

Cambridge International AS & A Level

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

4209742464

FURTHER MATHEMATICS

9231/43

Paper 4 Further Probability & Statistics

May/June 2022

1 hour 30 minutes

You must answer on the question paper.

You will need: List of formulae (MF19)

INSTRUCTIONS

- Answer all questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do not write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

INFORMATION

- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [].

This document has 12 pages.

1	The times taken by members of a large quiz club to complete a challenge have a normal distribution
	with mean μ minutes. The times, x minutes, are recorded for a random sample of 8 members of the
	club. The results are summarised as follows, where \overline{x} is the sample mean.

	$\bar{x} = 33.8$	$\sum (x - \overline{x})^2 = 94.5$
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Find a 95% confidence interval for μ .	[4]

A scientist is investigating the size of shells at various beach locations. She selects four beach locations and takes a random sample of shells from each of these beaches. She classifies each shell as large or small. Her results are summarised in the following table.

		A	В	С	D	Total
Size of shell	Large	68	69	96	81	314
Size of shell	Small	28	55	64	39	186
	Total	96	124	160	120	500

Test, at the 10% significance level, whe	ether the size of shell is indepe	endent of the beach location. [7]

3

The	orge throws two coins, A and B , at the same time. Coin A is biased so that the probability a head is a . Coin B is biased so that the probability of obtaining a head is b , where probability generating function of X , the number of heads obtained by George, is G_X efficients of t and t^2 in $G_X(t)$ are $\frac{5}{12}$ and $\frac{1}{12}$ respectively.	b < a
(a)	Find the value of <i>a</i> .	[2]
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	random variable Y is the sum of two independent observations of X . Find the probability generating function of Y , giving your answer as a polynomial in t .	[3
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(c)	Find $Var(Y)$.
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The continuous random variable X has probability density function f given by

4

a) Find $E(\sqrt{X})$	$f(x) = \begin{cases} \frac{3}{8} \left(1 + \frac{1}{x^2} \right) \\ 0 \end{cases}$	$1 \le x \le 3$, otherwise.	
	able <i>Y</i> is given by $Y = X^2$. Subability density function of <i>Y</i> .		

(c)	Find the 40th percentile of <i>Y</i> .	[3]

5

A manager claims that the lengths of the rubber tubes that his company produces have a median of

	5.56	5.45	5.47	5.58	5.54	5.52	5.60	5.35	5.59	5.51	5.62
It is red is 5.50	quired to cm again	test at t	the 10% alternativ	signific e hypot	ance lev hesis tha	el the nu	ıll hypot pulation	thesis the	at the po length i	pulation s not equ	median len
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6	A company has two machines, A and B, which independently fill small bottles with a liquid. The
	volumes of liquid per bottle, in suitable units, filled by machines A and B are denoted by x and y
	respectively. A scientist at the company takes a random sample of 40 bottles filled by machine A and a
	random sample of 50 bottles filled by machine <i>B</i> . The results are summarised as follows.

$\Sigma x = 1120$	$\sum x^2 = 31400$	$\sum y = 1370$	$\sum y^2 = 37600$

The population means of the volumes of liquid in the bottles filled by machines A and B are denoted by μ_A and μ_B .

Test at the 2% significance level whether there is any difference between μ_A and μ_B .

$\mu_A - \mu_B$ is greater	U.2.				
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Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.							
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