

**Linear Regression Activity: Predicting Exam Scores**

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

**1. Fill in the table (14 points)**

- Compute **x<sup>2</sup>** for each student.
- Compute **xy** for each student.
- Find the totals: **Σx**, **Σy**, **Σx<sup>2</sup>**, and **Σxy**.

A	B	C	D	E
Student	Hours Studied (x)	Exam Score (y)	xy	x <sup>2</sup>
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
	Σx = 15	Σy = 305	Σxy = 959	Σx <sup>2</sup> = 55

**2. Compute the Slope m (5 points)**

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

Handwritten calculation for the slope m:

$$m = \frac{5(959) - (15)(305)}{5(55) - (15)^2} = \frac{4795 - 4575}{275 - 225} = \frac{220}{50}$$

$$m = 4.4$$

### 3: Compute the Intercept b (5 points)

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

Handwritten calculation of the intercept  $b$ :

$$b = \frac{305 - (4.4)(10)}{5} = \frac{305 - 44}{5} = \frac{261}{5}$$
$$b = 52.2$$

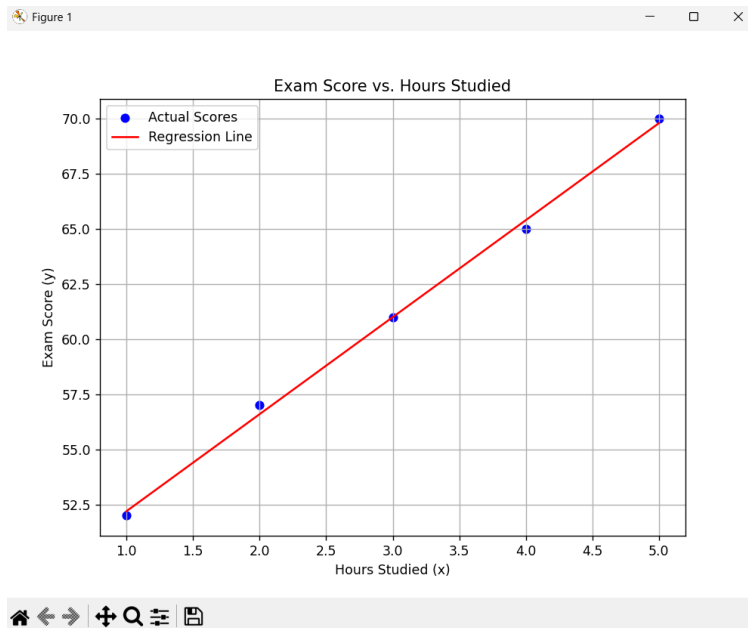
### 4. Regression Equation (5 points)

Write the regression line:

$$y = mx + b$$

$$y = 4.4x + 52.2$$

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



### 6. Calculate the sum of squared errors (20 points)

Student	Exam Score (y)	Predicted (ypredict)	yi-ypredict	(yi-ypredict) <sup>2</sup>
1	52	52.2	-0.2	0.04
2	57	56.6	0.4	0.16
3	61	61	0	0
4	65	65.4	-0.4	0.16
5	70	69.8	0.2	0.04
				SSE = 0.4

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

Student	Exam Score (y)	Mean ( $\bar{y}$ )	yi- $\bar{y}$	(yi- $\bar{y}$ ) <sup>2</sup>
1	52	61	-9	81
2	57	61	-4	16
3	61	61	0	0
4	65	61	4	16
5	70	61	9	81
				SST = 194

**8. Compute R<sup>2</sup> (20 points)**

$$R^2 = 1 - \frac{0.4}{194} = 1 - 0.00206$$

$$R^2 = 0.9979$$

**9. Prediction**

$$y = 9.9(6) + 47.8$$

$$y = 26.4 + 47.8$$

$$y = 74.2$$