



# Cambridge International AS & A Level

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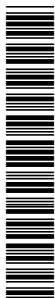
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**MATHEMATICS**

**9709/52**

Paper 5 Probability & Statistics 1

**May/June 2022**

**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 For  $n$  values of the variable  $x$ , it is given that

$$\Sigma(x - 200) = 446 \quad \text{and} \quad \Sigma x = 6846.$$

Find the value of  $n$ .

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2 A fair 6-sided die has the numbers 1, 2, 2, 3, 3, 3 on its faces. The die is rolled twice. The random variable  $X$  denotes the sum of the two numbers obtained.

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

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

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- 3 The back-to-back stem-and-leaf diagram shows the diameters, in cm, of 19 cylindrical pipes produced by each of two companies, *A* and *B*.

Company <i>A</i>							Company <i>B</i>				
					4	33	1	2	8		
	9	8	3	2	0	34	1	6	8	9	9
8	7	5	4	1	1	35	1	2	2	3	
		9	6	5	2	36	5	6			
			4	3	1	37	0	3	4		
						38	2	8			

Key: 1 | 35 | 3 means the pipe diameter from company *A* is 0.351 cm and from company *B* is 0.353 cm.

- (a) Find the median and interquartile range of the pipes produced by company *A*. [3]

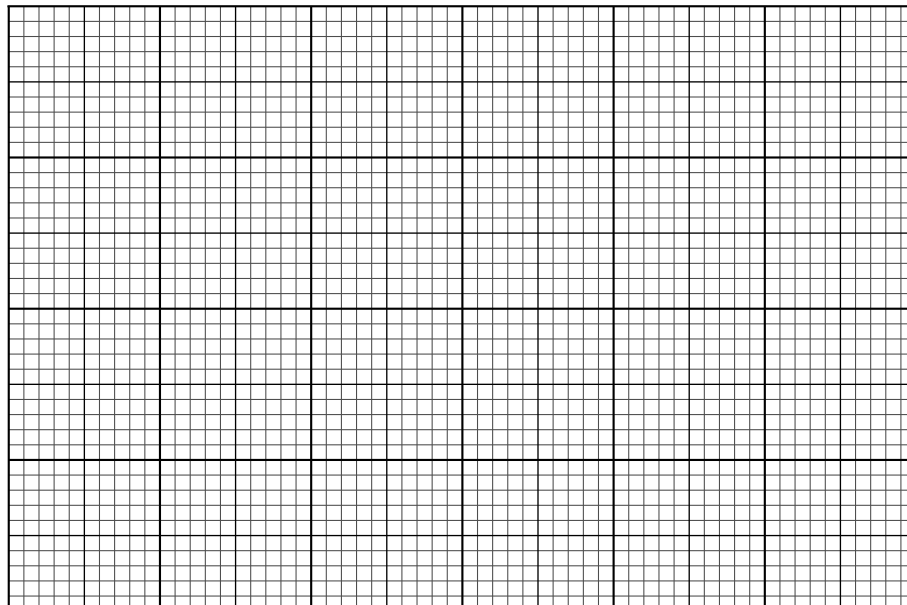
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It is given that for the pipes produced by company *B* the lower quartile, median and upper quartile are 0.346 cm, 0.352 cm and 0.370 cm respectively.

- (b) Draw box-and-whisker plots for companies *A* and *B* on the grid below. [3]



- (c) Make one comparison between the diameters of the pipes produced by companies *A* and *B*. [1]

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4 The weights, in kg, of bags of rice produced by Anders have the distribution  $N(2.02, 0.03^2)$ .

(a) Find the probability that a randomly chosen bag of rice produced by Anders weighs between 1.98 and 2.03 kg. [3]

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The weights of bags of rice produced by Binders are normally distributed with mean 2.55 kg and standard deviation  $\sigma$  kg. In a random sample of 5000 of these bags, 134 weighed more than 2.6 kg.

(b) Find the value of  $\sigma$ . [4]

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5 In a large college, 28% of the students do not play any musical instrument, 52% play exactly one musical instrument and the remainder play two or more musical instruments.

A random sample of 12 students from the college is chosen.

(a) Find the probability that more than 9 of these students play at least one musical instrument. [3]

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6 (a) Find the number of different arrangements of the 9 letters in the word CROCODILE. [1]

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(b) Find the number of different arrangements of the 9 letters in the word CROCODILE in which there is a C at each end and the two Os are not together. [3]

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- (c) Four letters are selected from the 9 letters in the word CROCODILE.

Find the number of selections in which the number of Cs is not the same as the number of Os.

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- (d) Find the number of ways in which the 9 letters in the word CROCODILE can be divided into three groups, each containing three letters, if the two Cs must be in different groups. [3]

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7 Hanna buys 12 hollow chocolate eggs that each contain a sweet. The eggs look identical but Hanna knows that 3 contain a red sweet, 4 contain an orange sweet and 5 contain a yellow sweet. Each of Hanna's three children in turn randomly chooses and eats one of the eggs, keeping the sweet it contained.

(a) Find the probability that all 3 eggs chosen contain the same colour sweet. [4]

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- (b) Find the probability that all 3 eggs chosen contain a yellow sweet, given that all three children have the same colour sweet. [2]

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- (c) Find the probability that at least one of Hanna’s three children chooses an egg that contains an orange sweet. [3]

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**Additional Page**

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