Liao, Adrian Miguel G.

COM231

ASSIGNMENT 2

Linear Regression Activity: Predicting Exam Scores

We want to predict a student's **Exam Score** (y) based on the number of **Hours Studied** (x).

Data

Student	Hours Studied (x)	Exam Score (y)
1	1	52
2	2	57
3	3	61
4	4	65
5	5	70

Task

We want to fit a **linear regression line** of the form:

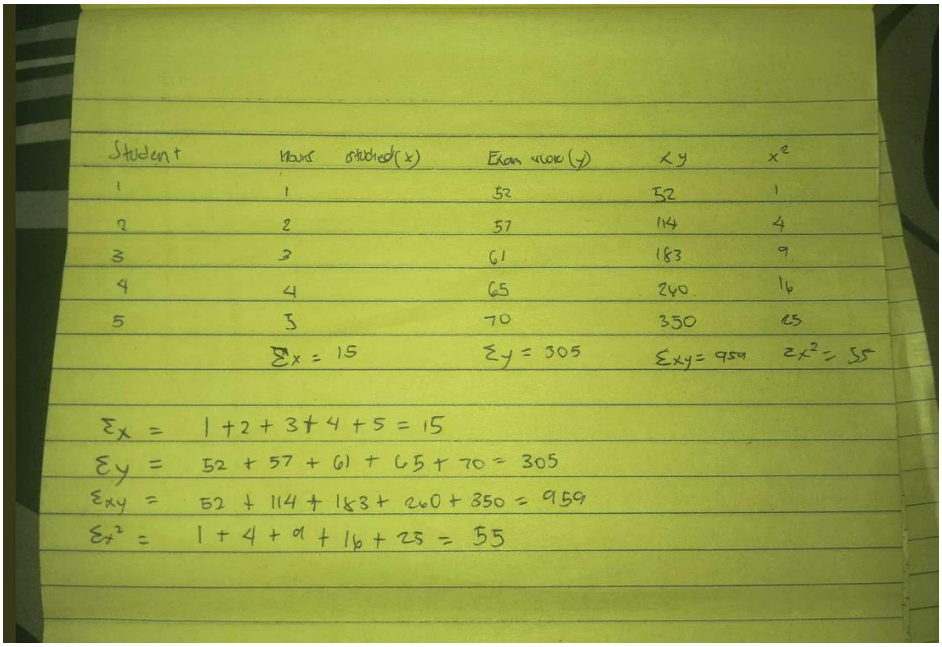
$$y = mx + b$$

A new student studied **6 hours**. We want to predict the **Exam Score** using the regression equation.

1. Fill in the table (14 points)

- Compute x^2 for each student.
- Compute xy for each student.
- Find the totals: Σx, Σy, Σx^2, and Σxy.

Student	Hours Studied (x)	Exam Score (y)	xy	x^2
1	1	52	?	?
2	2	57	?	?
3	3	61	?	?
4	4	65	?	?
5	5	70	?	?
	Σx = ?	Σx = ?	Σxy = ?	Σx^2 = ?



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	70	350	25
	$\Sigma x = 15$	$\Sigma y = 305$	$\Sigma xy = 959$	$\Sigma x^2 = 55$

$\Sigma x = 1 + 2 + 3 + 4 + 5 = 15$

$\Sigma y = 52 + 57 + 61 + 65 + 70 = 305$

$\Sigma xy = 52 + 114 + 183 + 260 + 350 = 959$

$\Sigma x^2 = 1 + 4 + 9 + 16 + 25 = 55$

2. Compute the Slope m (5 points)

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

$$m = \ ?$$

3: Compute the Intercept b (5 points)

