

Please check the examination details below before entering your candidate information

Candidate surname		Other names	
Centre Number		Candidate Number	

Pearson Edexcel Level 3 GCE

Friday 16 May 2025

Afternoon **Paper reference** **8FM0/23**

Further Mathematics
Advanced Subsidiary
Further Mathematics options
23: Further Statistics 1
(Part of options B, E, F and G)

You must have:
 Mathematical Formulae and Statistical Tables (Green), calculator

Total Marks

Candidates may use any calculator allowed by Pearson regulations. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear.
Answers without working may not gain full credit.
- Values from statistical tables should be quoted in full. If a calculator is used instead of tables the value should be given to an equivalent degree of accuracy.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- The total mark for this part of the examination is 40. There are 4 questions.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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1. A researcher is investigating the relationship between a person's age and their preferred method of shopping.

A random sample of 300 people is taken and the results are summarised in the table below.

		Preferred method of shopping		
		Online	In-store	Total
Age	18 – 30	27	23	50
	31 – 50	31	59	90
	51 – 64	17	43	60
	65 and older	30	70	100
Total		105	195	300

- (a) Write down suitable hypotheses for a test to determine whether or not there is evidence of an association between age and preferred method of shopping.

(1)

The researcher assumes that the null hypothesis is true and uses the data in the table to find expected values.

- (b) (i) Identify the cell which would have the smallest expected value.

(ii) Calculate the expected value for this cell.

(2)

The value of $\sum \frac{(O-E)^2}{E}$ for the other 7 cells is 5.060

- (c) Test, at the 5% level of significance, whether or not there is evidence of an association between age and preferred method of shopping.

You should state the test statistic, degrees of freedom, critical value and conclusion clearly.

(5)

- (d) Explain whether or not your conclusion to part (c) would be the same if the test was carried out at a 1% level of significance.

(2)



Question 1 continued

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Question 1 continued

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Question 1 continued

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(Total for Question 1 is 10 marks)



Question 2 continued

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Question 2 continued

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(Total for Question 2 is 12 marks)

Question 3 continued

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(Total for Question 3 is 11 marks)

Question 4 continued

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Question 4 continued

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(Total for Question 4 is 7 marks)**TOTAL FOR FURTHER STATISTICS 1 IS 40 MARKS**