



## Cambridge International AS & A Level

CANDIDATE NAME				
CENTRE NUMBER		CANDIDATE NUMBER		

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.



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 $P(X \le 3)$ .	[3]

(a)

**(b)** 

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

3

Find $P(\overline{X} > 6.2)$ . You are <b>not</b> expected to use a continuity correction.	[6]
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State why the Central Limit Theorem was needed in the calculation in part (a).	[1]
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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.

		2
n = 60	$\sum t = 2750$	$\sum t^2 = 127000$

(a)	Calculate unbiased estimates of the population mean and variance.	[3]
(b)	Test the passenger's belief at the 5% significance level.	[5]



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.

[3]
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- 5 (a) The random variables W and X have the independent distributions Po(1.2) and Po(2.3) respectively.
  - (i) Find  $P(3 \le W + X \le 5)$ . [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 $P(S > 600)$ .	[6]


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

It is given that $\frac{5}{2}P(Y)$	Y = 3) + P(Y = 4) = P(Y = 5)
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Find the value of $\lambda$ . [3]

A manufacturer of cell phones claims that 25% of students own a Pumpkin phone. Jeyeraj thinks that 6 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 1 binomial distribution to find the probability of a Type II error.	0%, use a [3]			
		· <b>·····</b>			

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

(	Calculate an approximate 95% confidence interval for the proportion of students at Florence college who own a Pumpkin phone.

X is a random variable with probability density function given by

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

Show that $P(X < \frac{1}{2}) = \frac{1}{2}$	 			[3
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**(b)** 

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

## Additional page

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