

Correlation :

② Calculate Karl Pearson's coefficient of correlation from the data given below.

X: 22 25 26 28 30 32 34 37 41 45
Y: 18 20 21 25 26 29 32 35 40 44.

Solution: Calculation of Karl Pearson's coefficient of correlation by Actual Mean Method:

X_i	$X_i - \bar{X}$ $X_i - 32$	X^2	Y_i	$Y_i - \bar{Y}$ $Y_i - 29$	Y^2	$X Y$
22	-10	100	18	-11	121	110
25	-7	49	20	-9	81	63
26	-6	36	21	-8	64	48
28	-4	16	25	-4	16	16
30	-2	4	26	-3	9	6
32	0	0	29	0	0	0
34	+2	4	32	3	9	30
37	+5	25	35	6	36	99
41	+9	81	40	11	121	99
45	+13	169	44	15	225	195
	$\bar{X} = 32$	$\sum X^2 = 484$	$\sum Y = 290$	$\sum Y = 290$	$\sum Y^2 = 682$	$\sum XY = 573$

$\sum X = 320$
 $n = 10$
 $\therefore \bar{X} = \frac{\sum X}{n}$
 $= \frac{320}{10}$
 $= 32$

$\sum Y = 290$
 $n = 10$
 $\therefore \bar{Y} = \frac{\sum Y}{n}$
 $= \frac{290}{10}$
 $= 29$

Substituting all relevant values in the expression for the correlation coefficient by Actual Mean Method:

$r = \frac{\sum XY}{\sqrt{\sum X^2 \sum Y^2}}$
 $= \frac{573}{\sqrt{484 \times 682}}$



$$\Rightarrow r = \frac{573}{\sqrt{484 \times 682}}$$

$$\Rightarrow r = \frac{573}{\sqrt{484 \times 682}}$$

$$\begin{aligned} \Rightarrow \log r &= \log 573 - \frac{1}{2} (\log 484 + \log 682) \\ &= 2.7582 - \frac{1}{2} [2.6848 + 2.8338] \\ &= 2.7582 - \frac{1}{2} (5.5186) \\ &= 2.7582 - 2.7593 \\ &= 0.0011 \\ &= -1 + 0.9989 \end{aligned}$$

$$\Rightarrow \log r = 7.9989$$

$$\therefore r = \text{Antilog}(7.9989)$$

$$= +0.999$$

\approx Almost perfect positive correlation.

(3)	X :	10	10	11	12	12
	Y :	5	6	4	3	2

Solution : Calculation of Karl Pearson's Correlation coefficient by Direct Method;

$$\text{i.e., } r = \frac{N \sum XY - \sum X \sum Y}{\sqrt{[N \sum X^2 - (\sum X)^2][N \sum Y^2 - (\sum Y)^2]}}$$

Group A: Econometrics

(3)

X	X ²	Y	Y ²	XY
10	100	5	25	50
10	100	6	36	60
11	121	4	16	44
12	144	3	09	108 36
12	144	2	04	144 24
<u>12</u>	<u>144</u>	<u>2</u>	<u>04</u>	<u>EXY = 340 214</u>
EX = 55	EX ² = 609	EY = 20	EY ² = 90	

Substituting the relevant values in the following formula, we get

$$r = \frac{NEXY - EXEY}{\sqrt{[NEX^2 - (EX)^2][NEY^2 - (EY)^2]}}$$

$$= \frac{5 \times 214 - 55 \times 20}{\sqrt{[5 \times 609 - (55)^2][5 \times 90 - (20)^2]}}$$

$$= \frac{1070 - 1100}{\sqrt{[3045 - 3025][450 - 400]}}$$

$$= \frac{-30}{\sqrt{1000}}$$

$$= -0.9 \quad \text{Negligible}$$

You must revise and correct the addition, subtraction and simplification. I am particular about the formula and procedure.