NO.:
DATE:

Linear Regression Activity

(1) Fill in the table

Student	Hours Studied (x)	Exam Score (y)	xy	x^2
1	1	52	52	1
2	2	57	114	4
3	3	61	183	9
4	4	65	260	16
5	5	76	350	25
	$\Sigma x = 15$	$\Sigma y = 305$	$\Sigma xy = 959$	$\Sigma x^2 = 55$

(2) Compute the slope

$$m = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{n(\Sigma x^2) - (\Sigma x)^2} = \frac{5(959) - 15(305)}{5(55) - 15^2}$$

$$= \frac{4795 - 4575}{275 - 225} = \frac{220}{50}$$

$$\boxed{m = 4.4}$$

(3) Compute the Intercept b

$$b = \frac{\Sigma y - m\Sigma x}{n} = \frac{305 - 4.4(15)}{5}$$

$$b = \frac{305 - 66}{5} = \frac{239}{5}$$

$$\boxed{b = 47.8}$$

(4) Regression Equation

$y = mx + b$ $\quad y = 4.40x + 47.80$

(5) Draw the regression line using a scatter plot : $y = 4.4x + 47.8$:

Student	Hours Studied (x)	Exam Score (y)	Predicted Exam Score ($y_{predict}$)
1	1	52	52.2
2	2	57	56.6
3	3	61	61.0
4	4	65	65.4
5	5	76	69.8

Solution :

(1) $y = 4.4(1) + 47.8 = 52.2$

(2) $y = 4.4(2) + 47.8 = 56.6$

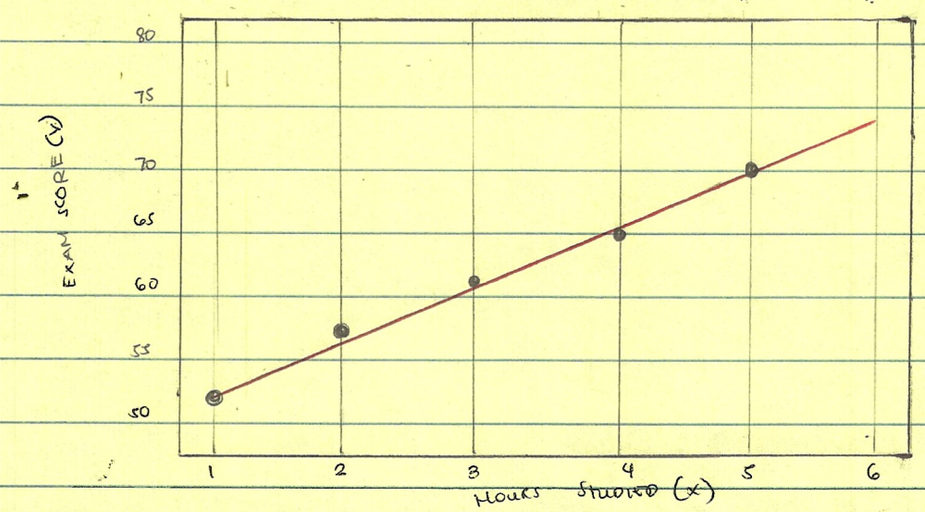
(3) $y = 4.4(3) + 47.8 = 61.0$

(4) $y = 4.4(4) + 47.8 = 65.4$

(5) $y = 4.4(5) + 47.8 = 69.8$

NO.:
DATE:

(5) Draw the regression line using a scatter plot



(6) Calculate the Sum of Squared Errors

Student	Hours Studied (x)	Exam Score (y)	Predicted Exam Score (ypred)	$y_i - y_{predict}$	$(y_i - y_{predict})^2$
1	1	52	52.2	-0.2	0.04
2	2	57	56.6	0.4	0.16
3	3	61	61.0	0.0	0.00
4	4	65	65.4	-0.4	0.16
5	5	70	69.8	0.2	0.04
SSE = 0.04 + 0.16 + 0 + 0.16 + 0.04					SSE = 0.40

(7) Calculate the Sum of Squared Total

Get $\bar{y}$ using this formula

$$\bar{y} = \frac{\sum y_i}{n} \qquad \bar{y} = \frac{305}{5} = 61$$

Get SST using this formula

$$SST = \sum (y_i - \bar{y})^2$$

Student	Hours Studied (x)	Exam Score (y)	Mean ($\bar{y}$)	$y_i - \bar{y}$	$(y_i - \bar{y})^2$
1	1	52	61	-9	81
2	2	57	61	-4	16
3	3	61	61	0	0
4	4	65	61	4	16
5	5	70	61	9	81
$SST = (-9)^2 + (-4)^2 + 0^2 + 4^2 + 9^2 = 81 + 16 + 0 + 16 + 81 =$					194

NO.:
DATE:

(8) Compute R^2

Get R^2 using this formula

$$R^2 = 1 - \frac{SSE}{SST} = 1 - \frac{0.40}{194} = \boxed{0.997}$$

(9) Prediction

Use your equation to predict score for a student who studied 6 hours

$$y = m(6) + b$$

$$y = 4.4(6) + 47.8 = 26.4 + 47.8 = \boxed{74.2}$$