

Answer on Question #62757 – Math – Statistics and Probability

Question

The data of an experiment to supply sufficient quantities of fertilizer to optimize vegetation growth (grass yield) and avoid excessive application that could lead to a runoff and nutrient enrichment of a nearby lake is shown in the data below. Determine the regression of y on x .

y	25	50	75	100	125	150	175	200	225	250
x	84	9	90	154	148	169	206	244	212	248

Solution

We shall derive the linear regression equation, i.e. we must calculate the coefficients a and b in the equation $y = a + bx$. Now we calculate the next values:

$$\bar{x} = \frac{84+9+90+154+148+169+206+244+212+248}{10} = 156.4;$$

$$\bar{y} = \frac{25+50+75+100+125+150+175+200+225+250}{10} = 137.5;$$

$$\overline{xy} = \frac{84 \cdot 25 + 9 \cdot 50 + 90 \cdot 75 + 154 \cdot 100 + 148 \cdot 125 + 169 \cdot 150 + 206 \cdot 175 + 244 \cdot 200 + 212 \cdot 225 + 248 \cdot 250}{10} = 26310;$$

$$\begin{aligned} \sigma_x^2 &= \frac{(84-156.4)^2 + (9-156.4)^2 + (90-156.4)^2 + (154-156.4)^2 + (148-156.4)^2 + (169-156.4)^2 + (206-156.4)^2 + (244-156.4)^2 + (212-156.4)^2 + (248-156.4)^2}{10} \\ &= 5322.84. \end{aligned}$$

Now we can obtain the coefficients using the next formulas:

$$b = \frac{\overline{xy} - \bar{x} \cdot \bar{y}}{\sigma_x^2} = 0.90; \quad a = \bar{y} - b\bar{x} = -3.68.$$

The regression equation for the given data is $y = -3.68 + 0.90 \cdot x$.

Answer: $y = -3.68 + 0.90 \cdot x$.