

Q. Find the line of regression of Y on X from the following data :

X: 5 10 15 25 30 35 40 45

Y: 25 32 44 32 39 49 55 60

What will be the value of Y for $X = 48$?

Soln

X	Y	$dx = x - 25$	$dy = y - 32$	dx^2	dy^2	$dxdy$
5	25	-20	-7	400	49	140
10	32	-15	0	225	0	0
15	44	-10	12	100	144	-120
25	32	0	0	0	0	0
30	39	5	7	25	49	35
35	49	10	17	100	289	170
40	55	15	23	225	529	345
45	60	20	28	400	784	560
$\Sigma x = 205$	$\Sigma y = 336$	$\Sigma dx = 5$	$\Sigma dy = 87$	$\Sigma dx^2 = 1475$	$\Sigma dy^2 = 1844$	$\Sigma dxdy = 1130$

Let, assumed mean for $x, A = 25$

& " " " " $y, B = 32$

Now, $\bar{x} = \frac{\Sigma x}{n} = \frac{205}{8} = 25.63$

$\bar{y} = \frac{\Sigma y}{n} = \frac{336}{8} = 42$

Regression equation of Y on X.

$$Y - \bar{Y} = b_{yx}(X - \bar{X}) \rightarrow (*)$$

where, $b_{yx} = \frac{n \sum dxdy - (\sum dx)(\sum dy)}{n \sum dx^2 - (\sum dx)^2}$

$$\begin{aligned} &= \frac{8 \times 1130 - 5 \times 87}{8 \times 1475 - (5)^2} \\ &= \frac{9040 - 435}{11800 - 25} \\ &= \frac{8605}{11775} \\ &= 0.7308 \\ &= 0.73 \end{aligned}$$

By putting the value of b_{yx} in equation (*)

$$\begin{aligned} Y - 42 &= 0.73(X - 25.63) \\ \Rightarrow Y &= 0.73X - 18.7099 + 42 \\ &= 0.73X + 23.29 \end{aligned}$$

$$\begin{aligned} \text{When } X &= 48, Y = 0.73 \times 48 + 23.29 \\ &= 35.04 + 23.29 \\ &= 58.33 \end{aligned}$$