Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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0776265871

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 [ ].

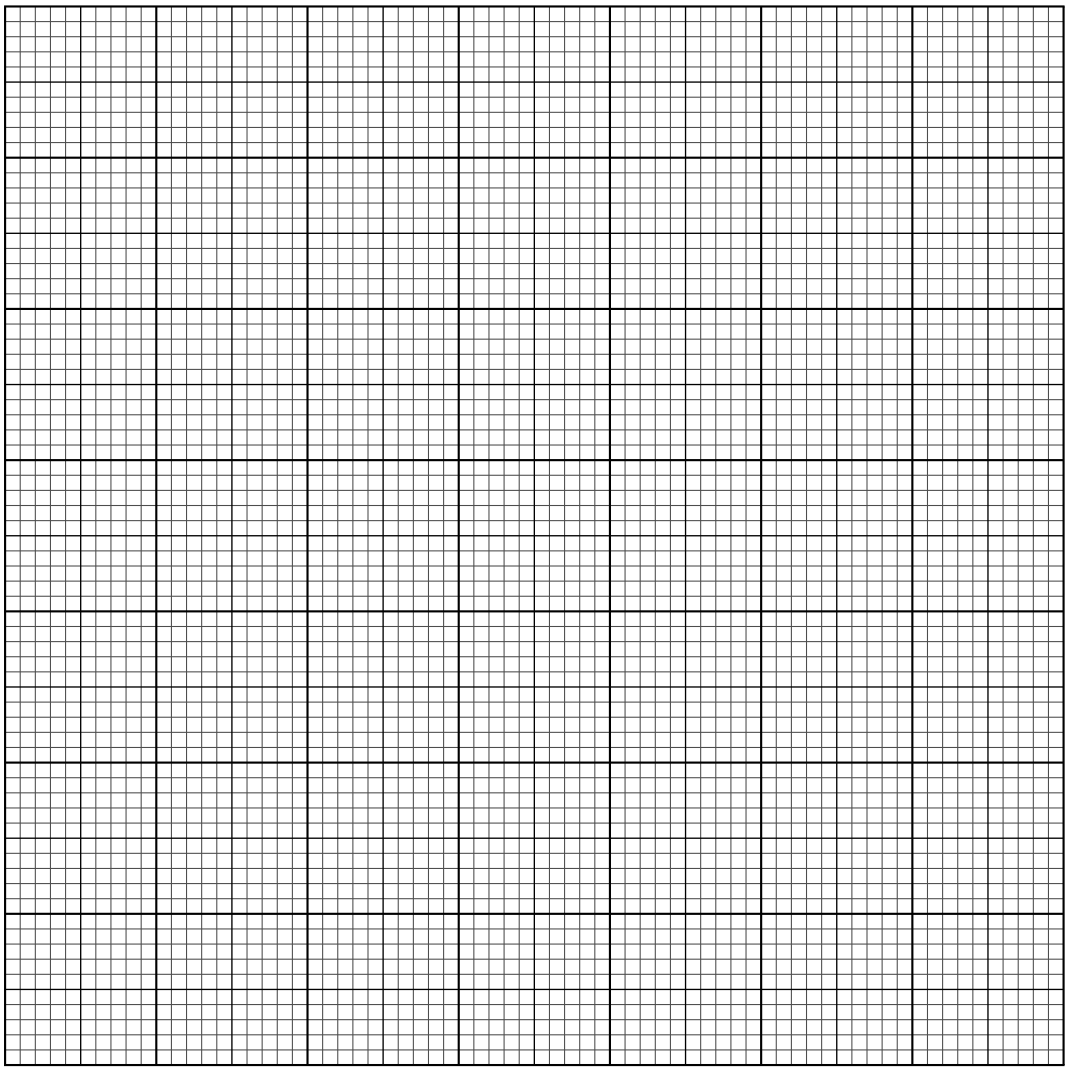
This document has **16** pages. Any blank pages are indicated.

[Turn over

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	$30 \leqslant x < 60$	$60 \leqslant x < 90$	$90 \leqslant x < 110$	$110 \leqslant x < 140$	$140 \leqslant x < 180$	$180 \leqslant x \leqslant 240$
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 $Var(X)$. [2]

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]

(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]

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]

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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Additional Page

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