$$b = \frac{\Sigma y - m\Sigma x}{n}$$

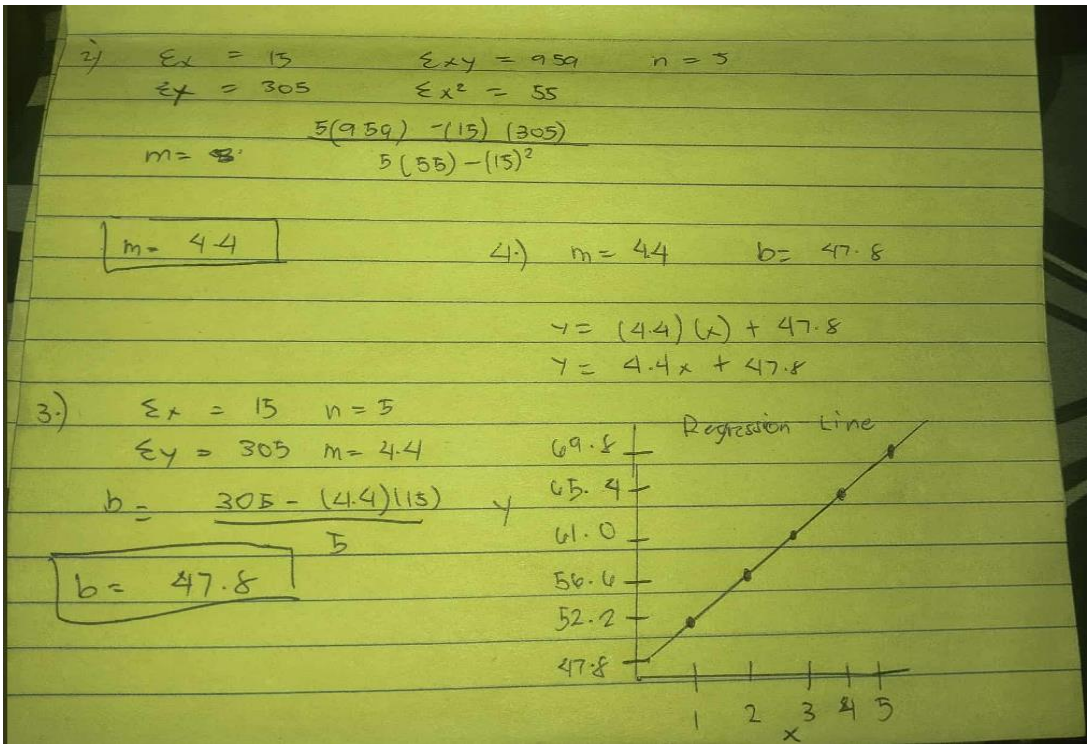
$$b = \ ?$$

4. Regression Equation (5 points)

Write the regression line:

