Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5715771126

MATHEMATICS **9709/51**

Paper 5 Probability & Statistics 1 **October/November 2022**

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. Any blank pages are indicated.

BLANK PAGE

1 The probability distribution table for a random variable X is shown below.

x	−2	−1	0.5	1	2
$P(X = x)$	0.12	p	q	0.16	0.3

Given that $E(X) = 0.28$, find the value of p and the value of q. [4]

2 The residents of Persham were surveyed about the reliability of their internet service. 12% rated the service as 'poor', 36% rated it as 'satisfactory' and 52% rated it as 'good'.

A random sample of 8 residents of Persham is chosen.

(a) Find the probability that more than 2 and fewer than 8 of them rate their internet service as poor or satisfactory. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

A random sample of 125 residents of Persham is now chosen.

(b) Use an approximation to find the probability that more than 72 of these residents rate their internet service as good. [5]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

3 The Lions and the Tigers are two basketball clubs. The heights, in cm, of the 11 players in each of their first team squads are given in the table.

Lions	178	186	181	187	179	190	189	190	180	169	196
Tigers	194	179	187	190	183	201	184	180	195	191	197

(a) Draw a back-to-back stem-and-leaf diagram to represent this information, with the Lions on the left. [4]

(b) Find the median and the interquartile range of the heights of the Lions first team squad. [3]

.....

.....

.....

It is given that for the Tigers, the lower quartile is 183 cm, the median is 190 cm and the upper quartile is 195 cm.

(c) Make two comparisons between the heights of the players in the Lions first team squad and the heights of the players in the Tigers first team squad. [2]

.....

.....

.....

.....

.....

4 In a large population, the systolic blood pressure (SBP) of adults is normally distributed with mean 125.4 and standard deviation 18.6.

(a) Find the probability that the SBP of a randomly chosen adult is less than 132. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

The SBP of 12-year-old children in the same population is normally distributed with mean 117. Of these children 88% have SBP more than 108.

(b) Find the standard deviation of this distribution. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Three adults are chosen at random from this population.

(c) Find the probability that each of these three adults has SBP within 1.5 standard deviations of the mean. [4]

5 A game is played with an ordinary fair 6-sided die. A player throws the die once. If the result is 2, 3, 4 or 5, that result is the player's score and the player does not throw the die again. If the result is 1 or 6, the player throws the die a second time and the player's score is the sum of the two numbers from the two throws.

(a) Draw a fully labelled tree diagram to represent this information. [2]

Events A and B are defined as follows.

A: the player's score is 5, 6, 7, 8 or 9

B: the player has two throws

(b) Show that $\mathrm{P}(A) = \frac{1}{3}$. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

(c) Determine whether or not events A and B are independent. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(d) Find $\mathrm{P}(B \mid A')$. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

6 A Social Club has 15 members, of whom 8 are men and 7 are women. The committee of the club consists of 5 of its members.

(a) Find the number of different ways in which the committee can be formed from the 15 members if it must include more men than women. [4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

The 15 members are having their photograph taken. They stand in three rows, with 3 people in the front row, 5 people in the middle row and 7 people in the back row.

(b) In how many different ways can the 15 members of the club be divided into a group of 3, a group of 5 and a group of 7? [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

In one photograph Abel, Betty, Cally, Doug, Eve, Freya and Gino are the 7 members in the back row.

(c) In how many different ways can these 7 members be arranged so that Abel and Betty are next to each other and Freya and Gino are not next to each other? [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Additional Page

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....