

- Q. 10. Briefly discuss the properties of coefficient of correlation.  
 Q. 11. How the problem of equal ranks is solved?  
 Q. 12. How rank correlation is calculated when ranks are not given?

### Long Answer Type Questions (6 Marks each)

- Q. 1. Define the term correlation. Also give significance of correlation.  
 Q. 2. Discuss the various reasons for correlation between two variables.  
 Q. 3. Explain the different types of correlation.  
 Q. 4. Discuss the different degrees of correlation.  
 Q. 5. Give the meaning of scatter diagram. Also draw scatter diagram showing perfect positive correlation and zero correlation.  
 Q. 6. Discuss the merits and demerits of scatter diagram.  
 Q. 7. Discuss the merits and demerits of coefficient of correlation.  
 Q. 8. Briefly discuss the merits and demerits of rank correlation.  
 Q. 9. Distinguish between Karl Pearson's Method and Spearman's Rank Method.

### Unsolved Practicals

#### Scatter Diagram

1. Make a scatter diagram from the following data and interpret the result.

X	4	5	6	7	8	9	10	11	12
Y	78	72	66	60	54	48	42	36	30

{There is perfect negative correlation between X and Y}

2. Represent correlation between the following figures through scatter diagram.

X	8	16	24	31	42	50
Y	70	58	50	32	26	12

{There is high degree of negative correlation between X and Y}

3. Given the following pairs of values of the variables X and Y:

X	1	2	3	4	5	6	7	8
Y	11	12	15	20	24	18	26	29

Make a scatter diagram. Comment on the nature of relationship between variables X and Y.

{There is high degree of positive correlation between X and Y}

4. Given the following pair of values of the variables X and Y:

X	8	10	12	11	9	7	13	14	15
Y	5	7	9	8	6	4	10	11	12

Also describe relationship between X and Y.

{There is perfect positive correlation between X and Y}



### Karl Pearson's Coefficient of Correlation

5. Find the coefficient of correlation between X and Y series from the data:

X	10	12	8	15	20	25	40
Y	15	10	6	25	16	12	8

{Coefficient of Correlation = -0.178}

6. The data on price and quantity purchased relating to a commodity for 10 months are given below. Calculate coefficient of correlation between price and quantity.

Price (₹)	10	14	12	11	9	7	15	16	18	20
Quantity (kg.)	25	20	30	32	35	40	19	16	12	10

{Coefficient of Correlation = -0.958}

7. From the following data, calculate coefficient correlation between the variables X and Y using Karl Pearson's method:

X	10	6	9	10	12	13	11	9
Y	9	4	6	9	11	13	8	4

{Coefficient of Correlation = 0.896}

8. Calculate coefficient of correlation for the ages of husband and wife.

Age of husband	24	25	22	30	34	37
Age of wife	20	21	18	26	28	30

{Coefficient of Correlation = 0.9925}

9. Find out the correlation between the marks in Statistics and marks in Accountancy:

No of students	1	2	3	4	5	6	7	8	9	10
Marks in Statistics	20	35	15	40	10	35	30	25	45	30
Marks in Accountancy	25	30	20	35	20	25	25	35	35	30

{Coefficient of Correlation = 0.76}

10. Find Karl Pearson's coefficient of correlation between the values of X and Y given data:

X	128	129	130	140	132	135	125	130	132	135
Y	80	89	90	95	96	94	80	100	96	100

{Coefficient of Correlation = 0.66}

11. Calculate coefficient of correlation from the following data:

Height of fathers (inches)	66	68	69	72	65	59	62	67	61	71
Height of Sons (inches)	65	64	67	69	64	60	59	68	60	64

{Coefficient of Correlation = 0.83}

12. Making use of the data given below, calculate the coefficient of correlation.

X	10	6	9	10	12	13	11	9
Y	9	4	6	9	11	13	8	4

{Coefficient of Correlation = 0.8958}

### Measures of Correlation

13. The data on price and demand for a commodity is given below:

Price (₹)	14	16	17	18	19	20	21	22	23
Demand (kg.)	84	78	70	75	86	67	62	58	60

Calculate the coefficient of correlation between price and demand and comment on its sign and magnitude.

{Coefficient of Correlation = -0.954; There is a high degree of negative correlation between price and demand}

14. Find coefficient of correlation from the following figures:

X	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
Y	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000

Note: Attempt this question by multiplying Series X by 10 and dividing series Y by 1,000. You will get the same answer, even if you solve it with the original figures.

