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COM231

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

Part 1

$$\Sigma x = 1 + 2 + 3 + 4 + 5 = 15$$
$$\Sigma y = 52 + 57 + 61 + 65 + 70 = 305$$
$$\Sigma xy = 52 + 114 + 183 + 260 + 350 = 959$$
$$\Sigma x^2 = 1 + 4 + 9 + 16 + 25 = 55$$

Part 2

2. Compute the Slope m (5 points)

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

$$m = ?$$

3. Compute the Intercept b (5 points)

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

$$b = ?$$

4. Regression Equation (5 points)

Write the regression line:

$$y = mx + b$$

$$y = ?$$

Handwritten student work for a regression problem. The work is on lined paper and shows the following calculations:

2. $\sum x = 15$
 $\sum x = 305$

$\sum xy = 959$
 $\sum x^2 = 55$

$n = 5$

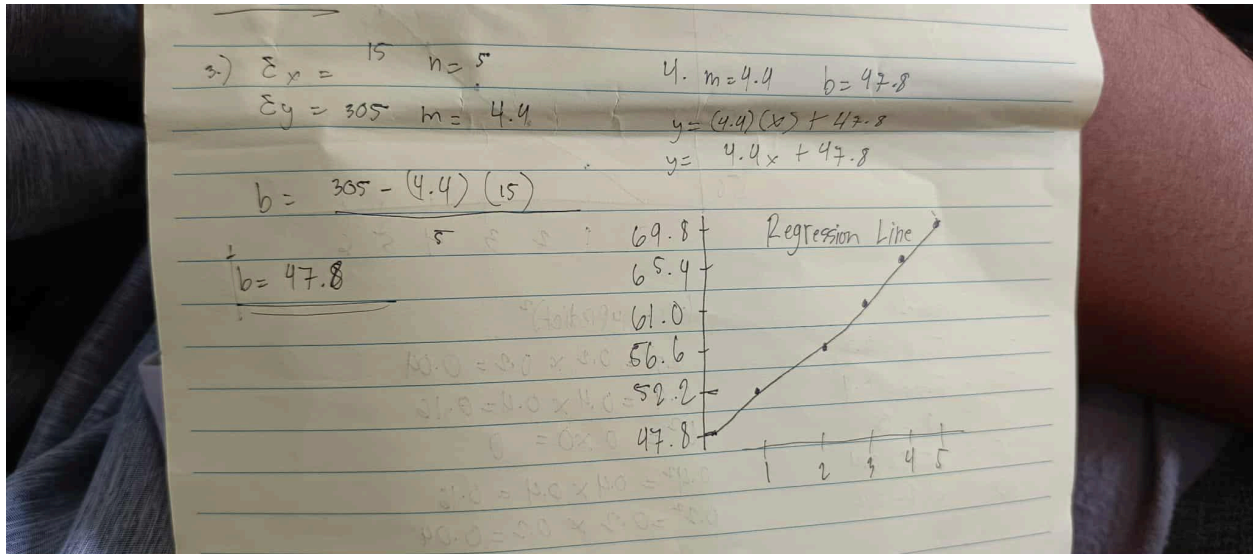
$$m = \frac{5(959) - (15)(305)}{5(55) - (15)^2}$$

