

So our assumption is correct.
Hence the equation $3x + 12y = 9$ is the regression equation of y on x .

3.

The following table shows the sales and expenditure of a farm:

	Sales (₹ in Crores)	advertisement expenditure (₹ in Crores)
Mean	40	6
Standard deviation	10	1.5

coefficient of correlation = $r = 0.9$

Estimate the likely sells for a proposed advertisement expenditure of ₹ 10 crores. (ISC 2006)

Solution:

	Sales (₹ in Crores) (x)	advertisement expenditure (₹ in Crores) (y)
Mean	$\bar{x} = 40$	$\bar{y} = 6$
Standard deviation	$\sigma_x = 10$	$\sigma_y = 1.5$

And $r = 0.9$

Regression coefficient of x on $y = b_{xy} = r \cdot \frac{\sigma_x}{\sigma_y} = 0.9 \cdot \frac{10}{1.5} = 6$

\therefore regression equation of x on y is $x - \bar{x} = b_{xy} (y - \bar{y})$

$$\Rightarrow x - 40 = 6(y - 6)$$

$$\Rightarrow x = 6y - 36 + 40$$

$$\Rightarrow x = 6y + 4$$

\therefore when $y = 10$ crores, sales $x = 6 \times 10 + 4 = 64$ crores.

4.

Given two regression lines $4x + 3y + 7 = 0$ and $3x + 4y + 8 = 0$, determine

(i) the regression line of y on x .

(ii) the regression line of x on y .

(iii) the coefficient of correlation.

(ISC 2007)

Solution:

Let equation $4x + 3y + 7 = 0$ is the regression equation of x on y and equation $3x + 4y + 8 = 0$ is the regression equation of y on x .

$$4x + 3y + 7 = 0$$

$$\Rightarrow 4x = -3y - 7$$

$$\Rightarrow x = -\frac{3}{4}y - \frac{7}{4}$$

$$\therefore b_{xy} = -\frac{3}{4}$$

$$\therefore r^2 = b_{xy} \times b_{yx} = -\frac{3}{4} \times -\frac{3}{4} = \frac{9}{16}$$

We know $0 \leq r^2 \leq 1$

\therefore our assumption is correct.

(i) The equation $3x + 4y + 8 = 0$ is the regression equation of y on x .

(ii) The equation $4x + 3y + 7 = 0$ is the regression equation of x on y

(iii) $r^2 = \frac{9}{16} \Rightarrow r = -\sqrt{\frac{9}{16}} = -\frac{3}{4}$

\therefore both b_{yx} and b_{xy} are negative, the correlation coefficient r is also negative.