



# Cambridge International AS & A Level

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## MATHEMATICS

9709/52

Paper 5 Probability &amp; 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 **12** pages. Any blank pages are indicated.



- 1 At a college, the students choose exactly one of tennis, hockey or netball to play. The table shows the numbers of students in Year 1 and Year 2 at the college playing each of these sports.

|        | Tennis | Hockey | Netball |
|--------|--------|--------|---------|
| Year 1 | 16     | 22     | 12      |
| Year 2 | 24     | 18     | 28      |

One student is chosen at random from the 120 students. Events  $X$  and  $N$  are defined as follows:

$X$ : the student is in Year 1

$N$ : the student plays netball.

- (a) Find  $P(X|N)$ . [1]

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- (b) Find  $P(N|X)$ . [1]

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- (c) Determine whether or not  $X$  and  $N$  are independent events. [1]

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One of the students who plays netball takes 8 shots at goal. On each shot, the probability that she will succeed is 0.15, independently of all other shots.

- (d) Find the probability that she succeeds on fewer than 3 of these shots. [3]

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- [illegible]

- [illegible]



3 A fair coin and an ordinary fair six-sided dice are thrown at the same time. The random variable  $X$  is defined as follows.

- If the coin shows a tail,  $X$  is twice the score on the dice.
- If the coin shows a head,  $X$  is the score on the dice if the score is even and  $X$  is 0 otherwise.

(a) Draw up the probability distribution table for  $X$ . [3]

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

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- 4 The heights, in metres, of white pine trees are normally distributed with mean 19.8 and standard deviation 2.4 .

In a certain forest there are 450 white pine trees.

- (a) How many of these trees would you expect to have height less than 18.2 metres? [4]

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The heights, in metres, of red pine trees are normally distributed with mean 23.4 and standard deviation  $\sigma$ . It is known that 26% of red pine trees have height greater than 25.5 metres.

- (b) Find the value of  $\sigma$ . [3]

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- 5 In a class of 21 students, there are 10 violinists, 6 guitarists and 5 pianists. A group of 7 is to be chosen from these 21 students. The group will consist of 4 violinists, 2 guitarists and 1 pianist.

(a) In how many ways can the group of 7 be chosen? [2]

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On another occasion a group of 5 will be chosen from the 21 students. The group must contain at least 2 violinists, at least 1 guitarist and at most 1 pianist.

(b) In how many ways can the group of 5 be chosen? [4]

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- 6 Teams of 15 runners took part in a charity run last Saturday. The times taken, in minutes, to complete the course by the runners from the Falcons and the runners from the Kites are shown in the table.

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|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Falcons | 38 | 39 | 42 | 44 | 46 | 48 | 50 | 51 | 52 | 56 | 58 | 59 | 64 | 69 | 76 |
| Kites   | 32 | 40 | 40 | 45 | 47 | 48 | 52 | 54 | 58 | 59 | 59 | 60 | 61 | 63 | 65 |

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

- (b) Find the median and the interquartile range of the times for the Falcons. [3]

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(c) Find the mean and the standard deviation of the times taken by all 30 runners from the two teams. [3]

[illegible]





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