



Cambridge International AS & A Level

CANDIDATE
NAME



CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



MATHEMATICS

9709/51

Paper 5 Probability & Statistics 1

October/November 2024

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 Nicola throws an ordinary fair six-sided dice. The random variable X is the number of throws that she takes to obtain a 6.

(a) Find $P(X < 8)$. [2]

(b) Find the probability that Nicola obtains a 6 for the second time on her 8th throw. [2]





2 The random variable X takes the values $-2, -1, 0, 2, 3$. It is given that $P(X = x) = k(x^2 + 2)$, where k is a positive constant.

(a) Draw up the probability distribution table for X , giving the probabilities as numerical fractions. [3]

(b) Find the value of $\text{Var}(X)$. [3]



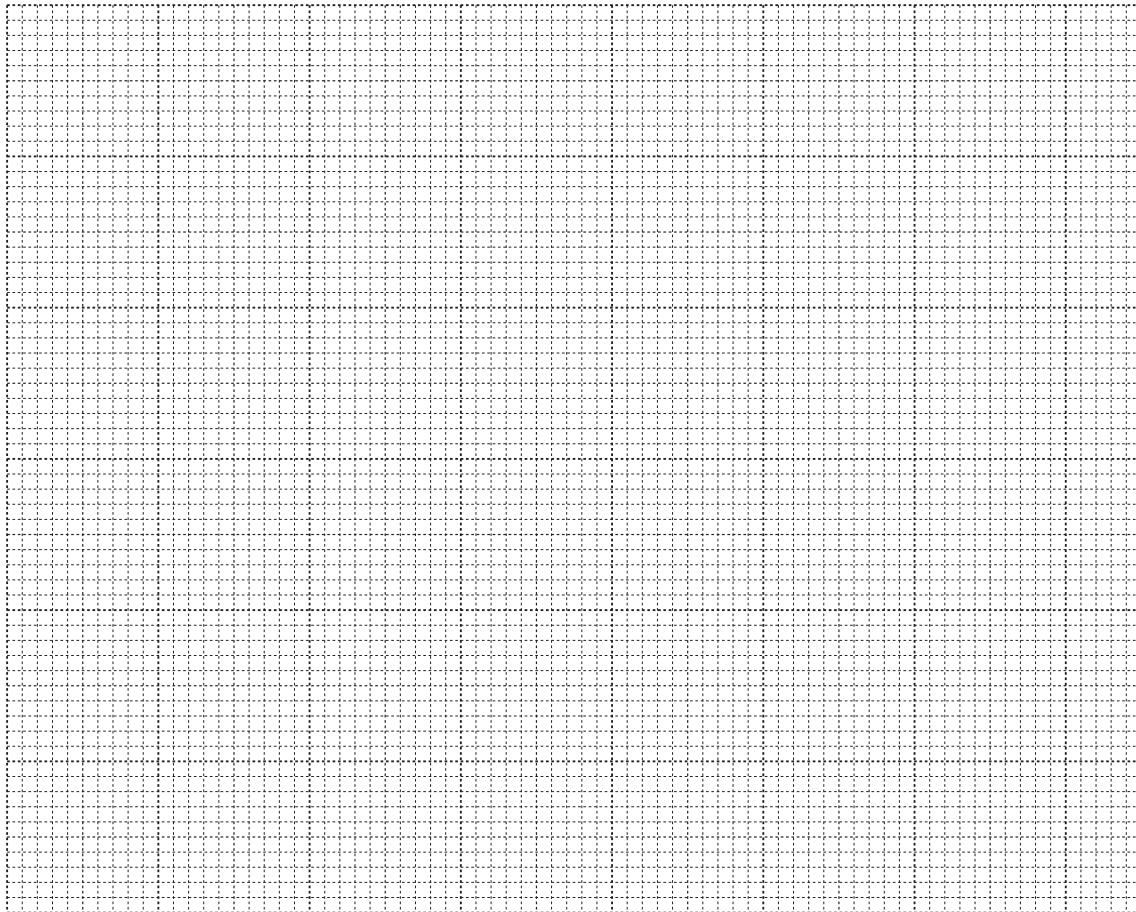


3 The time taken, in minutes, to walk to school was recorded for 200 pupils at a certain school. These times are summarised in the following table.

Time taken (t minutes)	$t \leq 15$	$t \leq 25$	$t \leq 30$	$t \leq 40$	$t \leq 50$	$t \leq 70$
Cumulative frequency	18	46	88	140	176	200

(a) Draw a cumulative frequency graph to illustrate the data.

[2]



(b) Use your graph to estimate the median and the interquartile range of the data.

[3]

.....





(c) Calculate an estimate for the mean value of the times taken by the 200 pupils to walk to school. [3]





4 Rahul has two bags, X and Y . Bag X contains 4 red marbles and 2 blue marbles. Bag Y contains 3 red marbles and 4 blue marbles. Rahul also has a coin which is biased so that the probability of obtaining a head when it is thrown is $\frac{1}{4}$.

Rahul throws the coin.

- If he obtains a head, he chooses at random a marble from bag X . He notes the colour and replaces the marble in bag X . He then chooses at random a second marble from bag X .
- If he obtains a tail, he chooses at random a marble from bag Y . He notes the colour and discards the marble. He then chooses at random a second marble from bag Y .

(a) Find the probability that the two marbles that Rahul chooses are the same colour. [3]





(b) Find the probability that the two marbles that Rahul chooses are both from bag Y given that both marbles are blue. [3]





5 The weights of the green apples sold by a shop are normally distributed with mean 90 grams and standard deviation 8 grams.

(a) Find the probability that a randomly chosen green apple weighs between 83 grams and 95 grams. [4]





(b) The shop also sells red apples. 60% of the red apples sold by the shop weigh more than 80 grams. 160 red apples are chosen at random from the shop.

Use a suitable approximation to find the probability that fewer than 105 of the chosen red apples weigh more than 80 grams. [5]

[5]





6 The heights of the female students at Breven college are normally distributed:

- 90% of the female students have heights less than 182.7 cm.
- 40% of the female students have heights less than 162.5 cm.

(a) Find the mean and the standard deviation of the heights of the female students at Breven college. [5]





Ten female students are chosen at random from those at Breven college.

(b) Find the probability that fewer than 8 of these 10 students have heights more than 162.5 cm. [3]





7 (a) How many different arrangements are there of the 9 letters in the word INTELLECT in which the two Ts are together? [2]

(b) How many different arrangements are there of the 9 letters in the word INTELLECT in which there is a T at each end and the two Es are not next to each other? [3]





Four letters are selected at random from the 9 letters in the word INTELLECT.

(c) Find the percentage of the possible selections which contain at least one E and exactly one T. [4]





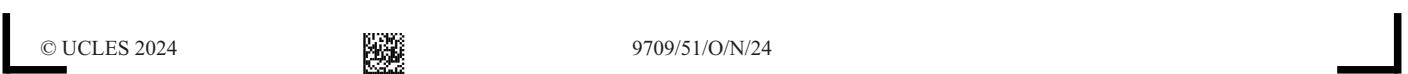
Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.





DO NOT WRITE IN THIS MARGIN





Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

