Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **9709/51**

Paper 5 Probability & Statistics 1 **October/November 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. Any blank pages are indicated.

[Turn over

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1 The random variable X takes the value x with probability kx^2, where k is a constant and x takes the values -2, 1, 2, 3 only.

(a) Draw up the probability distribution table for X, giving the probabilities as numerical fractions. [3]

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(b) Find $\mathrm{E}(X)$. [1]

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(c) Find $\mathrm{P}(X \neq 2 \,|\, X > 0)$. [2]

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2 A fair six-sided dice with faces labelled 1, 2, 3, 4, 5, 6 is thrown repeatedly until a 6 is obtained.

(a) Find the probability that a 6 is obtained for the first time on the 8th throw. [1]

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(b) Find the probability that a 6 is obtained for the third time on the 7th throw. [3]

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3 The back-to-back stem-and-leaf diagram shows the annual salaries, in dollars, of 27 employees at each of two companies, Browns and Greens.

Browns										Greens									
(3)						9	8	4	30	6	8								(2)
(7)		8	8	5	3	3	1	0	31	2	4	5	8						(4)
(7)		9	7	6	4	2	2	0	32	3	6	6	7	9					(5)
(6)			8	7	5	5	3	1	33	1	1	3	7	8	8	9	9		(8)
(3)						4	2	2	34	0	2	3	5	6	9				(6)
(1)								7	35	3	7								(2)

Key: 6|32|7 means \$32 600 for Browns and \$32 700 for Greens.

(a) Find the median and interquartile range for the annual salaries of employees at Browns. [3]

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The annual salary of an employee at Browns is denoted by x thousand dollars and the annual salary of an employee at Greens is denoted by y thousand dollars. It is given that, for the 27 employees at each of the companies,

$$\Sigma x = 878.3, \quad \Sigma x^2 = 28\,616.09, \quad \Sigma y = 896.5, \quad \Sigma y^2 = 29\,815.63.$$

(b) Find the mean and standard deviation of the annual salaries of these 54 employees. [5]

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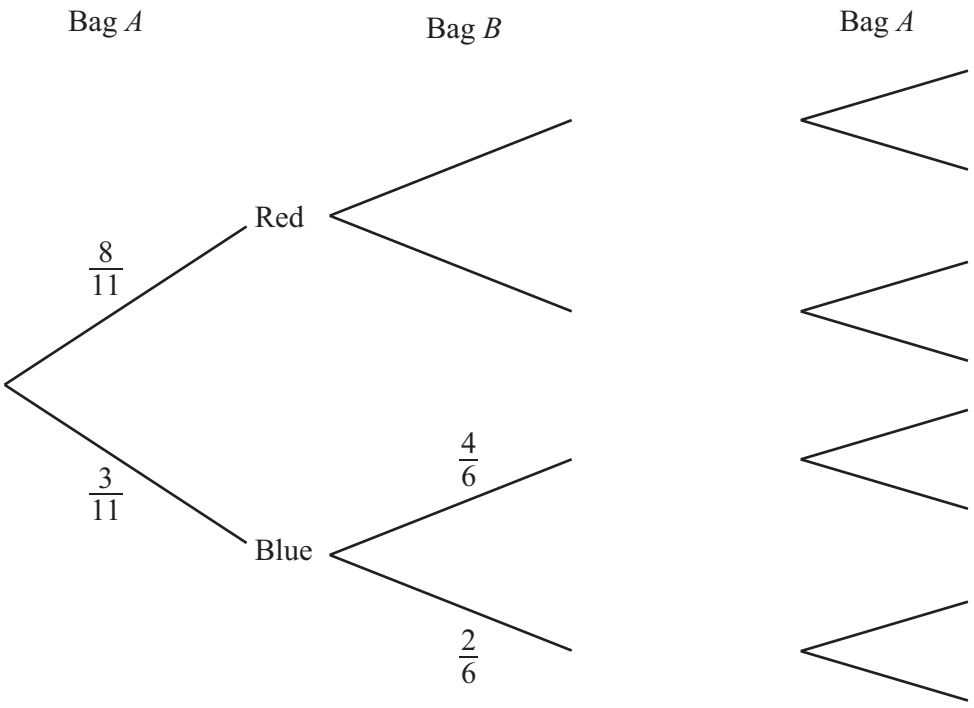
4 Bag A contains 8 red marbles and 3 blue marbles. Bag B contains 4 red marbles and 1 blue marble.

A marble is chosen at random from bag A. If the marble chosen is red, it is discarded. If the marble chosen is blue, it is placed in bag B.

A marble is then chosen at random from bag B. If the marble chosen is red, it is discarded. If the marble chosen is blue, it is placed in bag A.

A marble is now chosen at random from bag A.

(a) Complete the tree diagram below by entering all the remaining outcomes and probabilities. [3]



(b) Find the probability that all three marbles chosen are the same colour. [2]

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5 On any given day, Cooper either wears a blue jumper or he wears a green jumper or he does not wear a jumper. The probability that he wears a blue jumper is 0.6 and the probability that he wears a green jumper is 0.3. Whether Cooper wears a jumper of either colour, or does not wear a jumper, on any day is independent of his choice on any other day.

(a) Find the probability, that in a week (7 days), Cooper wears a blue jumper on at least 5 days. [3]

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(b) Use a suitable approximation to find the probability that, in any 150-day period, Cooper does not wear a jumper on fewer than 22 days. [5]

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6 A factory produces chocolate bars. The weights of the bars are normally distributed with mean 155 g and standard deviation 6 g. A random sample of 350 of these bars is chosen.

(a) How many of these 350 bars would you expect to weigh between 148 g and 160 g? [4]

A second factory also produces chocolate bars. The weights of these bars are normally distributed with mean μ g and standard deviation σ g. Tests show that 8% of the bars weigh more than 114.0 g and 20% weigh less than 99.5 g.

(b) Find the value of μ and the value of σ. [5]

7 **(a)** How many different arrangements are there of the 10 letters in the word SEYCHELLES? [1]

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(b) How many different arrangements are there of the 10 letters in the word SEYCHELLES in which there are exactly two letters between the Ss and one of these two letters is C? [3]

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(c) How many different arrangements are there of the 10 letters in the word SEYCHELLES in which there is an S at the beginning, an S at the end and the three Es are **not** all next to each other? [3]

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5 letters are selected at random from the 10 letters in the word SEYCHELLES.

(d) Find the probability that these 5 letters include the three Es. [3]

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Additional page

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