$m = 4.9$

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

 $b = 8.5$

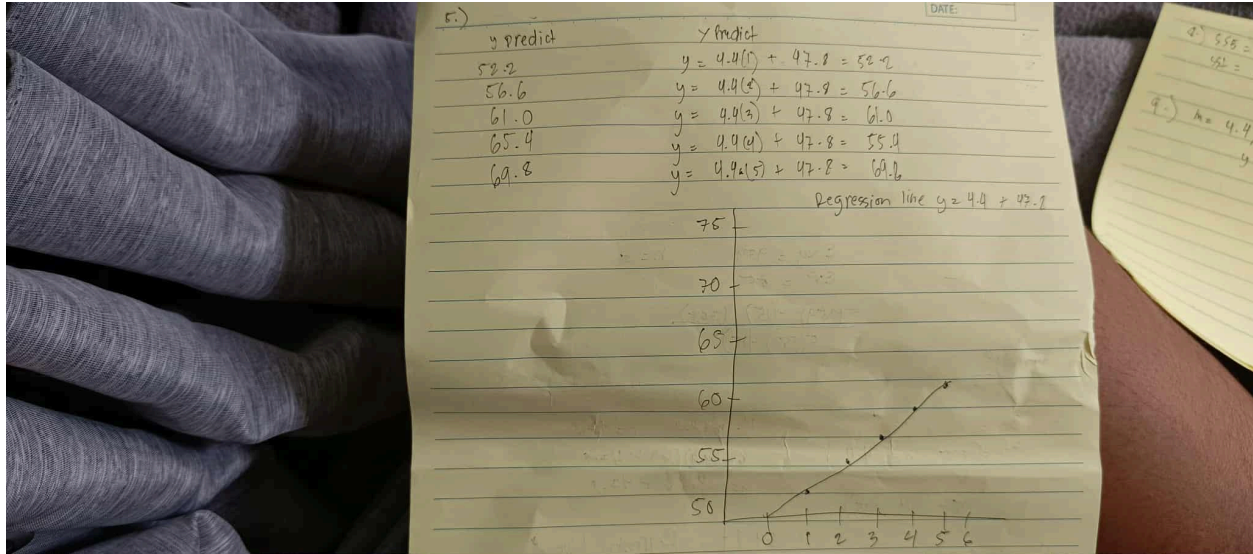
Regression line: $y = 4.9x + 8.5$



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)

$$SSE = \sum (y_i - y_{\text{predict}})^2$$

Student	Hours Studied (x)	Exam Score (y)	Predicted Exam Score (y_{predict})	$y_i - y_{\text{predict}}$	$(y_i - y_{\text{predict}})^2$
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)

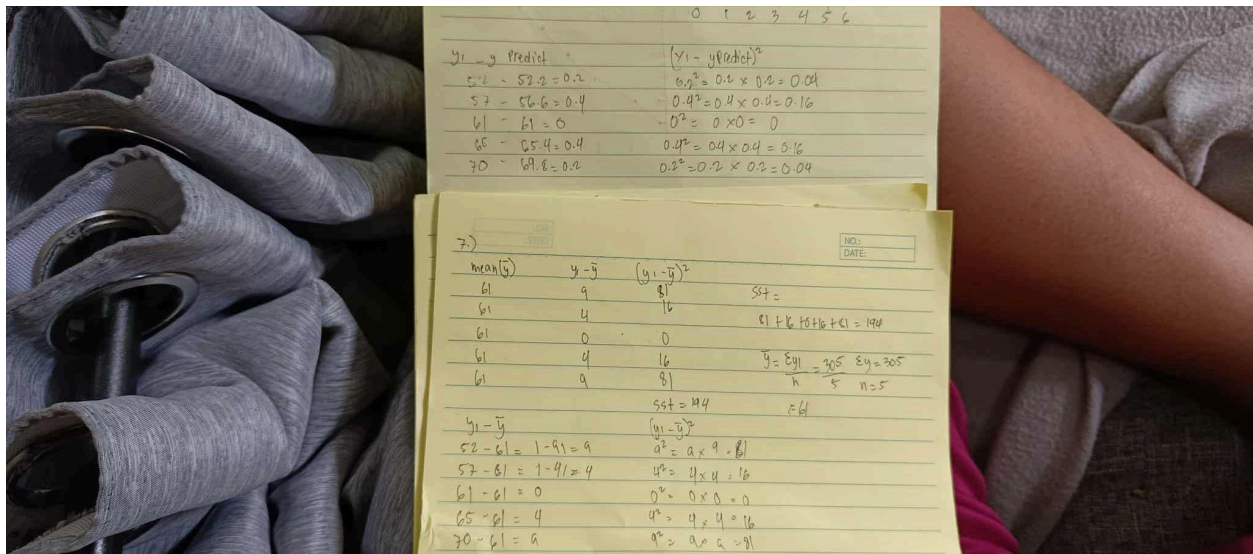
- Get \bar{y} using this formula :

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

- 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	?	?	?
					$SST = ?$



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.

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

$$y = ?$$

Handwritten student work for question 8:

$$8.) \begin{array}{l} SSE = 0.4 \\ SST = 194 \end{array} \quad R^2 = 1 - \frac{0.4}{194} = \underline{\underline{0.99}}$$

Handwritten student work for question 9:

$$9.) \begin{array}{l} m = 4.4, b = 47.8 \\ y = m(b) + b \\ = 4.4(6) + 47.8 \\ = \underline{\underline{74.2}} \end{array}$$