



# Cambridge International AS & A Level

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## MATHEMATICS

9709/52

Paper 5 Probability &amp; Statistics 1

February/March 2023

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 [ ].

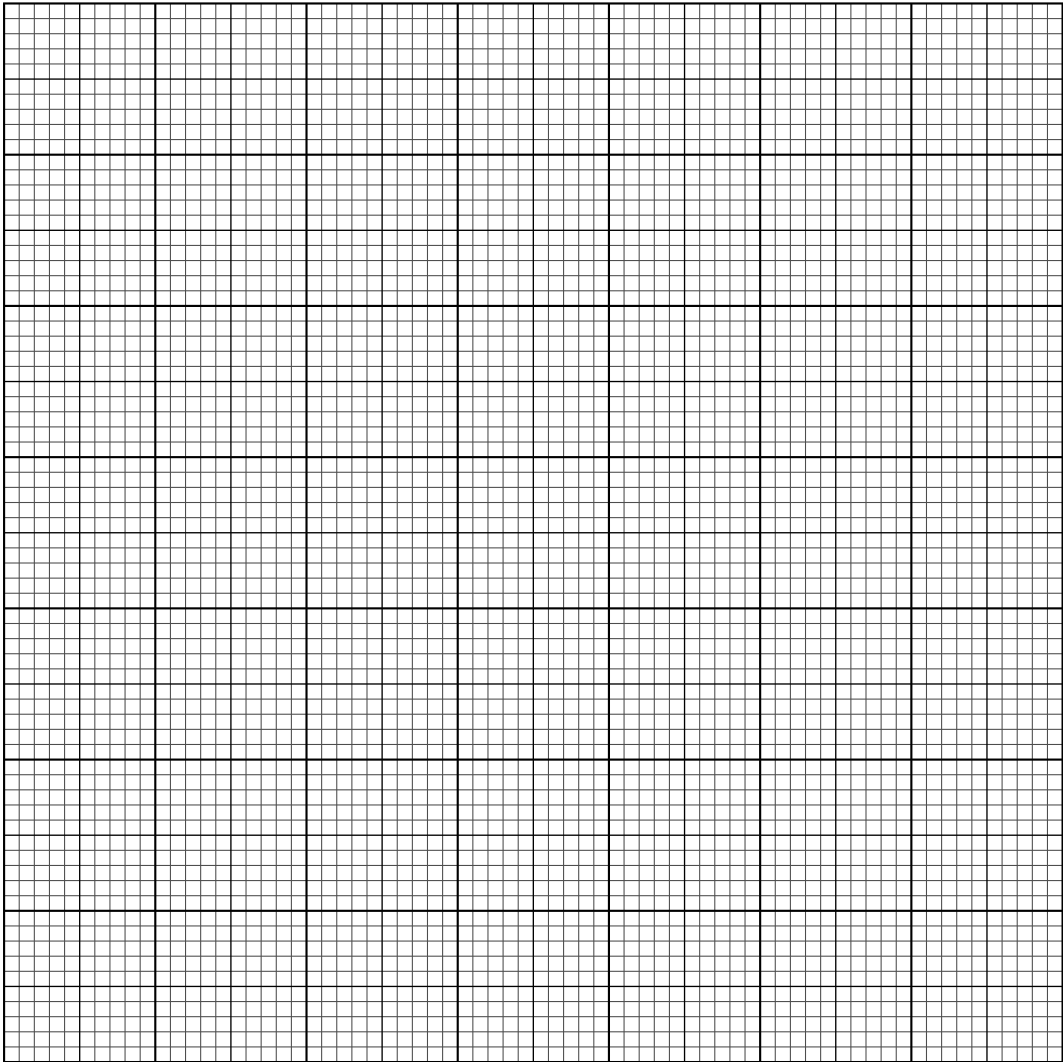
This document has **16** pages. Any blank pages are indicated.



- 1 Each year the total number of hours,  $x$ , of sunshine in Kintoo is recorded during the month of June. The results for the last 60 years are summarised in the table.

| $x$             | $30 \leq x < 60$ | $60 \leq x < 90$ | $90 \leq x < 110$ | $110 \leq x < 140$ | $140 \leq x < 180$ | $180 \leq x \leq 240$ |
|-----------------|------------------|------------------|-------------------|--------------------|--------------------|-----------------------|
| Number of years | 4                | 8                | 14                | 25                 | 7                  | 2                     |

- (a) Draw a cumulative frequency graph to illustrate the data. [3]



**3**

- (b)** Use your graph to estimate the 70th percentile of the data. [2]

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- (c)** Calculate an estimate for the mean number of hours of sunshine in Kintoo during June over the last 60 years. [3]

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2 Alisha has four coins. One of these coins is biased so that the probability of obtaining a head is 0.6. The other three coins are fair. Alisha throws the four coins at the same time. The random variable  $X$  denotes the number of heads obtained.

(a) Show that the probability of obtaining exactly one head is 0.225. [3]

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(b) Complete the following probability distribution table for  $X$ . [2]

|            |      |       |   |   |       |
|------------|------|-------|---|---|-------|
| $x$        | 0    | 1     | 2 | 3 | 4     |
| $P(X = x)$ | 0.05 | 0.225 |   |   | 0.075 |

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[illegible]

(a) Find the probability that more than 17 of these residents are in favour of the leisure centre. [3]

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(b) Find the probability that the 5th person asked is the first person who is **not** in favour of the leisure centre. [1]

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(c) Find the probability that the 7th person asked is the second person who is **not** in favour of the leisure centre. [2]

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- 4 The probability that it will rain on any given day is  $x$ . If it is raining, the probability that Aran wears a hat is 0.8 and if it is not raining, the probability that he wears a hat is 0.3. Whether it is raining or not, if Aran wears a hat, the probability that he wears a scarf is 0.4. If he does not wear a hat, the probability that he wears a scarf is 0.1. The probability that on a randomly chosen day it is not raining and Aran is not wearing a hat or a scarf is 0.36.

Find the value of  $x$ .

[3]

[illegible]

5 Marco has four boxes labelled  $K$ ,  $L$ ,  $M$  and  $N$ . He places them in a straight line in the order  $K$ ,  $L$ ,  $M$ ,  $N$  with  $K$  on the left. Marco also has four coloured marbles: one is red, one is green, one is white and one is yellow. He places a single marble in each box, at random. Events  $A$  and  $B$  are defined as follows.

- $A$ : The white marble is in either box  $L$  or box  $M$ .
- $B$ : The red marble is to the left of both the green marble and the yellow marble.

Determine whether or not events  $A$  and  $B$  are independent. [3]

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**6** In a cycling event the times taken to complete a course are modelled by a normal distribution with mean 62.3 minutes and standard deviation 8.4 minutes.

**(a)** Find the probability that a randomly chosen cyclist has a time less than 74 minutes. [2]

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**(b)** Find the probability that 4 randomly chosen cyclists all have times between 50 and 74 minutes. [4]

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- [illegible]

## 12

- 7 (a) Find the number of different arrangements of the 9 letters in the word DELIVERED in which the three Es are together and the two Ds are **not** next to each other. [4]

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- (b) Find the probability that a randomly chosen arrangement of the 9 letters in the word DELIVERED has exactly 4 letters between the two Ds. [5]

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Five letters are selected from the 9 letters in the word DELIVERED.

- (c) Find the number of different selections if the 5 letters include at least one D and at least one E. [3]

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