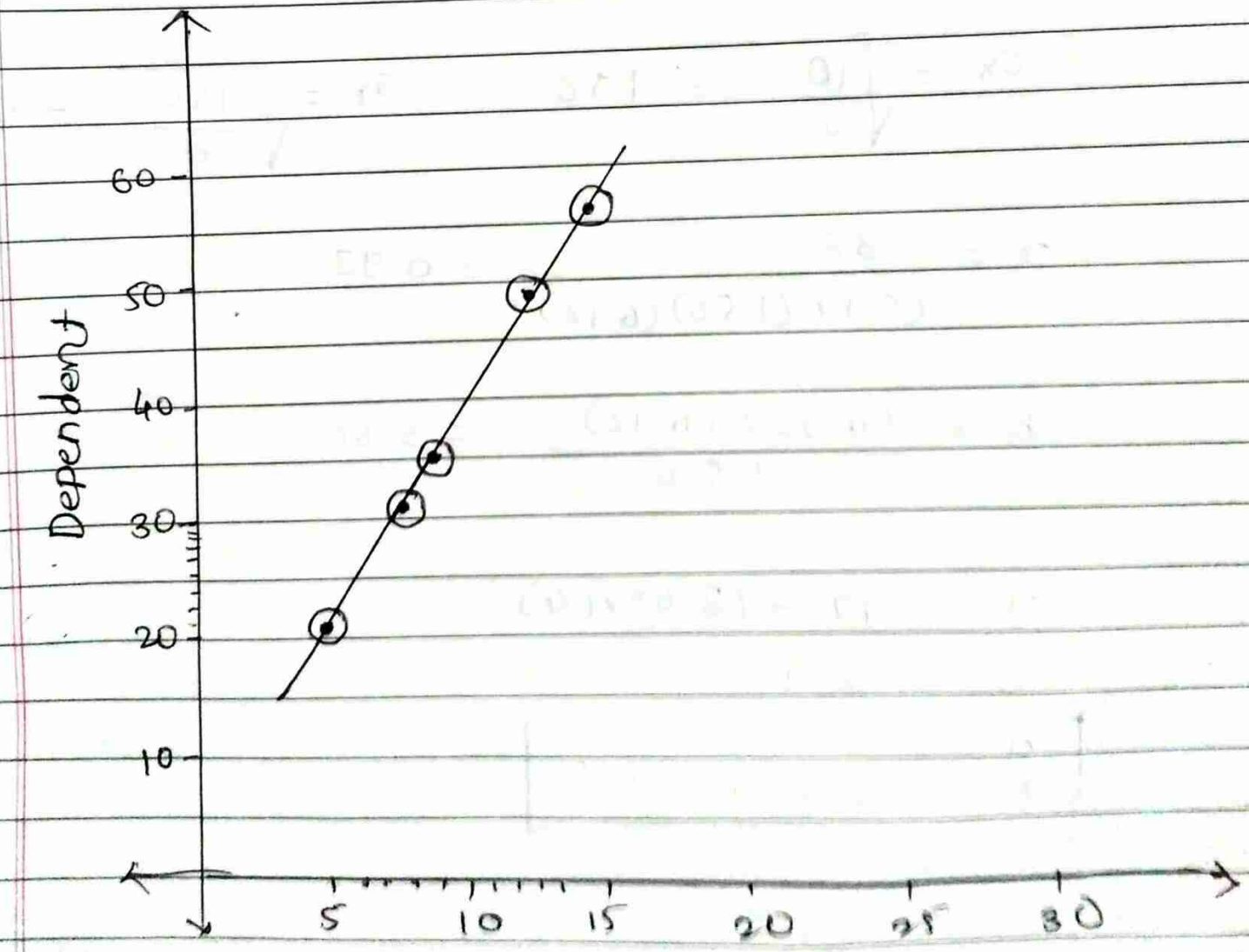
$X_3 = 9$ $\quad Y_3 = 35.0$

$X_4 = 13$ $\quad Y_4 = 49.4$

$X_5 = 15$ $\quad Y_5 = 56.6$

↑

independent



Indepent variable

Q4

		A	B			
X	Y	$(X-\bar{X})$	$(Y-\bar{Y})$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	A×B
2	15	-1	-9	1	11	9
4	25	1	1	1	1	1
1	10	-2	-14	4	196	21
5	40	2	16	4	256	32
3	30	0	6	0	36	0
15	120			10	570	70