{Coefficient of Correlation = 1}

15. Calculate product moment correlation between the values of X and Y:

X	2	3	1	5	6	4
Y	4	5	3	4	6	2

{Coefficient of Correlation = 0.45}

16. Following are the heights and weights of 10 students of a class:

Height (inches)	60	64	68	62	67	69	70	72	65	61
Weight (kg)	50	48	56	65	49	52	57	60	59	47

Calculate the coefficient of correlation by Karl Pearson's method:

{Coefficient of Correlation = 0.29}

17. Calculate coefficient of correlation from the following data:

X	30	36	42	48	54	60	72	82
Y	50	50	54	54	62	66	70	82

{Coefficient of Correlation = 0.975}

18. Calculate Karl Pearson's coefficient of correlation between income and expenditure of 10 families from the following data:

Income (in '000)	59	55	58	60	65	63	54	56	66	64
Expenditure (in '000)	52	53	55	58	57	66	59	54	52	54

{Coefficient of Correlation = 0.0843}

19. Calculate Karl Pearson's coefficient between the marks (out of 30) in English and Hindi obtained by 10 students.

Marks in English	10	25	13	25	22	11	12	25	21	20
Marks in Hindi	12	22	16	15	18	18	17	23	24	17

{Coefficient of Correlation = 0.5748}



20. Calculate coefficient of correlation from the following data:

- (i) Sum of deviation of X values = - 6
- (ii) Sum of deviation of Y values = 1
- (iii) Sum of squares of deviations of X values = 196
- (iv) Sum of squares of deviation of Y values = 87
- (v) Sum of the product of deviations of X and Y values = 124
- (vi) No of pairs of observations = 6

{Coefficient of Correlation = 0.973}

Rank Correlation

Ranks are given

21. Two judges in a beauty competition rank the 12 entries as follows:

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

Calculate the Spearman's rank coefficient of correlation.

{Coefficient of rank correlation = - 0.45}

22. A group of ten workers of a factory is ranked according to their efficiency by two different judges as follows:

Name of Worker	A	B	C	D	E	F	G	H	I	J
Rank by Judge A	4	8	6	7	1	3	2	5	10	9
Rank by Judge B	3	9	6	5	1	2	4	7	8	10

Compute the coefficient of rank correlation.

{Coefficient of rank correlation = 0.88}

23. Ten competitors in a debate contest are ranked by three judges in the following order.

Competitors	A	B	C	D	E	F	G	H	I	J
Ranks by 1 <sup>st</sup> Judge	7	4	10	5	9	8	6	2	1	3
Ranks by 2 <sup>nd</sup> Judge	4	1	9	10	7	3	2	5	6	8
Ranks by 3 <sup>rd</sup> Judge	10	2	8	5	7	6	9	1	4	3

Use the ranking correlation method and state which pair of judges have the nearest approach.

{1<sup>st</sup> and 3<sup>rd</sup> judge pair has the nearest approach; Ranking correlation between 1<sup>st</sup> and 2<sup>nd</sup> judge = 0.103;  
Ranking correlation between 1<sup>st</sup> and 3<sup>rd</sup> judge = 0.73;  
Ranking correlation between 2<sup>nd</sup> and 3<sup>rd</sup> judge = - 0.006}

Ranks are not given

24. A group of 8 students got the following marks in a test in Maths and Accountancy.

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

Compute the coefficient of rank correlation.

{Coefficient of rank correlation = - 0.5}

25. Calculate rank correlation between advertisement cost and sales as per the data given below:

Cost (in '000 ₹)	78	36	98	25	75	82	90	62	65	39
Sales (in lakh ₹)	84	51	91	60	68	62	86	58	53	47

{Coefficient of rank correlation = 0.82}

Equal Ranks

26. Calculate the coefficient of rank correlation from the following data:

X	48	33	40	9	16	16	65	24	16	57
Y	13	13	24	6	15	4	20	9	6	19

{Coefficient of Rank Correlation = 0.73}

Incorrect Values

27. The coefficient of rank correlation of the marks obtained by 10 students in two particular subjects was found to be 0.5. It was later discovered that the difference in ranks in two subjects obtained by one of the students was wrongly taken as 3 instead of 7. What should be the correct value of coefficient of rank correlation?

{Correct Coefficient of rank Correlation = 0.257}

Miscellaneous Questions

28. Find the standard deviation of X series, if coefficient of correlation between two series X and Y is 0.35 and their covariance in 10.5 and variance of Y series is 56.25.

{Standard deviation = 4}

29. The rankings of ten students in two subjects A and B as follows:

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

What is the coefficient of rank correlation?

{Coefficient of rank Correlation = - 0.297}

30. Calculate the number of items, when:

- (i) Standard deviation of series Y = 10
- (ii) Coefficient of correlation = 0.6
- (iii) Sum of the product of deviations of X and Y from actual means = 150
- (iv) Sum of squares of deviations of X from actual means = 125

{Number of items = 5}

31. Find the coefficient of rank correlation between the marks obtained in Mathematics and those in Statistics by 10 students of a class.

Marks in Mathematics	12	18	32	18	25	24	25	40	38	22
Marks in Statistics	16	15	28	16	24	22	25	36	34	19

{Coefficient of Rank Correlation = 0.95}

32. From the following data, calculate coefficient of correlation.

X	57	59	62	63	64	65	58	66	70	72
Y	113	117	126	125	130	128	110	132	140	149

{Coefficient of Correlation = 0.98}

33. Calculate the coefficient of correlation, if:

- (i) Covariance between X and Y = + 9.2
- (ii) Variance of X = 11.5
- (iii) Variance of Y = 14.2

{Coefficient of Correlation = 0.72}

34. Find Karl Pearson's coefficient for the following data:

Marks in English	45	70	65	30	90	40	50	75	85	60
Marks in Maths	35	90	70	40	95	40	60	80	80	50

{Coefficient of Correlation = 0.9031}

