

Please check the examination details below before entering your candidate information	
Candidate surname	Other names
Centre Number	Candidate Number
Pearson Edexcel Level 3 GCE	
Monday 24 June 2024	
Afternoon (Time: 1 hour 30 minutes)	Paper reference 9FM0/4B
Further Mathematics Advanced PAPER 4B: Further Statistics 2	
You must have: Mathematical Formulae and Statistical Tables (Green), calculator	Total Marks

Candidates may use any calculator permitted 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.
- There are 8 questions in this question paper. The total mark for this paper is 75.
- 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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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 9 marks)

P 7 2 8 0 1 A 0 5 2 8

2. An estate agent asks customers to rank 7 features of a house, A, B, C, D, E, F and G , in order of importance. The responses for two randomly selected customers are in the table below.

Rank	1	2	3	4	5	6	7
Customer 1	A	E	C	F	G	B	D
Customer 2	E	F	C	G	A	D	B

- (a) Calculate Spearman's rank correlation coefficient for these data.

(4)

- (b) Stating your hypotheses and critical value clearly, test at the 5% level of significance, whether or not the two customers are generally in agreement.

(3)

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Question 2 continued

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(Total for Question 2 is 7 marks)

- (2)

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Question 3 continued

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(Total for Question 3 is 8 marks)

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- (1)

(b) Show that the probability that G and H are both greater than 12 is $\frac{1}{16}$

(3)

$$y = -3$$

$$y = -4|x| + k$$

(c) Calculate the expected value of A

(5)

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Question 4 continued

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Question 4 continued

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(Total for Question 4 is 9 marks)

P 7 2 8 0 1 A 0 1 3 2 8

5. A continuous random variable X has probability density function

$$f(x) = \begin{cases} ax^{-2} - bx^{-3} & 2 \leq x < \infty \\ 0 & \text{otherwise} \end{cases}$$

where a and b are constants.

Given that $P(X \leq 4) = \frac{3}{8}$

- (a) use algebraic integration to show that $a = 3$
Show your working clearly.

(6)

- (b) Find the exact value of the median of X

(4)

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Question 5 continued

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Question 5 continued

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(Total for Question 5 is 10 marks)



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Question 6 continued

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Question 6 continued

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(Total for Question 6 is 12 marks)



7. Two organisations are each asked to carry out a survey to find out the proportion, p , of the population that would vote for a particular political party.

The first organisation finds that out of m people, X would vote for this particular political party.

The second organisation finds that out of n people, Y would vote for this particular political party.

An unbiased estimator, Q , of p is proposed where

$$Q = k \left(\frac{X}{m} + \frac{Y}{n} \right)$$

- (a) Show that $k = \frac{1}{2}$

(2)

A second unbiased estimator, R , of p is proposed where

$$R = \frac{aX}{m} + \frac{bY}{n}$$

- (b) Show that $a + b = 1$

(2)

Given that $m = 100$ and $n = 200$ and that R is a better estimator of p than Q

- (c) calculate the range of possible values of a
Show your working clearly.

(7)

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Question 7 continued

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Question 7 continued

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(Total for Question 7 is 11 marks)

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8. A company packs chickpeas into small bags and large bags.

The weight of a small bag of chickpeas is normally distributed with mean 500 g and standard deviation 5 g

A random sample of 3 small bags of chickpeas is taken.

- (a) Find the probability that the total weight of these 3 bags of chickpeas is between 1490 g and 1530 g

(3)

The weight of a large bag of chickpeas is normally distributed with mean 1020 g and standard deviation 20 g

One large bag and one small bag of chickpeas are chosen at random.

- (b) Calculate the probability that the weight of the large bag of chickpeas is at least 30 g more than twice the weight of the small bag of chickpeas.
Show your working clearly.

(6)

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Question 8 continued

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(Total for Question 8 is 9 marks)**TOTAL FOR PAPER IS 75 MARKS**