Assignment 2

Weight	Price
2	35
4	60
5	20
3	50
6	50
5	55
7	60

Slope

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

No. of observation $N = 7$

$\Sigma X = 2+4+5+3+6+5+7 = 32$

$\bar{x} = \frac{\Sigma X}{N} = \frac{32}{7} = 4.571428571$

$\Sigma Y = 35+60+20+50+50+55+60$

$= 330$

$\bar{y} = \frac{\Sigma y}{N} = \frac{330}{7} = 47.14285714$

$\therefore (x-\bar{x})(y-\bar{y}) = (2-4.571428571)(35-47.14285714)$

$= 31.22448978$

$\therefore (x-\bar{x})(y-\bar{y}) = (4-4.571428571)(60-47.14285714)$

$= -7.346938772$

$\therefore (x-\bar{x})(y-\bar{y}) = (5-4.571428571)(20-47.14285714)$

$= -11.63265307$

$\therefore (x-\bar{x})(y-\bar{y}) = (3-4.571428571)(50-47.14285714)$

$= -4.489795922$

$\therefore (x-\bar{x})(y-\bar{y}) = (6-4.571428571)(50-47.14285714)$

$= 4.081632658$

$\therefore (x-\bar{x})(y-\bar{y}) = (5-4.571428571)(55-47.14285714)$

$= 3.367346943$

$\therefore (x-\bar{x})(y-\bar{y}) = (7-4.571428571)(60-47.14285714)$

$= 31.22448981$

$\Sigma(x-\bar{x})(y-\bar{y}) = 31.22448978 - 7.346938772$

$-11.63265307 - 4.489795922 + 4.081632658$

$+3.367346943 + 31.22448981$

$= 46.42857143$

$\Sigma(x-\bar{x})^2 = (2-4.571428571)^2 + (4-4.571428571)^2$

$+(5-4.571428571)^2 + (3-4.571428571)^2$

$+(6-4.571428571)^2 + (5-4.571428571) + (7-4.571428571)^2$

$= 17.71428572$

$\text{Slope, } m = \frac{\Sigma(x-\bar{x})(y-\bar{y})}{\Sigma(x-\bar{x})^2} = \frac{46.42857143}{17.71428572}$

$= 2.620967741$

$c = \bar{y} - m\bar{x}$

$= 47.14285714 - (2.620967741 \times 4.571428571)$

$= 35.16129033$

Predicted Price for the weight 6

$y = mx + c = 2.620967741 \times 6 + 35.16129033$

$= 50.68709678$

for residuals

$$\text{residual} = y - \hat{y}$$

for $x = 2$

$$\hat{y} = 2.62096774 1 \times 2 + 35.16129033$$
$$= 40.40322581$$
$$\text{residual} = 35 - 40.40322581$$
$$= -5.40322581$$

for $x = 4$

$$\hat{y} = 2.62096774 1 \times 4 + 35.16129033$$
$$= 45.64516129$$
$$\text{residual} = 60 - 45.64516129 = 14.35483871$$

for $x = 5$

$$\hat{y} = 2.62096774 1 \times 5 + 35.16129033$$
$$= 48.26612904$$
$$\text{residual} = 20 - 48.26612904 = -28.26612904$$

for $x = 3$

$$\hat{y} = 2.62096774 1 \times 3 + 35.16129033$$
$$= 43.02419355$$
$$\text{residual} = 50 - 43.02419355 = 6.97580645$$

for $x = 6$

$\hat{y} = 2.620967741 \times 6 + 35.16129033$

$= 50.88709678$

residual $= 50 - 50.88709678 = -0.88709678$

for $x = 5$

$\hat{y} = 2.620967741 \times 5 + 35.16129033$

$= 48.26612904$

residual $= 55 - 48.26612904$

$= 6.73387096$

for $x = 7$

$\hat{y} = 2.620967741 \times 7 + 35.16129033$

$= 53.50806452$

residual $= 60 - 53.50806452$

$= 6.49193548$

Mean absolute error

$$MAE = \frac{1}{n} \sum_{i=1}^{n} |y_i - \hat{y}_i|$$

$= \frac{1}{7}(|-5.40322581| + |14.35483871| + |-28.266904| + |6.97580645| + |-0.88709678| + |6.73387096| + |6.49193548|)$

$= 9.87327189$

Mean Squared error

$$MSE = \frac{1}{n} \sum_{i=1}^{n} (y_i - \hat{y}_i)^2$$

$= \frac{1}{7} \left((-5.40322581)^2 + (14.35483871)^2 + (-28.26612904)^2 + (6.07580645)^2 + (-0.88709678)^2 + (6.73387096)^2 + (6.40193548)^2 \right)$

$= \frac{1}{7} \times 1171.169355$

$= 167.3099079$

$RMSE = \sqrt{MSE} = \sqrt{167.3099079} = 12.93483312$