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Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8743319016

MATHEMATICS **9709/52**

Paper 5 Probability & Statistics 1 **February/March 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.

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1 A bag contains 9 blue marbles and 3 red marbles. One marble is chosen at random from the bag. If this marble is blue, it is replaced back into the bag. If this marble is red, it is **not** returned to the bag. A second marble is now chosen at random from the bag.

(a) Find the probability that both the marbles chosen are red. [1]

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(b) Find the probability that the first marble chosen is blue given that the second marble chosen is red. [3]

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2 Sam is a member of a soccer club. She is practising scoring goals. The probability that Sam will score a goal on any attempt is 0.7, independently of all other attempts.

(a) Sam makes 10 attempts at scoring goals.

Find the probability that Sam will score goals on fewer than 8 of these attempts. [3]

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(b) Find the probability that Sam's first successful attempt will be before her 5th attempt. [2]

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(c) Wei is a member of the same soccer club. He is also practising scoring goals. The probability that Wei will score a goal on any attempt is 0.6, independently of all other attempts.

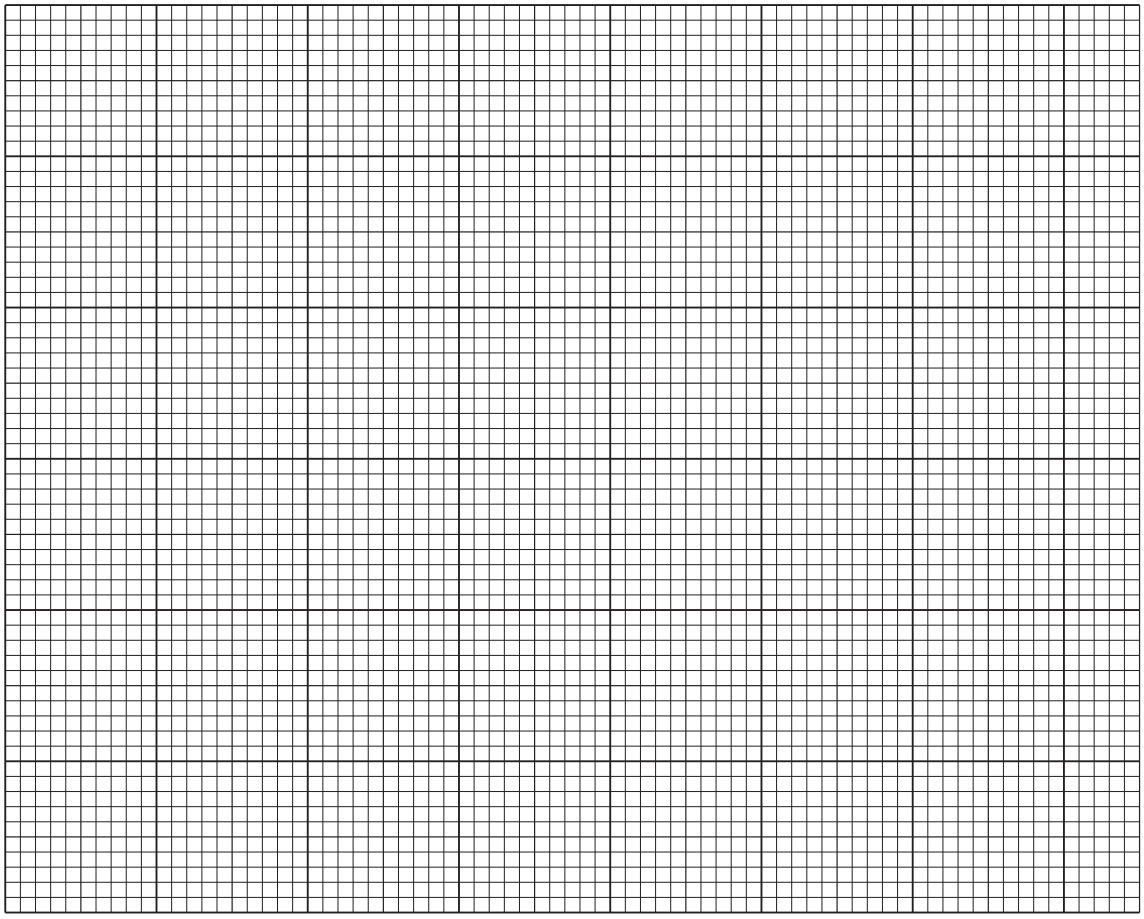
Wei is going to keep making attempts until he scores 3 goals.

Find the probability that he scores his third goal on his 7th attempt. [3]

3 The times taken, in minutes, by 150 students to complete a puzzle are summarised in the table.

Time taken (t minutes)	$0 \leqslant t < 20$	$20 \leqslant t < 30$	$30 \leqslant t < 35$	$35 \leqslant t < 40$	$40 \leqslant t < 50$	$50 \leqslant t < 70$
Frequency	8	23	35	52	20	12

(a) Draw a histogram to represent this information. [4]



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(b) Calculate an estimate for the mean time for these students to complete the puzzle. [3]

(c) In which class interval does the lower quartile of the times lie? [1]

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4 A company sells small and large bags of rice. The masses of the small bags of rice are normally distributed with mean 1.20 kg and standard deviation 0.16 kg.

(a) In a random sample of 500 of these small bags of rice, how many would you expect to have a mass greater than 1.26 kg? [4]

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The masses of the large bags of rice are normally distributed with mean 2.50 kg and standard deviation σ kg. 20% of these large bags of rice have a mass less than 2.40 kg.

(b) Find the value of σ. [3]

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A random sample of 80 large bags of rice is chosen.

(c) Use a suitable approximation to find the probability that fewer than 22 of these large bags of rice have a mass less than 2.40 kg. [5]

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5 Anil is taking part in a tournament. In each game in this tournament, players are awarded 2 points for a win, 1 point for a draw and 0 points for a loss. For each of Anil's games, the probabilities that he will win, draw or lose are 0.5, 0.3 and 0.2 respectively. The results of the games are all independent of each other.

The random variable X is the total number of points that Anil scores in his first 3 games in the tournament.

(a) Show that $\mathrm{P}(X = 2) = 0.114$. [2]

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(b) Complete the probability distribution table for X. [3]

x	0	1	2	3	4	5	6
$\mathrm{P}(X = x)$			0.114	0.207	0.285		0.125

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

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6 A new village social club has 10 members of whom 6 are men and 4 are women. The club committee will consist of 5 members.

(a) In how many ways can the committee of 5 members be chosen if it must include at least 2 men and at least 1 woman? [4]

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The 10 members of the club stand in a line for a photograph.

(b) How many different arrangements are there of the 10 members if all the men stand together and all the women stand together? [2]

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For a second photograph, the members stand in two rows, with 6 on the back row and 4 on the front row. Olly and his sister Petra are two of the members of the club.

(c) How many different arrangements are there of the 10 members in which Olly and Petra stand next to each other on the front row? [4]

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Additional page

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

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