(2) Karl pearson's Coefficient of Correlation

* The Karl pearson's Method, Popularly Known as pearson's Coefficient of correlation. it is denoted by the Symbol r.

* It is one of the very few Symbols that are used Universely for describing the degree of correlation between 2 Series.

* ∴ the formula of computing a pearson's r is $= \frac{\Sigma xy}{N \sigma x \sigma y}$ Here $x = (x - \bar{x})$, $y = (y - \bar{y})$.

σx = Standard deviation of Series x.

σy = " " " " y.

N = No. of Observation.

r = the correlation coefficient.

* This method is to be applied only where the deviation of items are taken from actual mean & not from assumed mean.

another formula.

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \cdot \Sigma y^2}} \qquad x = (x - \bar{x}), \quad y = (y - \bar{y})$$

Step 1:- Take the deviation of X series of the mean of X & denote these deviation by x.

Step 2:- Squared these deviation & obtain that is Σx^2

Step 3:- Take the deviation of Y series from the mean of Y & denote these deviations by Y.

Step 4:- Squared these deviation & obtain the total that is Σy^2.

Step 5:- Multiply the deviations of X & Y and obtain the total that is Σxy.

Step 6:- Substitute the values of Σxy, Σx^2 & Σy^2 in the above formula.

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Problem:- 1

Calculate Karl pearson's coefficient of correlation from the following data.

Roll no. of stu	1	2	3	4	5
Marks in banking	48	35	17	23	47
Marks in stat.	45	20	40	25	45

Soln:-

Let marks in banking the denoted by X & marks in stat by Y.

Calculation of Correlation Coefficient

Roll no.	x	$X = x - \bar{x}$ $(x - 34)$	x^2	y	$Y = y - \bar{y}$ $(y - 35)$	y^2	xy
1	48	$48 - 34 = 14$	196	45	$45 - 35 = 10$	100	140
2	35	$35 - 34 = 1$	1	20	$20 - 35 = -15$	225	-15
3	17	$17 - 34 = -17$	289	40	$40 - 35 = 5$	25	85
4	23	$23 - 34 = -11$	121	25	$25 - 35 = -10$	100	110
5	47	$47 - 34 = 13$	169	45	$45 - 35 = 10$	100	130
$N = 5$	$\Sigma X = 170$	$\Sigma x = 0$	$\Sigma x^2 = 776$	$\Sigma Y = 175$	$\Sigma y = 0$	$\Sigma y^2 = 550$	$\Sigma xy = 280$

$$\bar{x} = \frac{\Sigma x}{N}$$

Here $N = 5$, $\Sigma x = 170$

$$\bar{x} = \frac{170}{5}$$

$$\bar{x} = 34$$

$$\bar{y} = \frac{\Sigma y}{N}$$

$N = 5$, $\Sigma y = 175$.

$$\bar{y} = \frac{175}{5}$$

$$\bar{y} = 35.$$

Now take

$$\Sigma xy = 280$$

$$\Sigma x^2 = 776$$

$$\Sigma y^2 = 550.$$

Then apply the formula.

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}} = \frac{280}{\sqrt{776 \times 550}} = 0.429$$

Hence $\boxed{r = 0.429}$

(21) Make a use of the data summarized below, calculate the coefficient of correlation h_2:

8m

case X_1 X_2 case

Case	A	B	C	D	E	F	G	H
X_1	10	6	9	10	12	13	11	9
X_2	9	4	6	9	11	13	8	4

Soln :-

Let the X_1 denoted by X & X_2 denoted by Y.

Calculation of correlation coefficient.

Case	X	$x = x - \bar{x}$ $= x - 10$	x^2	Y	$y = y - \bar{y}$ $y - 8$	y^2	xy
A	10	$10-10 = 0$	0	9	$9-8 = 1$	1	0
B	6	$6-10 = -4$	16	4	$4-8 = -4$	16	16
C	9	$9-10 = -1$	1	6	$6-8 = -2$	4	2
D	10	$10-10 = 0$	0	9	$9-8 = 1$	1	0
E	12	$12-10 = 2$	4	11	$11-8 = 3$	9	6
F	13	$13-10 = 3$	9	13	$13-8 = 5$	25	15
G	11	$11-10 = 1$	1	8	$8-8 = 0$	0	0
H	9	$9-10 = -1$	1	4	$4-8 = -4$	16	4
$N=8$	$\Sigma x = 80$	$\Sigma x = 0$	$\Sigma x^2 = 82$	$\Sigma y = 64$	$\Sigma y = 0$	$\Sigma y^2 = 72$	$\Sigma xy = 43$

$\bar{x} = \frac{\Sigma x}{N} = \frac{80}{8} = 10$, $\bar{y} = \frac{\Sigma y}{N} = \frac{64}{8} = 8$

Now take:

$\Sigma xy = 43$

$\Sigma x^2 = 32$

$\Sigma y^2 = 72$.

Then the apply formula.

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}}$$

$$= \frac{43}{\sqrt{32 \times 72}}$$

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(3) The following table gives indicies of industrial Production of registered unemployed (in hundred thousand) calculate the value of the Karl pearsons coefficient. or calculation of coefficient of correlation.

Year	2007	2008	2009	2010	2011	2012	013
Index of Production	100	102	104	107	105	112	103
No of unemployed	15	12	13	11	12	12	19

Soln:- Let Index of production be X and no of unemployed be Y

Calculate the karl pearsons of coefficient. Let as assumed mean be $\bar{x} = 100$ & $\bar{y} = 12$.

Year	Production X	$x = X - \bar{X}$, $\bar{X} = 104$	Unemployment Y	$y = Y - \bar{Y}$, $\bar{Y} = 15$	x^2	y^2	xy
2007	100	-4	15	0	16	0	0
2008	102	-2	12	-3	4	9	6
2009	104	0	13	-2	0	4	0
2010	107	3	11	-4	9	16	-12
2011	105	1	12	-3	1	9	-3
2012	112	8	12	-3	64	9	-24
2013	103	-1	19	4	1	16	-4
2014	99	-5	26	11	25	121	-55
N=	$\Sigma X = 832$	$\Sigma x = 0$	$\Sigma y = 0$		$\Sigma x^2 = 120$	$\Sigma y^2 = 184$	$\Sigma xy = -92$

Let $\bar{X} = \frac{\Sigma X}{N} = \frac{832}{8} = 104$

$\bar{Y} = \frac{\Sigma Y}{N} = \frac{120}{8} = 15$

Now take,

$N = 8 \quad \Sigma x^2 = 120, \quad \Sigma y^2 = 184,$

$\Sigma xy = -92.$

Then apply formula.

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}} = \frac{-92}{\sqrt{120 \times 184}}$$

$$= \frac{-92}{\sqrt{22,080}} = \frac{-92}{148.592} = -0.61915$$