Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **9709/51**

Paper 5 Probability & Statistics 1 **May/June 2025**

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.

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1 The masses of the bags of rice made by a company are normally distributed with mean μ kg and standard deviation 0.14 kg. The probability that the mass of a randomly chosen bag of this rice is less than 1.48 kg is 0.22.

Find the value of μ. [3]

2 **(a)** Find the number of different arrangements of the 8 letters in the word KANGAROO in which the two As are together and the two Os are **not** together. [3]

A fair 8-sided dice has faces labelled K, A, N, G, A, R, O, O. The dice is rolled repeatedly.

(b) Find the probability that fewer than 6 rolls of this dice are required to obtain an A. [2]

(c) Find the probability that the second A is obtained on the 6th roll of the dice. [2]

3 Last Sunday, teams of runners took part in a charity event. The time taken, in seconds, to run 50 m was recorded, correct to 1 decimal place, for each runner. The times recorded for 11 runners from each of the Gulls and the Herons are shown in the table.

Gulls	7.9	8.2	8.3	8.6	8.6	8.8	9.2	9.7	9.8	10.0	10.4
Herons	9.5	9.9	8.5	8.1	9.2	10.8	8.3	9.7	9.3	9.9	8.7

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

(b) Find the median and the interquartile range of the times of the runners from the Gulls. [3]

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Two other teams of runners, the Eagles and the Swifts, also took part in the event. The recorded times in seconds for 20 runners from the Eagles and 30 runners from the Swifts are denoted by x and y respectively.

It is given that $\sum x = 175.0$ and that the mean of y is 8.4.

(c) Find the mean of the times taken by all 50 runners. [2]

It is given that $\sum x^2 = 1823.0$.

It is also known that the standard deviation of the times taken by all 50 runners is 1.38 seconds.

(d) Find the value of $\sum y^2$, correct to 1 decimal place. [3]

4 Every Saturday, a particular community holds a ‘Puzzle’ event to raise money for a new Leisure Centre. Competitors attempt to solve a puzzle as quickly as possible.

Last Saturday, 600 competitors took part. The times taken to complete the puzzle were normally distributed with mean 32.4 minutes and standard deviation 2.5 minutes.

(a) How many competitors would you expect to have times within 1.2 minutes of the mean time? [4]

In this Saturday’s event, 60% of the competitors had times less than 36.0 minutes.

(b) 9 competitors who took part in this Saturday’s event are selected at random.

Find the probability that at least 2 and fewer than 8 of these competitors had times less than 36.0 minutes. [3]

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(c) 80 competitors who took part in this Saturday's event are selected at random.

Use a suitable approximation to find the probability that more than 50 of these competitors had times less than 36.0 minutes. [5]

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5 In a group of 20 musicians, there are 9 guitarists, 6 pianists and 5 drummers.

6 musicians are selected from these 20 to perform at a concert.

(a) Find the number of different ways in which the 6 musicians can be selected if there must be at least 3 guitarists, at most 2 pianists and exactly 1 drummer. [4]

Three bands will be selected from the original group of 20 musicians. Each band will consist of 3 guitarists, 1 pianist and 1 drummer. No musician can be in more than one band. The first band selected will play at a concert in France, the second band selected will play in Italy and the third band selected will play in Spain.

(b) Find the number of different ways in which these three bands can be selected. [3]

6 A bag contains 10 marbles, of which 4 are red and 6 are blue. Four marbles are selected from the bag at random, without replacement. The random variable X denotes the number of blue marbles selected.

(a) Show that $P(X = 2) = \frac{3}{7}$. [2]

(b) Draw up the probability distribution table for X. [4]

(c) Find the probability that at least 2 of the marbles chosen are blue, given that at least 1 red marble and at least 1 blue marble are chosen. [3]