



# Cambridge International AS & A Level

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**MATHEMATICS**

**9709/62**

Paper 6 Probability & Statistics 2

**October/November 2024**

**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.

[3]

This image shows a full page of a handwriting practice worksheet. It consists of approximately 20 horizontal rows. Each row is defined by two parallel dotted lines, creating a series of uniform gaps for writing. The lines are evenly spaced across the entire page, providing a guide for letter height and placement. There is no text or other markings on the page.



- 2 The lengths of a random sample of 50 roads in a certain region were measured. Using the results, a 95% confidence interval for the mean length, in metres, of all roads in this region was found to be [245, 263].

(a) Find the mean length of the 50 roads in the sample. [1]

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(b) Calculate an estimate of the standard deviation of the lengths of roads in this region. [2]

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(c) It is now given that the lengths of roads in this region are normally distributed.

State, with a reason, whether this fact would make any difference to your calculation in part (b). [1]

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- 3 A factory owner models the number of employees who use the factory canteen on any day by the distribution  $B(25, p)$ . In the past the value of  $p$  was 0.8 . A new menu is introduced in the canteen and the owner wants to test whether the value of  $p$  has increased.

On a randomly chosen day he notes that the number of employees who use the canteen is 23.

- (a) Use the binomial distribution to carry out the test at the 10% significance level. [5]

[illegible]

- (b) Given that there are 30 employees at the factory comment on the suitability of the owner's model. [1]

[illegible]



- 4 A population is normally distributed with mean 35 and standard deviation 8.1 . A random sample of size 140 is chosen from this population and the sample mean is denoted by  $\bar{X}$ .

(a) Find  $P(\bar{X} > 36)$ . [3]

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(b) It is given that  $P(\bar{X} < a) = 0.986$  . Find the value of  $a$ . [3]

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- 5 A machine puts sweets into bags at random. The numbers of lemon and orange sweets in a bag have the independent distributions  $Po(3.7)$  and  $Po(2.6)$  respectively.

A bag of sweets is chosen at random.

- (a) Find the probability that the number of lemon sweets in the bag is more than 2 but not more than 5. [2]

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- (b) Find the probability that the total number of lemon and orange sweets in the bag is less than 4. [3]

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- 6 The time,  $X$  hours, taken by a large number of people to complete a challenge is modelled by the probability density function given by

$$f(x) = \begin{cases} \frac{1}{x^2} & a \leq x \leq b, \\ 0 & \text{otherwise,} \end{cases}$$

where  $a$  and  $b$  are constants.

- (a)** State what the constants  $a$  and  $b$  represent in this context. [1]

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- (b)** Show that  $a = \frac{b}{b+1}$ . [3]

[illegible]

It is given that  $E(X) = \ln 3$ .

- (c) Show that  $b = 2$  and find the value of  $a$ . [4]

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[3]

- (a) State the probability that she will make a Type I error. [1]

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$$n = 100 \qquad \Sigma h = 238 \qquad \Sigma h^2 = 580$$

- (b)** Carry out the test at the 2% significance level. [7]

[illegible]



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- (c) The scientist carries out the test correctly, but another scientist claims that she has made a Type II error.

Comment on this claim.

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