Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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8016065171

MATHEMATICS **9709/52**

Paper 5 Probability & Statistics 1 **October/November 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 A competitor in a throwing event has three attempts to throw a ball as far as possible. The random variable X denotes the number of throws that exceed 30 metres. The probability distribution table for X is shown below.

x	0	1	2	3
$P(X = x)$	0.4	p	r	0.15

(a) Given that $E(X) = 1.1$, find the value of p and the value of r. [3]

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(b) Find the numerical value of $\text{Var}(X)$. [2]

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2 George has a fair 5-sided spinner with sides labelled 1, 2, 3, 4, 5. He spins the spinner and notes the number on the side on which the spinner lands.

(a) Find the probability that it takes fewer than 7 spins for George to obtain a 5. [2]

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George spins the spinner 10 times.

(b) Find the probability that he obtains a 5 more than 4 times but fewer than 8 times. [3]

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3 A factory produces a certain type of electrical component. It is known that 15% of the components produced are faulty. A random sample of 200 components is chosen.

Use an approximation to find the probability that more than 40 of these components are faulty. [5]

4 The heights, in cm, of the 11 players in each of two teams, the Aces and the Jets, are shown in the following table.

Aces	180	174	169	182	181	166	173	182	168	171	164
Jets	175	174	188	168	166	174	181	181	170	188	190

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

(b) Find the median and the interquartile range of the heights of the players in the Aces. [3]

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(c) Give one comment comparing the spread of the heights of the Aces with the spread of the heights of the Jets. [1]

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5 **(a)** The heights of the members of a club are normally distributed with mean 166 cm and standard deviation 10 cm.

(i) Find the probability that a randomly chosen member of the club has height less than 170 cm. [2]

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(ii) Given that 40% of the members have heights greater than h cm, find the value of h correct to 2 decimal places. [3]

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(b) The random variable X is normally distributed with mean μ and standard deviation σ.

Given that $\sigma = \frac{2}{3}\mu$, find the probability that a randomly chosen value of X is positive. [3]

6 Freddie has two bags of marbles.

Bag X contains 7 red marbles and 3 blue marbles.

Bag Y contains 4 red marbles and 1 blue marble.

Freddie chooses one of the bags at random. A marble is removed at random from that bag and not replaced. A new red marble is now added to each bag. A second marble is then removed at random from the same bag that the first marble had been removed from.

(a) Draw a tree diagram to represent this information, showing the probability on each of the branches. [3]

(b) Find the probability that both of the marbles removed from the bag are the same colour. [4]

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(c) Find the probability that bag Y is chosen given that the marbles removed are **not** both the same colour. [2]

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7 **(a)** Find the number of different arrangements of the 9 letters in the word ANDROMEDA in which no consonant is next to another consonant. (The letters D, M, N and R are consonants and the letters A, E and O are **not** consonants.) [3]

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(b) Find the number of different arrangements of the 9 letters in the word ANDROMEDA in which there is an A at each end and the Ds are **not** together. [3]

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

(c) Find the probability that this selection contains at least one D and exactly one A. [4]

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.

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