

1. Question — You have a dataset consisting of input data X and target variable Y as depicted in Table 1:

X	Y
1	-3
4	18
5	25
2	4
9	53
4	18
10	60

Table 1: Sample dataset

Perform linear regression to estimate w, b in order to solve $y_i = wx_i + b$

Answer :

1. Compute XY, X^2, Y^2

	X	Y	XY	X^2	Y^2
	1	-3	-3	1	9
	4	18	72	16	324
	5	25	125	25	625
	2	4	8	4	16
	9	53	477	81	2809
	4	18	72	16	324
	10	60	600	100	3600
Σ	35	175	1351	243	7707

Table 2: Sample dataset with necessary calculations

2. Solve for w and b using

$$b = \frac{\sum Y \sum X^2 - \sum X \sum XY}{n \sum X^2 - (\sum X)^2}$$

$$w = \frac{n \sum XY - \sum X \sum Y}{n \sum X^2 - (\sum X)^2}$$

$$\Leftrightarrow b = \frac{175 * 243 - 35 * 1351}{7 * 243 - 35^2} = -10$$

$$\Leftrightarrow w = \frac{7 * 1351 - 35 * 175}{7 * 243 - 35^2} = 7$$

Thus: $y_i = 7x_i - 10$