Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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4794550752

MATHEMATICS **9709/52**

Paper 5 Probability & Statistics 1 **May/June 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 Rajesh applies once every year for a ticket to a music festival. The probability that he is successful in any particular year is 0.3, independently of other years.

(a) Find the probability that Rajesh is successful for the first time on his 7th attempt. [1]

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(b) Find the probability that Rajesh is successful for the first time before his 6th attempt. [2]

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(c) Find the probability that Rajesh is successful for the second time on his 10th attempt. [2]

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2 Seva has a coin which is biased so that when it is thrown the probability of obtaining a head is $\frac{1}{3}$. He also has a bag containing 4 red marbles and 5 blue marbles.

Seva throws the coin. If he obtains a head, he selects one marble from the bag at random. If he obtains a tail, he selects two marbles from the bag at random and without replacement.

(a) Find the probability that Seva selects at least one red marble. [3]

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(b) Find the probability that Seva obtains a head given that he selects no red marbles. [2]

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3 The weights of oranges can be modelled by a normal distribution with mean 131 grams and standard deviation 54 grams. Oranges are classified as small, medium or large. A large orange weighs at least 184 grams and 20% of oranges are classified as small.

(a) Find the percentage of oranges that are classified as large. [3]

(b) Find the greatest possible weight of a small orange. [3]

4 The back-to-back stem-and-leaf diagram shows the annual salaries of 19 employees at each of two companies, Petral and Ravon.

Petral							Ravon				
			3	0	0	30	2	6			
9	9	8	2	2	1	31	1	5			
		5	5	4	0	32	0	0	2		
			7	5	3	33	0	4	8	9	
				1	0	34	1	1	3	4	6
						35	3				
					8	36	7	9			

Key: 2 | 31 | 5 means \$31 200 for a Petral employee and \$31 500 for a Ravon employee.

(a) Find the median and the interquartile range of the salaries of the Petral employees. [3]

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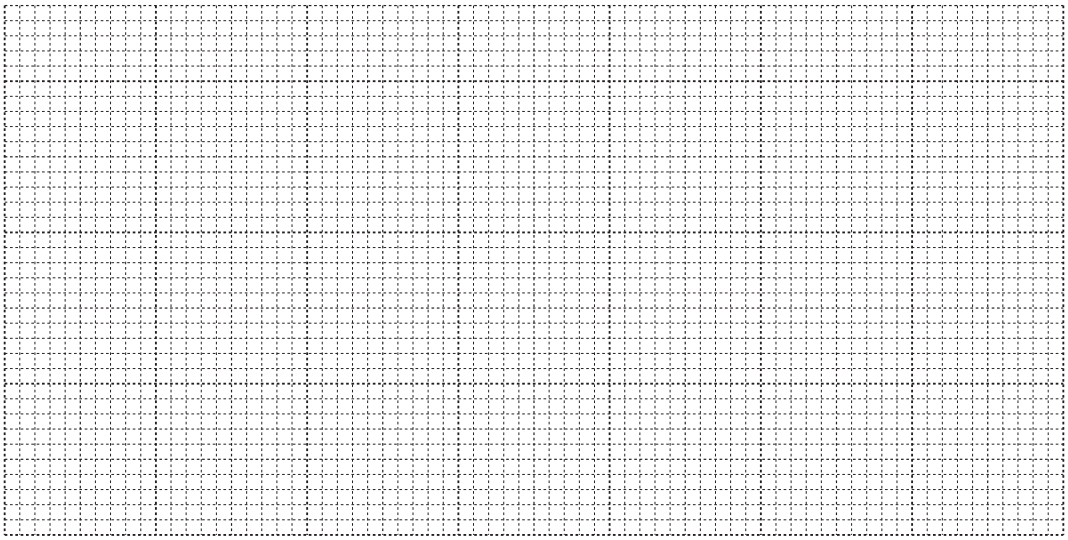
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The median salary of the Ravon employees is \$33 800, the lower quartile is \$32 000 and the upper quartile is \$34 400.

(b) Represent the data shown in the back-to-back stem-and-leaf diagram by a pair of box-and-whisker plots in a single diagram. [3]



(c) Comment on whether the mean or the median would be a better representation of the data for the employees at Petral. [1]

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5 Jasmine has one \$5 coin, two \$2 coins and two \$1 coins. She selects two of these coins at random. The random variable X is the total value, in dollars, of these two coins.

(a) Show that $\mathrm{P}(X = 7) = 0.2$. [1]

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

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

6 The residents of Mahjing were asked to classify their local bus service:

- 25% of residents classified their service as good.
- 60% of residents classified their service as satisfactory.
- 15% of residents classified their service as poor.

(a) A random sample of 110 residents of Mahjing is chosen.

Use a suitable approximation to find the probability that fewer than 22 residents classified their bus service as good. [5]

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(b) For a random sample of 10 residents of Mahjing, find the probability that fewer than 8 classified their bus service as good or satisfactory. [3]

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(c) Three residents of Mahjing are selected at random.

Find the probability that one resident classified the bus service as good, one as satisfactory and one as poor. [2]

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

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(b) How many different arrangements are there of the 10 letters in the word REGENERATE in which the 4 Es are together and the 2 Rs have exactly 3 letters in between them? [4]

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(c) Find the probability that a randomly chosen arrangement of the 10 letters in the word REGENERATE is one in which the consonants (G, N, R, R, T) and vowels (A, E, E, E, E) alternate, so that no two consonants are next to each other and no two vowels are next to each other. [5]

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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