



Cambridge International AS & A Level

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MATHEMATICS

9709/65

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 [].

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- 1 The random variable X has the distribution $\text{Po}(1.5)$. The sum of three independent values of X is denoted by S .

(a) Find $P(S \leq 3)$.

[3]

(b) Show that the exact value of $\frac{P(S \leq 2)}{P(S \leq 1)}$ is $\frac{125}{44}$.

[3]





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[6]

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[1]

[illegible]



- 3 Maroulla's calculator can generate random numbers between 0.000 and 0.999 inclusive, correct to 3 significant figures. She plans to use her calculator to choose a sample of members from the 851 members in her health club. She numbers the members from 1 to 851. Then she uses her calculator to generate some random numbers. She multiplies each random number by 851 and rounds **up** to the next whole number to give the number of a member in the sample. This is called a 'member number'.

- (a) Maroulla's first random number is 0.401.

Find the member number that is produced by this random number.

[1]

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- (b) Find all possible random numbers, correct to 3 decimal places, that would produce the following member numbers.

- (i) A member number of 680.

[1]

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- (ii) A member number of 850.

[1]

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- (c) Explain briefly how your answers to part (b) show that Maroulla's method does not produce a random sample.

[1]

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(b) Use a suitable approximating distribution to find the probability that a total of fewer than 145 cars and trucks arrive at the fuel station during a randomly chosen 2-hour period. [5]

[illegible]



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- 5 Candidates for a certain diploma take two tests. Their marks for the first test and the second test are modelled by the independent variables with distributions $N(38.1, 3.8^2)$ and $N(64.0, 6.1^2)$ respectively. The final mark, F , for each candidate is found by doubling the mark in the first test and adding the result to the mark in the second test.

Find the probability that the mean, $\bar{F}$, of the final marks of a random sample of 25 candidates is greater than 143. [5]

[illegible]



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[5]

[illegible]

[illegible]

(c) Find the probability of a Type I error. [2]

[illegible]



- 7 A firm makes a certain type of battery-powered toy. The battery life is denoted by X hours and the population mean of X is supposed to be 12. The Quality Control department wished to test whether the population mean of X is actually less than 12. They tested a random sample of 50 of these toys and found that the sample mean, $\bar{X}$, was 11.4.

- (a) State suitable null and alternative hypotheses for the test. [1]

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You may assume that the standard deviation of the battery life is 2.3 hours.

- (b) Show that the value $\bar{X} = 11.4$ leads to rejection of the null hypothesis at the 5% significance level. [2]

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- (c) It is given that the value $\bar{X} = 11.4$ leads to rejection of the null hypothesis at the $\alpha\%$ significance level.

Find the set of possible values of α . [2]

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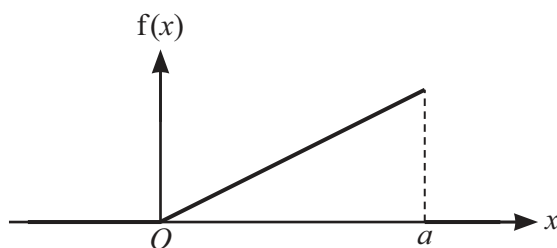
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It is given that the median of X is $\sqrt{2}$.

- (a) Find the value of k . [2]

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- (b) Find the value of $E(X)$. [4]

[illegible]



Additional page

[illegible]



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