

Chapter 8 – Measures of Correlation

Question1

Evaluate the coefficient of rank correlation of ten artisans of a facility that is ranked in terms of their capability by 2 separate judges:

Artisans Name	P	Q	R	S	T	U	V	W	X	Y
Position given Judge P	2	9	5	5	2	2	4	7	8	10
Position given Judge R	3	8	5	7	2	3	2	5	10	9

Answer:

Artisans Name	Position given Judge RP	Position given Judge RR	D= RP-RR	D ²
P	2	3	1	1
Q	9	8	1	1
R	5	5	0	0
S	5	7	-2	4
T	2	2	0	0
U	2	3	-1	1
V	4	2	2	4
W	7	5	2	4
X	8	10	-2	4
Y	10	9	1	1
				ΣD ² =20

$$N = 10$$

$$r_k = 1 - \frac{6 \sum D^2}{n(n^2 - 1)}$$

$$r_k = 1 - \frac{6 \times 20}{10(10^2 - 1)}$$

$$\text{Or, } r_k = \frac{6 \times 20}{1000 - 10}$$

$$r_k = 1 - 0.121$$

$$r_k = 0.88$$

Hence, the coefficient of rank correlation is 0.88

Question 2

Evaluate the coefficient of rank correlation.

Maths Marks	50	60	65	70	75	40	80	85
Accountancy Marks	80	71	60	75	90	82	70	50

Answer:

Maths Marks	Accountancy Marks	R1	R2	D = R1 - R2	D²
50	80	2	6	-4	16
60	71	3	4	-1	1
65	60	4	2	2	4
70	75	5	5	0	0
75	90	6	8	-2	4
40	82	1	7	-6	36
80	70	7	3	4	16
85	50	8	1	7	49
					$\Sigma D^2 = 126$

N = 8

$rk = 1 - \frac{6 \Sigma D^2}{N(N^2 - 1)}$

Or, $rk = \frac{6 \times 126}{512 - 8}$

$rk = 0.5$

Hence, the coefficient of rank correlation is 0.5

Question 3

What is the coefficient of rank correlation of the following information

Subject A	3	5	8	4	7	10	2	1	6	9
Subject B	6	4	9	8	1	2	3	10	5	7

Answer:

RA	RB	D = RA - RB	D²
3	6	-3	9
5	4	1	1

8	9	-1	1
4	8	-4	16
7	1	6	36
10	2	8	64
2	3	-1	1
1	10	-9	81
6	5	1	1
9	7	2	4
			$\Sigma D^2 = 214$

N = 10

$$rk = 1 - \frac{6 \sum D^2}{N^3 - N}$$

$$\text{Or, } rk = \frac{6 \times 214}{1000 - 10}$$

rk = 0.2969

Hence, the coefficient of rank correlation is -0.297

Question 4

Evaluate rank correlation between advertisement sales and cost according to the following information

Cost	78	36	98	25	75	82	90	62	65	39
Sales (in lakh)	84	51	91	60	68	62	86	58	53	47

Answer:

Advertising Cost (X)	Sales (Y)	R1	R2	D = R1 - R2	D2
78	84	7	8	-1	1
36	51	2	2	0	0
98	91	10	10	0	0
25	60	1	5	-4	16
75	68	6	7	-1	1
82	62	8	6	2	4

90	86	9	9	0	0
62	58	4	4	0	0
65	53	5	3	2	4
39	47	3	1	2	4
					$\Sigma D^2 = 30$

$N = 10$

$$r_k = 1 - \frac{6 \sum D^2}{N^3 - N}$$

$$\text{Or, } r_k = 1 - \frac{6 \times 30}{1000 - 10}$$

$$r_k = 1 - 0.1818 = -0.1818$$

Hence, the coefficient of rank correlation is -0.18

Question 5

Evaluate rank coefficient of correlation.

X	1	2	3	4	5	6	7	8	9	10	11	12
Y	12	9	6	10	3	5	4	7	8	2	11	1

Answer:

X	Y	R1	R2	D = R1 - R2	D²
1	12	1	12	-11	121
2	9	2	9	-7	49
3	6	3	6	-3	9
4	10	4	10	-6	36
5	3	5	3	2	4
6	5	6	5	1	1
7	4	7	4	3	9
8	7	8	7	1	1
9	8	9	8	1	1
10	2	10	2	8	64

11	11	11	11	0	0
12	1	12	1	11	121
$N = 12$					$\Sigma D^2 = 416$

Here, $m = 0$

$$rk = 1 - \frac{6 \sum D^2}{N^3 - N}$$

$$rk = 1 - \frac{6 \times 416}{1728 - 12}$$

$$\text{Or, } rk = 1 - \frac{2946}{1716}$$

$$rk = -0.454$$

Hence, the coefficient of rank correlation is -0.454