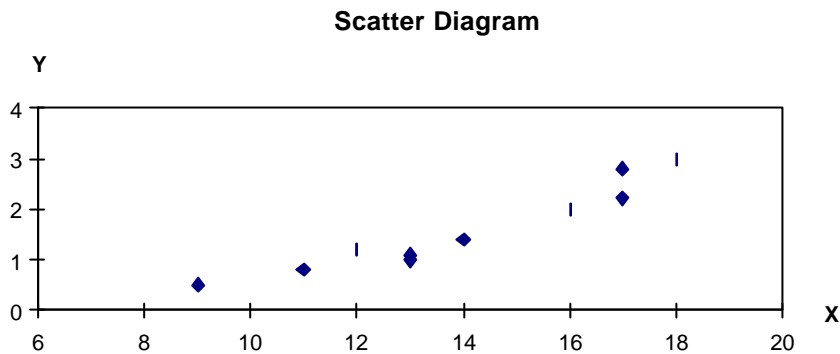


Seminar 21 (Suggested Solution)

1. False
2. True
3. d
4. a
5. e

6a.



- b. $n = 10$, $\sum x = 140$, $\sum y = 16.0$, $\sum xy = 245.6$, $\sum x^2 = 2038$.
Hence, $\bar{x} = \sum x/n = 14$, $\bar{y} = \sum y/n = 1.6$.

The slope of the regression line is:

$$b = \frac{\sum xy - n\bar{x}\bar{y}}{\sum x^2 - n\bar{x}^2} = \frac{245.6 - (10)(14)(1.6)}{2038 - (10)(14)^2} = 0.2769$$

The y-intercept of the regression line is:

$$a = \bar{y} - b\bar{x} = 1.6 - (0.2769)(14) = -2.2766$$

$$\therefore \text{The Regression line: } \hat{y} = -2.2766 + 0.2769x$$

- c. Prediction using Regression line:

When $x = 10$, $\hat{y} = -2.2766 + 0.2769(10) = 0.4924$.

When $x = 15$, $\hat{y} = -2.2766 + 0.2769(15) = 1.8769$.

When $x = 30$, the x-value is out of the sample data range (9 - 18), we cannot use the estimated regression equation found in part (b) to make such estimation.

- 7a. Independent Variable: Units Produced (X)
Dependent Variable: Overhead (Y)

$$n = 10, \sum x = 420, \sum y = 2922, \sum xy = 126541, \sum x^2 = 18228, \sum y^2 = 879424.$$

$$\text{Hence, } \bar{x} = \sum x/n = 42, \bar{y} = \sum y/n = 292.2.$$

The slope of the regression line is:

$$b = \frac{\sum xy - n\bar{x}\bar{y}}{\sum x^2 - n\bar{x}^2} = \frac{126541 - (10)(42)(292.2)}{18228 - (10)(42)^2} = 6.4915$$

The y-intercept of the regression line is:

$$a = \bar{y} - b\bar{x} = 292.2 - (6.4915)(42) = 19.5571$$

$$\therefore \text{The Regression line: } \hat{y} = 19.5571 + 6.4915x$$

- b. Prediction using Regression line:

When 50 units are produced,

$$\begin{aligned} \text{estimated overhead} &= \hat{y} = 19.5571 + 6.4915(50) \\ &= 344.1320 = 344.13 \text{ (2 decimal places)} \end{aligned}$$

$$\begin{aligned} \text{c. } S_e &= \sqrt{\frac{1}{n-2} \sum (y_i - \hat{y}_i)^2} = \sqrt{\frac{SSE}{n-2}} = \sqrt{\frac{S_{yy} - bS_{xy}}{n-2}} \\ &= \sqrt{\frac{25615.6 - (6.4915)(3817)}{10-2}} = 10.2320 \end{aligned}$$

- d. Slope = b = 6.4915,
it means that for each addition unit produced, the plant has to pay 6.4915 dollars for overhead. It is the variable cost.

Y-intercept = 19.5571,

it means that even there is no production, the cost 19.5571 dollars still has to pay.
It is the fixed cost.