$$\bar{X} = \frac{15}{5} = 3 \qquad \bar{Y} = \frac{120}{5} = 24$$

$$S_X = \sqrt{\frac{10}{4}} = 1.581 \qquad S_Y = \sqrt{\frac{170}{4}} = 11.937$$

$$r = \frac{70}{(5-1)(1.58)(11.937)} = 0.927$$

$$b = \frac{(0.927)(11.937)}{1.581} = 7$$

$$a = 24 - (7)(3)$$
$$= 3$$

$$\hat{Y} = 3 + 7X$$

$\hat{Y} = 3 + 7X$

put

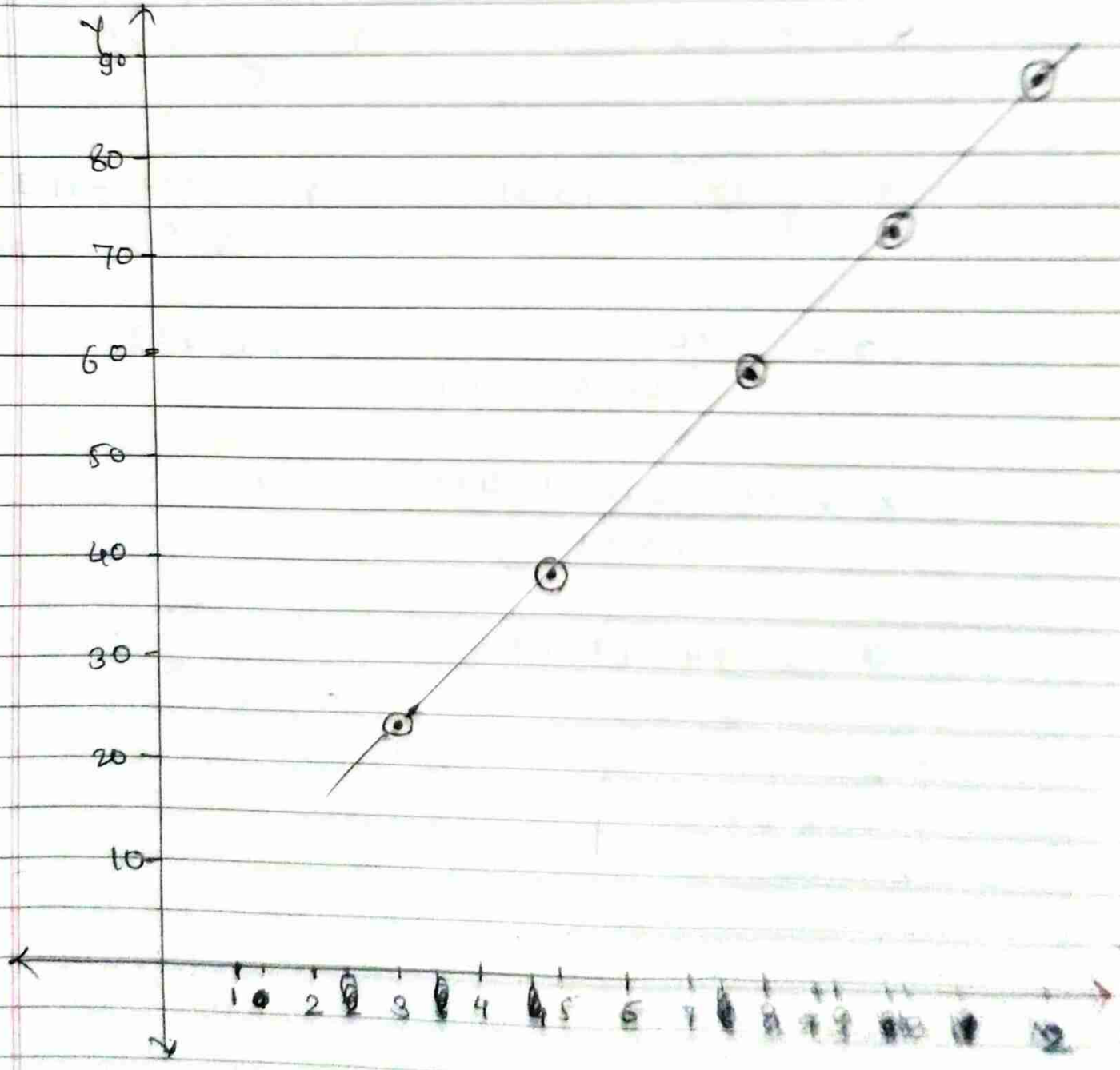
$X_1 = 3$ $\quad Y_1 = 24$

$X_2 = 5$ $\quad Y_2 = 38$

$X_3 = 8$ $\quad Y_3 = 59$

$X_4 = 10$ $\quad Y_4 = 73$

$X_5 = 12$ $\quad Y_5 = 87$



Q5

X	Y	$X-\bar{X}$	$Y-\bar{Y}$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})(Y-\bar{Y})$
15	17	-3.250	5.125	10.563	26.266	-16.656
17	13	-1.250	1.125	1.563	1.266	-1.406
25	5	6.750	-6.875	45.563	47.266	-46.406
27	7	8.750	-4.875	76.563	23.766	-42.656
17	7	-1.250	-4.875	1.563	23.766	6.094
12	21	-6.250	9.125	39.063	83.266	-57.031
11	19	-7.250	7.125	52.563	50.766	-51.656
22	6	-3.750	-5.875	14.063	34.516	-22.031
146	95			241.50	290.875	-231.750

