Answer on Question #43725-Math-Statistics and Probability

Heights of fathers and sons are given in centimeters.

Height of father (x)

150 152 155 157 160 161 164 166

Height of son (y)

154 156 158 159 160 162 161 164

Find the line of regression and calculate the expected average height of the son when the height of the father is 154cm.

Solution

Let 160 and 159 be assumed means of x and y. Using the given data, we get the following table:

x	y	$X = x - 160$	$Y = y - 159$	X^2	Y^2	XY
150	154	-10	-5	100	25	50
152	156	-8	-3	64	9	24
155	158	-5	-1	25	1	5
157	159	-3	0	9	0	0
160	160	0	1	0	1	0
161	162	1	3	1	9	3
164	161	4	2	16	4	8
166	164	6	5	36	25	30
		$\sum X = -15$	$\sum Y = 2$	$\sum X^2 = 251$	$\sum Y^2 = 74$	$\sum XY = 120$

$$\bar{x} = 160 + \frac{\sum X}{n} = 160 - \frac{15}{8} = 158.13$$

$$\bar{y} = 159 + \frac{\sum Y}{n} = 159 + \frac{2}{8} = 159.25$$

Since regression coefficients are independent of change of origin, we have regression coefficient of y on x.

$$b_{yx} = b_{YX} = \frac{n\sum XY - \sum X \sum Y}{n\sum X^2 - (\sum X)^2} = \frac{8 \cdot 120 - (-15) \cdot 2}{8 \cdot 251 - (-15)^2} = 0.56$$

Equation of a line of regression of y on x is

$$y - \bar{y} = b_{yx}(x - \bar{x})$$

$$y - 159.25 = 0.56(x - 158.13)$$

$$y = 0.56x + 70.697.$$

When $x = 154$

$$y = 0.56(154) + 70.697 = 156.937.$$

Answer: $\boldsymbol{y = 0.56x + 70.697; y = 156.937}$.