

## Answer on Question#71918 – Math – Statistics and Probability

**Question.** Consider a set of 10 data points:

$x$	1	2	3	4	4	5	5	6	6	7
$y$	7	8	9	8	9	11	10	13	14	13

Derive the simple linear regression model.

**Solution.** We must calculate the coefficients  $a$  and  $b$  in the equation  $y = a + bx$ . Now we calculate the next values:

$$\bar{x} = \frac{1+2+3+4+4+5+5+6+6+7}{10} = 4.3;$$

$$\bar{y} = \frac{7+8+9+8+9+11+10+13+14+13}{10} = 10.2;$$

$$\overline{xy} = \frac{1 \cdot 7 + 2 \cdot 8 + 3 \cdot 9 + 4 \cdot 8 + 4 \cdot 9 + 5 \cdot 11 + 5 \cdot 10 + 6 \cdot 13 + 6 \cdot 14 + 7 \cdot 13}{10} = 47.6;$$

$$\sigma_x^2 = \frac{(1-4.3)^2 + (2-4.3)^2 + (3-4.3)^2 + (4-4.3)^2 + (4-4.3)^2 + (5-4.3)^2 + (5-4.3)^2 + (6-4.3)^2 + (6-4.3)^2 + (7-4.3)^2}{10} = 3.21.$$

Now we can obtain the coefficients using the following formulas:

(see <https://www.easycalculation.com/statistics/learn-regression.php>)

$$b = \frac{\overline{xy} - \bar{x} \cdot \bar{y}}{\sigma_x^2} = 1.165; \quad a = \bar{y} - b\bar{x} = 5.19.$$

The regression equation for the given data is  $y = 5.19 + 1.165 \cdot x$ .

**Answer.**  $y = 5.19 + 1.165 \cdot x$ .