$$\bar{X} = \frac{146}{8} = 18.25 \qquad \bar{Y} = \frac{95}{8} = 11.875$$

$$S_X = \sqrt{\frac{241.5}{7}} = 5.874$$

$$S_Y = \sqrt{\frac{290.875}{7}} = 6.446$$

$$r = \frac{-231.75}{(8-1)(5.874)(6.446)} = -0.874$$

$$b = \frac{(-0.874)(6.446)}{5.874} = -0.96$$

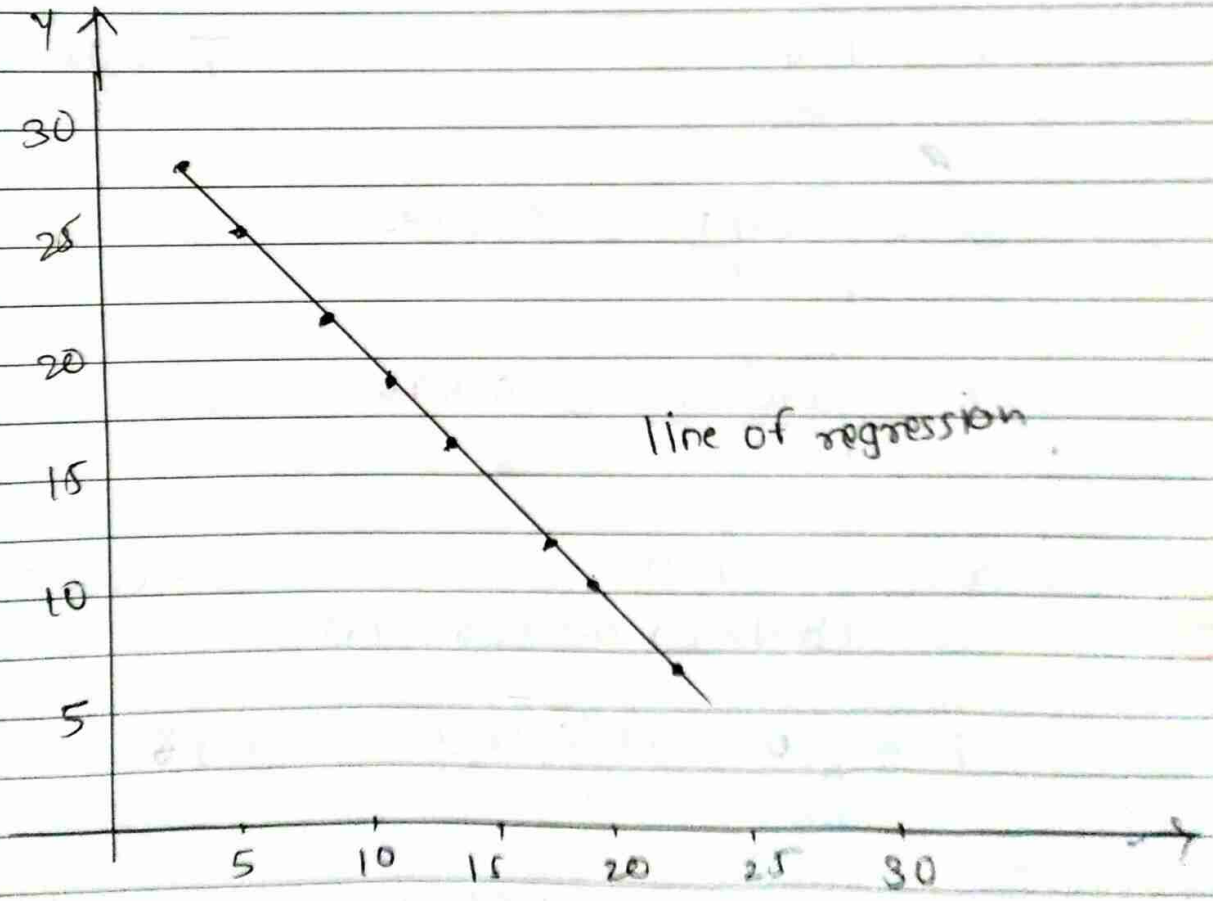
$$a = 11.875 - (-0.96)(18.25)$$
$$= 29.40$$

$$\hat{Y} = 29.40 + (-0.96)X$$

$\hat{Y} = 29.40 + (-0.96)X$

put

$x_1 = 3$	$Y_1 = 26.52$
$x_2 = 5$	$Y_2 = 24.60$
$x_3 = 7$	$Y_3 = 22.68$
$x_4 = 11$	$Y_4 = 18.84$
$x_5 = 13$	$Y_5 = 16.92$
$x_6 = 17$	$Y_6 = 13.08$
$x_7 = 19$	$Y_7 = 11.16$
$x_8 = 23$	$Y_8 = 7.32$



ε_1
ε_2
ε_n

Q7 Example 1.

