



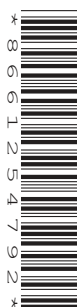
Cambridge International AS & A Level

CANDIDATE
NAME
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FURTHER MATHEMATICS

9231/43

Paper 4 Further Probability & Statistics

May/June 2024

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.

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- 2 A rowing club has a large number of members. A random sample of 12 of these members is taken and the pulse rate, x beats per minute (bpm), of each is measured after a 30-minute training session. A 98% confidence interval for the population mean pulse rate, μ bpm, is calculated from the sample as $64.22 < \mu < 68.66$.

(a) Find the values of $\sum x$ and $\sum x^2$. [6]

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(b) State an assumption that is necessary for the confidence interval to be valid. [1]

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Test, at the 5% significance level, whether the reliability of buses is independent of bus company. [7]

[illegible]



4 The random variable X has probability generating function $G_X(t)$ given by

$$G_X(t) = ct(1+t)^5,$$

where c is a constant.

(a) Find the value of c .

[1]

(b) Find the value of $E(X)$.

[2]

[illegible]



The random variable Y is the sum of two independent values of X .

- (c) Write down the probability generating function of Y and hence find $\text{Var}(Y)$. [4]

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- (d) Find $P(Y = 5)$. [2]

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5 The continuous random variable X has cumulative distribution function F given by

$$F(x) = \begin{cases} 0 & x < 2, \\ \frac{(x-2)^2}{12} & 2 \leq x < 4, \\ 1 - \frac{(8-x)^2}{24} & 4 \leq x \leq 8, \\ 1 & x > 8. \end{cases}$$

(a) Sketch the graph of the probability density function of X .

[3]

(b) Find $E(X)$.

[3]

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[4]

[illegible]



- [illegible]

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