

Simple Linear Regression (MATH)

Q. Find the equation of the best fitted straight line for the following observations:-

$$X: 4 \ 6 \ 8 \ 12 \ 15 \ 17 \ 22$$

$$Y: 46 \ 42 \ 40 \ 36 \ 30 \ 25 \ 19$$

→ Linear Regression Function

$$y = a + bx$$

✓ ✓

here, $a = y$ -intercept

$b =$ slope

we have to find a & b

to find, $a = \bar{y} - b\bar{x}$

$$b = R \cdot \frac{S_y}{S_x} \quad [R = \text{Pearson Correlation Coefficient}]$$

$$R = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2 \cdot \sum (y - \bar{y})^2}}$$

$$S_y = \sqrt{\frac{\sum (y - \bar{y})^2}{n-1}}$$

$$S_x = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$$

$S_y =$ Standard deviation of y , and n is the number of observations]

Now, we'll prepare a table.

x	y	$(x-\bar{x})$	$(y-\bar{y})$	$(x-\bar{x})(y-\bar{y})$	$(x-\bar{x})^2$	$(y-\bar{y})^2$
4	46	-8	12	-96	64	144
6	42	-6	8	-48	36	64
8	40	-4	6	-24	16	36
12	36	0	2	0	0	4
15	30	3	-4	-12	9	16
17	25	5	-9	-45	25	81
22	19	10	-15	-150	100	225
$\bar{x}=12$	$\bar{y}=34$			$\Sigma = -375$	$\Sigma = 250$	$\Sigma = 570$

$$\therefore R = \frac{-375}{\sqrt{250 \times 570}} = -0.993$$

$$S_y = \sqrt{\frac{570}{7-1}} = 9.746 \quad [n=7]$$

$$S_x = \sqrt{\frac{250}{7-1}} = 6.454 \quad [n=7]$$

$$\therefore b = -0.993 \times \frac{9.746}{6.454} = -1.499$$

$$a = 34 - (-1.499) \times 12 = 51.988$$

So, best fitted straight line would be

$$y = 51.988 + 1.499x$$

$$a + bx$$

[Tech4Tonic]