Income	$\bar{X}$ hrs/week.
80	38
64	50
25	15
30	30
60	50
50	38
80	50
389	271

$\bar{Y} = \frac{389}{7}$

$\bar{X} = 55.57$

$\bar{X} = \frac{X}{7} = \frac{271}{7} = 38.71$

$\bar{Y} = 38.71$

Q7

X	Y	(A) $(x-\bar{x})$	(B) $(Y-\bar{Y})$	$(x-\bar{x})^2$	$(Y-\bar{Y})^2$	(A)*(B)
80	38	24.43	-0.7100	596.82	-0.5041	-17.345
64	50	8.430	11.29	71.064	127.46	95.174
25	15	-30.57	-23.71	-934.52	-562.16	724.81
80	30	-25.57	-8.710	-653.82	-75.86	222.71
60	50	4.430	11.29	19.624	127.46	50.0147
50	38	-5.570	-0.710	-31.024	-0.5041	3.956
80	50	24.43	11.29	596.82	127.46	275.81
				2903.69		1021.408

$S_X = \frac{2903.69}{6}$

$= 21.95$

$S_Y = \frac{1021.408}{6}$

$= 13.04$

A & B total = 1355.127

$$r = \frac{1355.127}{(6)(21.99)(13.04)}$$

$$\boxed{r = 0.7876}$$

$$b = \frac{r * Sy}{Sx} = \frac{0.7876 * 13.04}{21.99}$$

$$\boxed{b = 0.4670}$$

$$a = \bar{Y} - (b)(\bar{X})$$
$$= 38.71 - (0.4670)(55.57)$$
$$= 12.75$$

$$\boxed{a = 12.75}$$

$$\hat{Y} = a + bx$$
$$= 12.75 + 0.4670x$$

$$\boxed{\hat{Y} = 12.75 + 0.4670x}$$

			A	B			
Q8	X	Y	$x-\bar{x}$	$(Y-\bar{Y})$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	(A)*(B)
	9.0	8.1	0.083	1.192	0.007	1.420	0.099
	7.0	6.0	-1.917	-3.908	3.674	0.825	1.741
	11.0	3.6	2.083	-3.308	4.340	10.945	-6.967
	12.0	4.0	3.083	-2.908	9.507	8.458	8.719
	8.0	5.0	-0.917	-1.908	0.840	3.642	-1.926
	7.0	10.0	-1.917	3.092	3.674	9.558	-5.634
	8.0	7.6	-0.917	0.692	0.840	0.478	-0.274
	11.0	8.0	2.083	1.092	4.340	1.192	2.183
	10.0	8.0	1.083	1.092	1.1740	1.192	-1.801
	12.0	6.0	3.083	-0.908	9.507	0.825	-2.934
	6.0	8.6	-2.917	1.692	8.507	2.862	-4.934
	6.0	8.0	-2.917	1.092	8.507	1.192	-3.184
	107	82.90			54.917	42.589	-26.292

$\bar{X} = \frac{107}{12} = 8.917$ $\quad \bar{Y} = \frac{82.9}{12} = 6.908$

$SX = \sqrt{\frac{54.917}{11}} = 2.234$ $\quad SY = \sqrt{\frac{42.589}{11}} = 1.968$

$r = \frac{26.292}{(12-1)(2.234)(1.968)} = -0.544$

$b = \frac{(-0.544)(1.968)}{2.234} = -0.48$

$a = 6.908 - (-0.48)(8.917)$

$= 11.19$

$$\hat{Y} = 11.19 + (-0.48)X$$

Put

X_1	= 2	Y_1	= 10.23
X_2	= 3	Y_2	= 9.75
X_3	= 5	Y_3	= 8.79
X_4	= 7	Y_4	= 7.83
X_5	= 8	Y_5	= 7.35
X_6	= 10	Y_6	= 6.39
X_7	= 12	Y_7	= 5.43
X_8	= 15	Y_8	= 3.99
X_9	= 17	Y_9	= 3.03
X_{10}	= 19	Y_{10}	= 2.07
X_{11}	= 21	Y_{11}	= 1.11
X_{12}	= 23	Y_{12}	= 0.15