Unit 5:
Spearman’s rank correlation coefficient

- Spearman’s rank correlation coefficient measures the strength of association between two ranked variables

The formula for the Spearman rank correlation coefficient when there are no tied ranks is:

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

p = Spearman's rank correlation coefficient

d_i = difference between the two ranks of each observation

n = number of pairs of ranks

Example 1: Suppose we have ranks of 8 students of B.Sc. in Statistics and Mathematics. On the basis of rank we would like to know that to what extent the knowledge of the student in Statistics and Mathematics is related.

Rank in Statistics	1	2	3	4	5	6	7	8
Rank in Mathematics	2	4	1	5	3	8	7	6

Rank in Statistics (R_x)	Rank in Mathematics (R_y)	Difference of Ranks $d_i=R_X-R_Y$	d_i^2
1	2	-1	1
2	4	-2	4
3	1	2	4
4	5	-1	1
5	3	-2	4
6	8	2	4
7	7	0	0
8	6	2	4
		$\sum d_i^2$	22

$$\rho = 1 - \frac{6\sum d_i^2}{n(n^2-1)}$$

Here, n = number of paired observations = 8

$$r_s = 1 - \frac{6\sum d_i^2}{n(n^2-1)} = 1 - \frac{6 \times 22}{8 \times 63} = 1 - \frac{132}{504} = \frac{372}{504} = 0.74$$

Example 2 : The scores for nine students in physics and math are as follows:

Physics: 35, 23, 47, 17, 10, 43, 9, 6, 28

Mathematics: 30, 33, 45, 23, 8, 49, 12, 4, 31

Physics (X)	R_x	Maths (Y)	R_y	Difference of Ranks $d_i=R_X-R_Y$	d_i^2
35	3				
23	5				
47	1				
17	6				
10	7				
43	2				
9	8				
6	9				
28	4				