

Cambridge International AS & A Level

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**MATHEMATICS****9709/53**

Paper 5 Probability & Statistics 1

May/June 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 **12** pages.

1 Two fair coins are thrown at the same time repeatedly until a pair of heads is obtained. The number of throws taken is denoted by the random variable X .

(a) State the value of $E(X)$. [1]

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(b) Find the probability that exactly 5 throws are required to obtain a pair of heads. [1]

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(c) Find the probability that fewer than 7 throws are required to obtain a pair of heads. [2]

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(b) Draw up the probability distribution table for X , giving the probabilities as numerical fractions. [1]

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(c) Given that $E(X) = 3.2$, find $\text{Var}(X)$. [2]

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- 4 The times taken, in minutes, to complete a cycle race by 19 cyclists from each of two clubs, the Cheetahs and the Panthers, are represented in the following back-to-back stem-and-leaf diagram.

Cheetahs		Panthers
9 8	7	4
8 7 3 2 0	8	6 8
9 8 7	9	1 7 8 9 9
6 5 3 3 1	10	2 3 4 4 5 6
9 8 2	11	1 2 8
4	12	0 6

Key: 7 | 9 | 1 means 97 minutes for Cheetahs and 91 minutes for Panthers

- (a) Find the median and the interquartile range of the times of the Cheetahs. [3]

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The median and interquartile range for the Panthers are 103 minutes and 14 minutes respectively.

- (b) Make two comparisons between the times taken by the Cheetahs and the times taken by the Panthers. [2]

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Another cyclist, Kenny, from the Cheetahs also took part in the race. The mean time taken by the 20 cyclists from the Cheetahs was 99 minutes.

- (c) Find the time taken by Kenny to complete the race. [3]

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5 Jasmine throws two ordinary fair 6-sided dice at the same time and notes the numbers on the uppermost faces. The events A and B are defined as follows.

A : The sum of the two numbers is less than 6.

B : The difference between the two numbers is at most 2.

(a) Determine whether or not the events A and B are independent. [4]

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(b) Find $P(B | A')$. [3]

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- 7 (a) Find the number of different arrangements of the 10 letters in the word CASABLANCA in which the two Cs are **not** together. [3]

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- (b) Find the number of different arrangements of the 10 letters in the word CASABLANCA which have an A at the beginning, an A at the end and exactly 3 letters between the 2 Cs. [3]

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