

Section 2: Testing for correlation

Exercise level 1

A

Child	A	B	C	D	E	F	G	H	I	J
Arithmetic Mark x	1	8	15	18	23	28	33	39	45	45
English Mark y	3	14	8	20	19	17	36	26	14	29

B

x	3	7	9	11	14	14	15	21	22	23	24
y	5	12	5	12	10	17	23	16	10	20	25

C

x	0.6	1	2	2.5	2.8	3.6	4	4	4	5
y	5	10	15	10	2.5	7.5	2.5	5	15	10

D

x	1	5	5	5	6	7.5	7.5	7.5	10	11	12.5	14	14.5	68
y	85	82	85	89	78	66	77	81	70	74	65	69	63	16

- For each of tables of bivariate data, A, B, C above:
 - Draw a scatter diagram of the data of y against x .
 - Describe the nature of any correlation of x and y .
 - Calculate the mean value of x and that of y . Mark the point (\bar{x}, \bar{y}) on the diagram and if appropriate draw a line of best fit eye through the mean point.
- Use your scatter diagrams from Question 1 to answer these questions.
 - Using your graph for A, estimate the English mark for another student in the group who scored an arithmetic mark of 35.
 - In B, y represents a maths mark with 20 subtracted and x represents a student's IQ with 100 subtracted. Estimate from your graph for B, the maths mark of another student in the group with an IQ of 120. What about a student with an IQ of 140?
 - What can be estimated from C?
- Consider the data for D. Identify the outlier and suggest a reason for it.
 - Remove the outlier and repeat Q1 for D.
- Use calculator or spreadsheet functions to calculate the product moment correlation coefficients for each of A, B, C and D.

In question 5 to 8, hypothesis tests are carried out using samples of bivariate data (x, y) from a parent population.

Edexcel A level Maths Hypothesis testing 2 Exercise

In each case state whether the test should be 1-tail or 2-tail, find the critical value and give the acceptance and critical regions. State whether the result is significant and why, and draw the correct conclusions about the population.

5. H_0 : No correlation $\rho = 0$
 H_1 : Positive correlation $\rho > 0$
5% significance level.
A random sample of 20 gives correlation coefficient $r = 0.4$.

6. H_0 : No correlation $\rho = 0$
 H_1 : Some correlation $\rho \neq 0$
2% significance level.
A random sample of 20 gives correlation coefficient $r = 0.5$.

7. H_0 : No correlation $\rho = 0$
 H_1 : Negative correlation $\rho < 0$
5% significance level.
A random sample of 15 gives correlation coefficient $r = -0.6$.

8. H_0 : No correlation $\rho = 0$
 H_1 : Some correlation $\rho \neq 0$
5% significance level.
A random sample of 28 gives correlation coefficient $r = -0.45$.