

Cambridge International AS & A Level

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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 .

[3]

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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: $1 \mid 35 \mid 3$ 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]

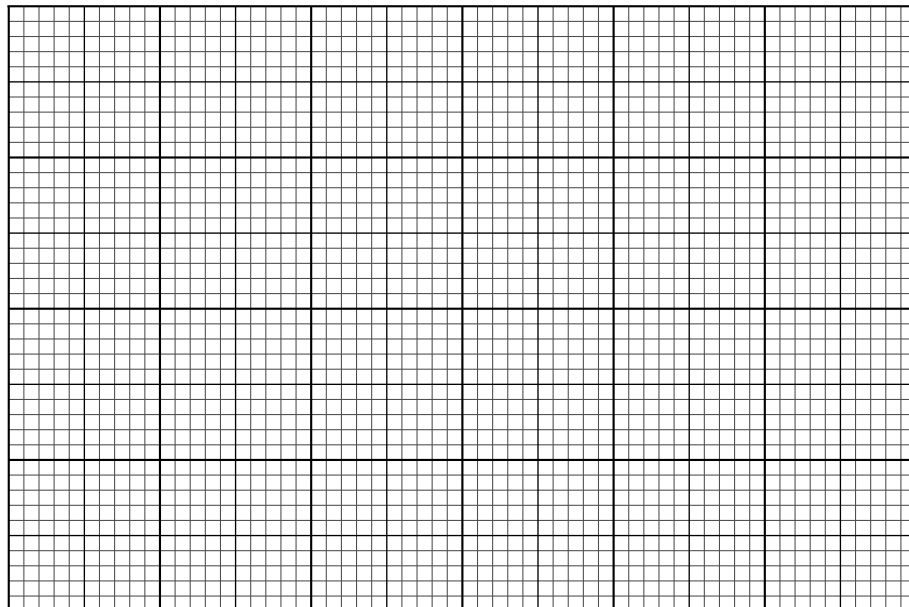
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It is given that for the pipes produced by company *B* the lower quartile, median and upper quartile are 0.346 cm, 0.352 cm and 0.370 cm respectively.

- (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]

[illegible]

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

(b) Find the value of σ .

[4]

[illegible]

- 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]

[illegible]

A random sample of 90 students from the college is now chosen.

- (b) Use an approximation to find the probability that fewer than 40 of these students play exactly one musical instrument. [5]

[illegible]

- 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]

[illegible]

- (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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