

Cambridge International AS & A Level

CANDIDATE
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MATHEMATICS

9709/52

Paper 5 Probability & 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 [].

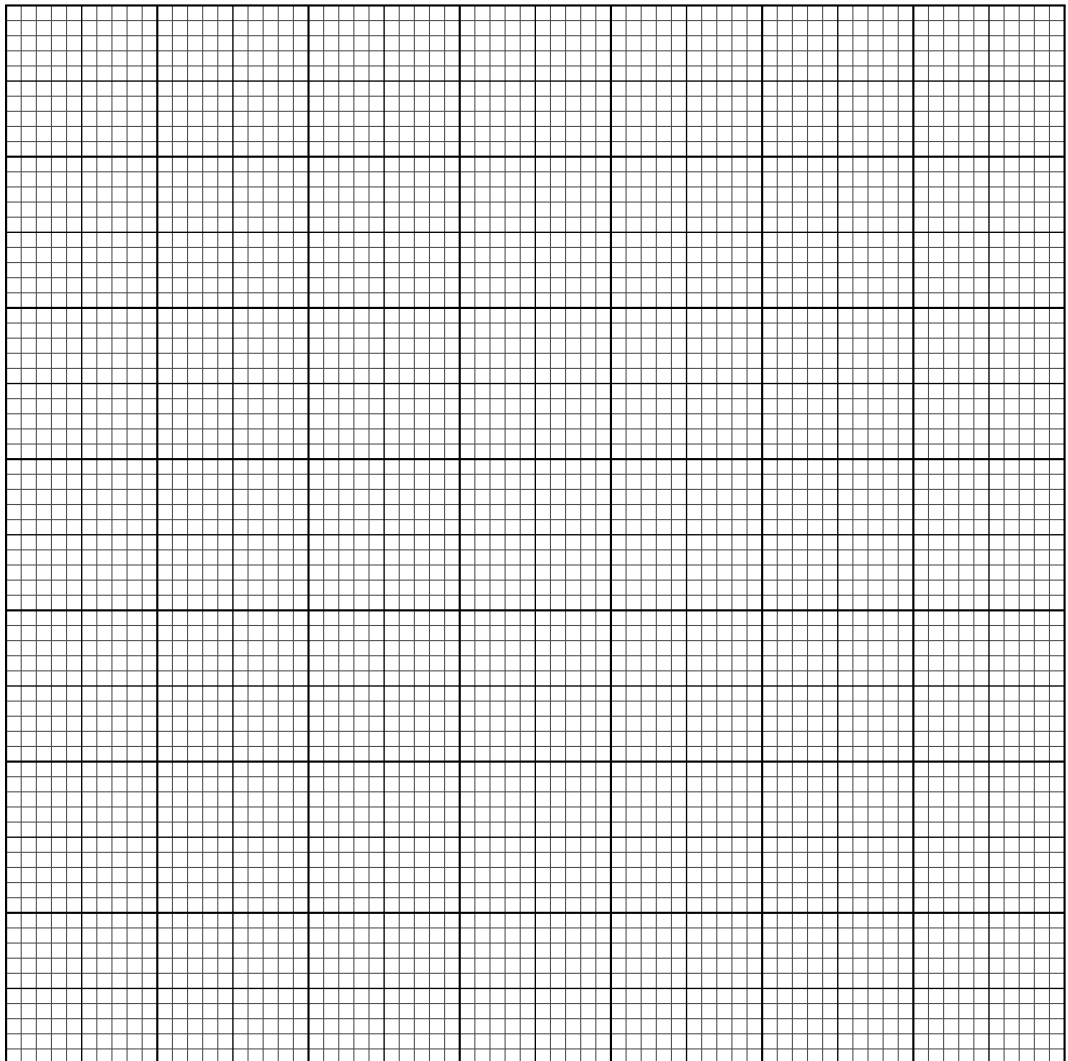
This document has **16** pages. Any blank pages are indicated.

- 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]



- (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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- (c) Given that $E(X) = 2.1$, find the value of $\text{Var}(X)$.

[2]

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- 3** 80% of the residents of Kinwawa are in favour of a leisure centre being built in the town.

20 residents of Kinwawa are chosen at random and asked, in turn, whether they are in favour of the leisure centre.

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

[illegible]

- (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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In a different cycling event, the times can also be modelled by a normal distribution. 23% of the cyclists have times less than 36 minutes and 10% of the cyclists have times greater than 54 minutes.

- (c) Find estimates for the mean and standard deviation of this distribution. [5]

[illegible]

- 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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