

Cambridge Assessment  
International Education

# Cambridge International AS & A Level

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## FURTHER MATHEMATICS

9231/43

Paper 4 Further Probability &amp; Statistics

May/June 2025

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.



- Use the data to carry out a goodness of fit test at the 5% significance level to test the scientist's claim.

[6]

[illegible]



- 2 A farmer is investigating whether using a new fertiliser will increase the yield of tomato plants. The farmer selects 40 tomato plants at random and gives them the new fertiliser. The crop mass,  $x$  kg, of each of these 40 plants is recorded. The farmer selects a further 60 tomato plants at random and gives them a standard fertiliser. The crop mass,  $y$  kg, of each of these 60 plants is recorded. The results are summarised as follows.

$$\Sigma x = 168 \quad \Sigma x^2 = 720 \quad \Sigma y = 228 \quad \Sigma y^2 = 900$$

Find a 90% confidence interval for the difference in mean crop mass associated with each type of fertiliser. [7]

[illegible]



- 3 A continuous random variable  $X$  has probability density function  $f$  given by

$$f(x) = \begin{cases} kx & 0 \leq x < 1, \\ k(8-x) & 1 \leq x \leq 8, \\ 0 & \text{otherwise,} \end{cases}$$

where  $k$  is a constant.

- (a) Show that  $k = \frac{1}{25}$ .

[2]

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- (b) Find the median value of  $X$ .

[3]

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(c) Find the probability density function of  $Y$ .

[5]

[illegible]



- 4 A researcher claims that older people take longer to react to a sudden loud noise than younger people. To investigate this, the researcher randomly selects 6 people over 50 years old and 8 people under 25 years old and records their reaction times, in milliseconds, to a sudden loud noise. The reaction times are as follows.

|          |     |     |     |     |     |     |     |     |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|
| Over 50  | 198 | 212 | 217 | 229 | 235 | 242 |     |     |
| Under 25 | 178 | 181 | 183 | 192 | 203 | 209 | 223 | 231 |

Carry out a Wilcoxon rank-sum test at the 5% significance level to test the researcher's claim. [8]

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[1]



(a) Find the probability generating functions,  $G_X(t)$  of  $X$  and  $G_Y(t)$  of  $Y$ . [4]

[illegible]

- (b)** Explain why Kieran is incorrect. [1]

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This image shows a full page of a worksheet designed for handwriting practice. It features 18 horizontal rows, each defined by two parallel dashed lines. The lines are evenly spaced and extend across the entire width of the page, providing a guide for letter height and placement. There is no text or other markings on the page.

This image shows a full page of white paper with ten horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and extend across the entire width of the page. There is no text or other markings on the paper.



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