Task1: Your objective is to manually compute the slop (M) and y-intercept (c) using Ordinary least Square Linear Regression. Once determined, apply these values predict the price when the vegetable weight is **6**.

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<u>Solution</u>: For simple linear Regression,

We know,

$$Y = mx + c$$

$$\therefore Y = 6m + c \qquad | \text{ Here } x = 6$$

weight (x)	Price (y)
2	35
4	60
5	20
3	50
6	50
5	55
7	60

x	Y	xy	x^2
2	35	70	4
4	60	240	16
5	20	100	25
3	50	150	9
6	50	300	36
5	55	275	25
7	66	420	49
$\bar{x}=4.571$	$\bar{Y}=47.142$	$\overline{xy}=222.142$	$\overline{(x^2)}=23.42$

we know,

$$M = \frac{\bar{x}\bar{Y} - \overline{xy}}{(\bar{x})^2 - \overline{(x^2)}}$$

$$\bar{x}\bar{Y} = 215.49$$
$$(\bar{x})^2 = 20.90$$

$$= \frac{215.49 - 222.142}{20.90 - 23.42}$$

$$= 2.634$$

$$c = \bar{Y} - M\bar{x}$$

$$= 47.142 - 2.634 \times 4.571$$

$$= 35.102$$

$$\therefore Y = 6 \times 2.634 + 35.102$$

$$= 50.906$$

Task 02: Compute the residuals for each data point.

x	Y	Predict $Y_p = 2.634x + 35.162$	residuals $(Y - Y_p)$
2	35	40.37	-5.37
4	60	45.638	14.362
5	20	48.272	-28.272
3	50	43.004	6.996
6	50	50.9059	-0.9059
5	55	48.272	6.728
7	60	53.539	6.461

Task 03: Calculate both the mean squared error (mse) and (mae)

We know,

$$MSE = \frac{1}{n} \sum (Y - Y_p)^2$$

$$= \frac{(-5.37)^2 + (14.362)^2 + (-28.272)^2 + (6.996)^2 + (-0.9059)^2 + (6.728)^2 + (6.4...)^2}{7}$$

$$= 167.313 \ (Ans)$$

$$MAE = \frac{1}{n} \sum |Y - Y_p| = \frac{69.0949}{7} = 9.88 \ \underline{(Ans)}$$