Pearson Edexcel AS Further Mathematics 8FM0

FurStats 2 − 3 Correlation

Time allowed: 45 minutes

School: www.CasperYC.club

Name:

Teacher:

Question	Points	Score
1	3	
2	5	
3	10	
4	9	
5	12	
Total:	39	

How I can achieve better:

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1. An estate agent in Tornep believes that houses further from the railway station are more expensive [3] than those that are closer. She took a random sample of 22 three–bedroom houses in Tornep and calculated the product moment correlation coefficient between the house price and the distance from the station to be 0.3892. Stating your hypotheses clearly, use a 5% level of significance to test the estate agent's belief. State the critical region used in your test.

2. An antiques expert was asked to rank 10 china plates $A, B, C, D, E, F, G, H, I$ and J in order of age. Her order was   [5]

$$D \quad C \quad B \quad G \quad I \quad H \quad A \quad E \quad J \quad F$$

with D being the plate she thinks is the oldest.

The actual ages of the plates, in years, are given in the table below.

Plate	A	B	C	D	E	F	G	H	I	J
Age	60	120	110	95	25	68	40	75	85	80

Calculate Spearman's rank correlation coefficient between the ages of the plates and the expert's ranks.

3. Bara is investigating whether or not the two judges of a skating competition are in agreement. The two judges gave a score to each of the 8 skaters in the competition as shown in the table below.

	Skater							
	A	B	C	D	E	F	G	H
Judge 1	71	70	72	62	63	61	57	53
Judge 2	73	71	67	64	62	56	52	53

Bara decided to calculate Spearman's rank correlation coefficient for these data.

(a) Calculate Spearman's rank correlation coefficient between the ranks of the two judges. [4]

(b) Test, at the 1% level of significance, whether or not the two judges are in agreement. [4]

Judge 1 accidentally swapped the scores for skaters D and E. The score for skater D should be 63 and the score for skater E should be 62.

(c) Without carrying out any further calculations, explain how Spearman's rank correlation coefficient will change. Give a reason for your answer. [2]

Total: 10

(Q3 continued . . .)

4. Mary, Jahil and Dawn are judging the cakes in a village show. They have 5 features to consider and each feature is awarded up to 5 points. The total score the judges gave each cake are given in the table below.

Cake	A	B	C	D	E	F	G	H	I
Mary	19	17	23	10	21	15	12	8	14
Jahil	22	18	21	10	24	20	16	12	15
Dawn	9	11	6	18	9	15	13	20	13

(a) Calculate Spearman's rank correlation coefficient between Mary's scores and Jahil's scores. [4]

(b) Calculate Spearman's rank correlation coefficient between Jahil's scores and Dawn's scores. [3]

The judges discussed their interpretation of the points system and agreed that the first prize should go to cake C.

(c) Explain how different interpretations of the points system could give rise to the results in part (a) and part (b). [2]

Total: 9

(Q4 continued . . .)

5. The table below shows the heights cleared, in metres, for each of 6 competitors in a high jump competition.

Competitor	A	B	C	D	E	F
Height (m)	2.05	1.93	2.02	1.96	1.81	2.02

These 6 competitors also took part in a long jump competition and finished in the following order, with C jumping the furthest.

$$C \quad A \quad F \quad D \quad B \quad E$$

(a) Calculate Spearman's rank correlation coefficient for these data. [4]

(b) Stating your hypotheses clearly, test at the 5% level of significance whether or not there is a positive correlation between results in the high jump and results in the long jump. [4]

The product moment correlation coefficient between the height of the high jump and the length of the long jump for each competitor is found to be 0.678.

(c) Use this value to test, at the 5% level of significance, for evidence of positive correlation between results in the high jump and results in the long jump. [2]

(d) State the condition required for the test in part (c) to be valid. [1]

(e) Explain what your conclusions in part (b) and part (c) suggest about the relationship between results in the high jump and results in the long jump. [1]

Total: 12

(Q5 continued . . .)