Answer on Question #55140 – Math – Statistics and Probability

In a partially destroyed laboratory, record of an analysis of correlation of data, only the following results are legible:

Variance of X = 9

Regression equations are

(*) 8x −10y + 66 = 0

(**) 40x −18y − 214 = 0

Find out the following missing results.

(i) The means of X and Y

(ii) The coefficient of correlation between x and y

(iii) The standard deviation of Y

Solution

(i) Since two regression lines always intersect at a point $(\bar{x},\bar{y})$ representing mean values of the values $\bar{x}$ and $\bar{y}$ as shown below:

$$8x - 10y = -66$$
$$40x - 18y = 214$$

Multiplying the first equation by 5 and subtracting from the second, we have

$32y = 544 \Rightarrow \bar{y} = 17$

Then $\bar{x} = (10\bar{y} - 66)/8 = (10\cdot 17 - 66)/8 = 13$

(ii) To find the given regression equations in such a way that the coefficient of dependent variable is less than one at least in one equation.

So, $8x - 10y = -66 \Rightarrow 10y = 66 + 8x \Rightarrow y = \frac{66}{10} + \frac{8}{10}x$.

That is, $b_{yx} = 8/10 = 0.8$

And $40x - 18y = 214 \Rightarrow 40x = 214 + 18y \Rightarrow x = \frac{214}{40} + \frac{18}{40}y$

That is, $b_{yx} = 18/40 = 0.45$.

Hence coefficient of correlation r between x and y is given by:

$$r = \sqrt{b_{xy} \times b_{yx}} = \sqrt{0.45 \cdot 0.80} = 0.60$$

(iii) To determine the standard deviation of y, consider the formula:

$$\sigma_y = \frac{b_{yx}\sigma_x}{r} = \frac{0.8 \cdot \sqrt{9}}{0.6} = 4.$$