CAMBRIDGE
International Education

Cambridge International AS & A Level

MATHEMATICS **9709/06**

Paper 6 Probability & Statistics 2 **For examination from 2027**

SPECIMEN PAPER **1 hour 15 minutes**

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You must answer on the printed answer booklet.

You will need: Printed answer booklet
List of formulae (MF19)

INSTRUCTIONS

- Answer **all** questions.
- Write your answers on the printed answer booklet. Follow the instructions on the front cover of the answer booklet.
- 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 **4** pages. Any blank pages are indicated.

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1 Leaves from a certain type of tree have lengths that are distributed with standard deviation 3.2 cm. A random sample of 250 of these leaves is taken and the mean length of this sample is found to be 12.5 cm.

(a) Calculate a 99% confidence interval for the population mean length. [3]

(b) Write down the probability that the whole of a 99% confidence interval will lie below the population mean. [1]

2 Describe briefly how to use random numbers to choose a sample of 10 students from a year-group of 276 students. [3]

3 The number of calls received at a small call centre has a Poisson distribution with mean 2.4 calls per 5-minute period.

(a) Find the probability of exactly 4 calls in an 8-minute period. [2]

(b) Find the probability of at least 3 calls in a 3-minute period. [3]

(c) The number of calls received at a large call centre has a Poisson distribution with mean 41 calls per 5-minute period.

Use an approximating distribution to find the probability that the number of calls received in a 5-minute period is between 41 and 59 inclusive. [5]

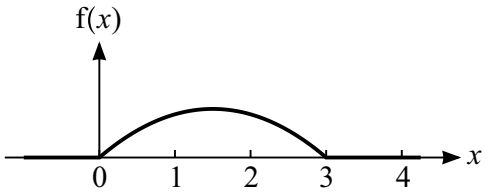
4 The lifetimes, in hours, of Longlive light bulbs and Enerlow light bulbs have the independent distributions $N(1020, 45^2)$ and $N(2800, 52^2)$ respectively.

(a) Find the probability that the total of the lifetimes of five randomly chosen Longlive bulbs is less than 5200 hours. [4]

(b) Find the probability that the lifetime of a randomly chosen Enerlow bulb is at least three times that of a randomly chosen Longlive bulb. [6]

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5



The diagram shows the graph of the probability density function, f, of a random variable X, where

$$f(x) = \begin{cases} \frac{2}{9}(3x - x^2) & 0 \leqslant x \leqslant 3, \\ 0 & \text{otherwise.} \end{cases}$$

(a) State the value of $E(X)$ and find $\text{Var}(X)$. [4]

(b) State the value of $P(1.5 \leqslant X \leqslant 4)$. [1]

(c) Given that $P(1 \leqslant X \leqslant 2) = \frac{13}{27}$, find $P(X > 2)$. [2]

6 At a certain hospital it was found that the probability that a patient did not arrive for an appointment was 0.2. The hospital carries out some publicity in the hope that this probability will be reduced. They wish to test whether the publicity has worked.

A random sample of 30 appointments is selected and the number of patients that do not arrive is noted. This figure is used to carry out a test at the 5% significance level.

(a) Explain why the test is one-tailed and state suitable null and alternative hypotheses. [2]

(b) Use a binomial distribution to find the critical region, and find the probability of a Type I error. [5]

(c) In fact 3 patients out of the 30 do not arrive.

State the conclusion of the test, explaining your answer. [2]

7 The mean weight of bags of carrots is μ kilograms. An inspector wishes to test whether $\mu = 2.0$. He weighs a random sample of 200 bags and his results are summarised as follows.

$$\Sigma x = 430 \quad \Sigma x^2 = 1290$$

Carry out the test at the 10% significance level. [7]

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