$$y = mx + b$$

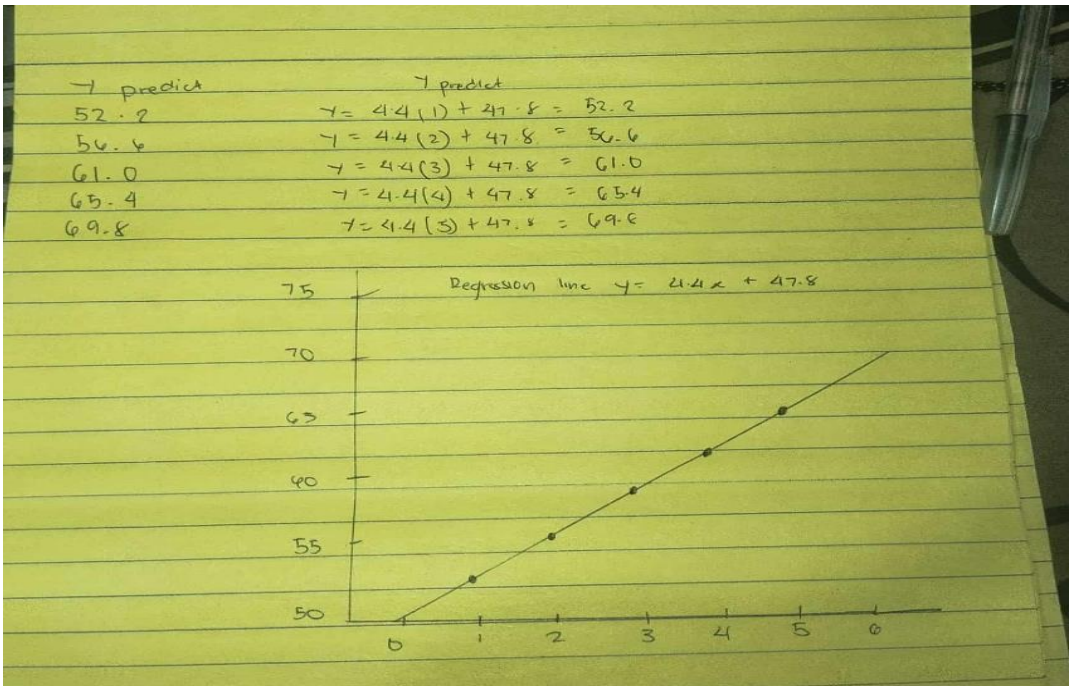
$$y = \ ?$$



5. Draw the regression line using a scatter plot (10 points)

- Calculate $y_{predict}$ for each data points
- Draw a regression line using $y_{predict}$
- Use a circle 🔵 for all data points
- Use a red line for the regression line

Student	Hours Studied (x)	Exam Score (y)	Predicted Exam Score ($y_{predict}$)
1	1	52	?
2	2	57	?
3	3	61	?
4	4	65	?
5	5	70	?



6. Calculate the Sum of Squared Errors (20 points)

$$ SSE = \sum (yi - y{predict})^2 $$

Student	Hours Studied (x)	Exam Score (y)	Predicted Exam Score ($y_{predict}$)	$y_i - y_{predict}$	$(y_i - y_{predict})^2$
1	1	52	?	?	?
2	2	57	?	?	?
3	3	61	?	?	?
4	4	65	?	?	?
5	5	70	?	?	?
					SSE = ?

7. Calculate the Sum of Squared Total (20 points)

- Get $\bar{y}$ using this formula :

$$\bar{y} = \frac{\Sigma y_i}{n}$$

- 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	?	?	?
2	2	57	?	?	?
3	3	61	?	?	?
4	4	65	?	?	?
5	5	70	?	?	?
					SST = ?

$y_i - y_{predict}$	$(y_i - y_{predict})^2$
$52 - 52.2 = 0.2$	$0.2^2 = 0.2 \times 0.2 = 0.04$
$57 - 56.6 = 0.4$	$0.4^2 = 0.4 \times 0.4 = 0.16$
$61 - 61 = 0$	$0^2 = 0 \times 0 = 0$
$65 - 65.4 = 0.4$	$0.4^2 = 0.4 \times 0.4 = 0.16$
$70 - 69.8 = 0.2$	$0.2^2 = 0.2 \times 0.2 = 0.04$

7.) mean $(\bar{y})$

$y_i - \bar{y}$	$(y_i - \bar{y})^2$
9	81
4	16
0	0
4	16
9	81

SST =

$81 + 16 + 0 + 16 + 81 = 194$

SST = 194

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

$= 61$

$y_i - \bar{y}$	$(y_i - \bar{y})^2$
$52 - 61 = \lvert -9 \rvert = 9$	$9^2 = 9 \times 9 = 81$
$57 - 61 = \lvert -4 \rvert = 4$	$4^2 = 4 \times 4 = 16$
$61 - 61 = 0$	$0^2 = 0 \times 0 = 0$
$65 - 61 = 4$	$4^2 = 4 \times 4 = 16$
$70 - 61 = 9$	$9^2 = 9 \times 9 = 81$

8. Compute R^2 (20 points)

- Get R^2 using this formula :

$$R^2 = 1 - \frac{SSE}{SST}$$

$$R^2 = ?$$

9. Prediction (1 point)

Use your equation to predict the exam score for a student who studied **6 hours**.

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

$$y = ?$$