* 0000800000001 *

Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8955405244

MATHEMATICS **9709/61**

Paper 6 Probability & Statistics 2 **May/June 2025**

1 hour 15 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.

© UCLES 2025

[Turn over

https://xtremepape.rs/

1 It is known that 1% of houses in a certain area have a wind turbine. A random sample of 400 houses in this area is chosen for a survey on domestic heating. The number of houses in the sample that have a wind turbine is denoted by X.

Use a suitable approximating distribution to find $P(X \leqslant 3)$. [3]

DO NOT WRITE IN THIS MARGIN

https://xtremepape.rs/

2 The random variable X has the distribution $\mathrm{B}\left(8, \frac{3}{4}\right)$. A random sample of 100 values of X is chosen, and the sample mean, $\overline{X}$, is found.

(a) Find $\mathrm{P}(\overline{X} > 6.2)$. You are **not** expected to use a continuity correction. [6]

(b) State why the Central Limit Theorem was needed in the calculation in part **(a)**. [1]

DO NOT WRITE IN THIS MARGIN

https://xtremepape.rs/

3 The time, T minutes, for a certain daily bus journey is normally distributed. The bus company claims that the mean of T is 45. A passenger believes that the mean of T is actually greater than 45. She notes the times taken for this journey on a random sample of 60 days. The results are summarised below.

$$n = 60 \qquad \Sigma t = 2750 \qquad \Sigma t^2 = 127000$$

(a) Calculate unbiased estimates of the population mean and variance. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Test the passenger's belief at the 5% significance level. [5]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

https://xtremepape.rs/

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

4 At an entertainment centre, the cost for using a particular video game is \$0.40 per minute. The number of minutes for which people use the video game has mean 15 and variance 9.

(a) Find the mean and variance of the amount people pay for using the video game. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Each day, 35 people independently use the video game.

(b) Find the mean and variance of the total amount paid by 35 people. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

https://xtremepape.rs/

5 **(a)** The random variables W and X have the independent distributions Po(1.2) and Po(2.3) respectively.

(i) Find $\mathrm{P}(3 \leqslant W+X \leqslant 5)$. [2]

.....

.....

.....

.....

.....

.....

The random variable S is the sum of 100 independent values of W and 200 independent values of X.

(ii) Use a suitable approximation to find $\mathrm{P}(S > 600)$. [6]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

https://xtremepape.rs/

(b) The random variable Y has the distribution $\mathrm{Po}(\lambda)$, where $\lambda > 0$.

It is given that $\frac{5}{2}\mathrm{P}(Y = 3) + \mathrm{P}(Y = 4) = \mathrm{P}(Y = 5)$.

Find the value of λ. [3]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

https://xtremepape.rs/

6 A manufacturer of cell phones claims that 25% of students own a Pumpkin phone. Jeyeraj thinks that the proportion of students at his large college who own a Pumpkin phone is less than 25%. He plans to test the manufacturer's claim. He chooses a random sample of 30 students at his college. If the number of students who own a Pumpkin phone is less than 5, Jeyeraj will reject the manufacturer's claim.

(a) State suitable hypotheses for the test. [1]

.....

.....

.....

.....

.....

(b) Given that the true proportion of students at the college who own a Pumpkin phone is 10%, use a binomial distribution to find the probability of a Type II error. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

https://xtremepape.rs/

At Florence's college, in a random sample of 40 students, it was found that 5 own a Pumpkin phone.

(c) Calculate an approximate 95% confidence interval for the proportion of students at Florence's college who own a Pumpkin phone. [3]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

https://xtremepape.rs/

7 X is a random variable with probability density function given by

$$f(x) = \begin{cases} (1+\cos \pi x) & 0 \leqslant x \leqslant 1, \\ 0 & \text{otherwise.} \end{cases}$$

(a) Show that $P\left(X < \frac{1}{2}\right) = \frac{1}{2} + \frac{1}{\pi}$. [3]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
https://xtremepape.rs/

(b) Show that $\mathrm{E}(X) = \frac{1}{2} - \frac{2}{\pi^2}$. [5]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

https://xtremepape.rs/

Additional page

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

https://xtremepape.rs/