



Cambridge International AS & A Level

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



FURTHER MATHEMATICS

9231/04

Paper 4 Further Probability & Statistics

For examination from 2020

SPECIMEN PAPER

1 hour 30 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. Blank pages are indicated.

3

2 Each of the 10 identically based dice is thrown repeatedly until an even number is obtained. The number of throws needed is recorded and the results are summarised in the following table.

Number of throws	1	2	3	4	5	6	≥ 7
Frequency	8	4	2	3	5	1	0

Carry out a goodness of fit test, at the 5% significance level, to test whether the Geometric distribution is a satisfactory model for the data. [7]

•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•

4 The number, x , of a certain type of sea shell was counted at 6 randomly chosen sites, each 1 metre square, along the coastline in country A. The number, y , of the same type of sea shell was counted at 6 randomly chosen sites, each 1 metre square, along the coastline in country B. The results are summarised as follows, where \bar{x} and \bar{y} denote the sample means of x and y respectively.

$$\bar{x} = 2 \quad \Sigma(x - \bar{x})^2 = 3 \quad \bar{y} = 2 \quad \Sigma(y - \bar{y})^2 = 0$$

Find a 95% confidence interval for the difference between the mean number of sea shells, per square metre, on the coastlines in country A and in country B. [7]

.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.

5 The continuous random variable X has probability density function given by

$$f(x) = \begin{cases} 0 & x < 0, \\ \frac{6}{5}x & 0 \leq x \leq 1, \\ \frac{6}{5}x^{-4} & x > 1. \end{cases}$$

(a) Find $P(X > 1)$. [1]

·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·

(b) Find the mean value of X . [2]

·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·

6 Aisha has a bag containing 3 red balls and 3 white balls. She selects a ball at random, notes its colour and returns it to the bag. The same process is repeated twice more. The number of red balls selected by Aisha is denoted by X .

(a) Find the probability distribution of $X(t)$ for X . [2]

•	•	•
•	•	•
•	•	•
•	•	•
•	•	•
•	•	•
•	•	•
•	•	•
•	•	•
•	•	•

Basim also has a bag containing 3 red balls and 3 white balls. He selects three balls at random, with replacement, from his bag. The number of red balls selected by Basim is denoted by Y .

(b) Find the probability distribution of $Y(t)$ for Y . [3]

•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•

