

Cambridge
International
A Level

Cambridge International Examinations
Cambridge International Advanced Level

CANDIDATE
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MATHEMATICS

9709/72

Paper 7 Probability & Statistics 2 (**S2**)

February/March 2017

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: List of Formulae (MF9)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of this page.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** the questions.

Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.

The use of an electronic calculator is expected, where appropriate.

You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 50.

This document consists of **11** printed pages and **1** blank page.



3

2 Karim has noted the lifespans, in weeks, of a large random sample of certain insects. He carries out a test, at the 1% significance level, for the population mean, μ . Karim's null hypothesis is $\mu = 6.4$.

(i) Given that Karim's test is two-tail, state the alternative hypothesis. [1]

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Karim finds that the value of the test statistic is $z = 2.43$.

(ii) Explain what conclusion he should draw. [2]

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(iii) Explain briefly when a one-tail test is appropriate, rather than a two-tail test. [1]

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4 At a doctors' surgery, the number of missed appointments per day has a Poisson distribution. In the past the mean number of missed appointments per day has been 0.9. Following some publicity, the manager carries out a hypothesis test to determine whether this mean has decreased. If there are fewer than 3 missed appointments in a randomly chosen 5-day period, she will conclude that the mean has decreased.

(i) Find the probability of a Type I error. [3]

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(ii) State what is meant by a Type I error in this context. [1]

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(iii) Find the probability of a Type II error if the mean number of missed appointments per day is 0.2. [3]

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(b) The probability density function g is defined by

$$g(x) = \begin{cases} 6(a^2 - x^2) & -a \leq x \leq a, \\ 0 & \text{otherwise,} \end{cases}$$

where a is a constant.

(i) Show that $a = \frac{1}{2}$. [3]

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(ii) State the value of $E(X)$. [1]

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(iii) Find $\text{Var}(X)$. [2]

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7 The number of planes arriving at an airport every hour during daytime is modelled by the random variable X with distribution $Po(5.2)$.

(i) State two assumptions required for the Poisson model to be valid in this context. [2]

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(ii) (a) Find the probability that the number of planes arriving in a 15-minute period is greater than 1 and less than 4, [3]

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(b) Find the probability that more than 3 planes will arrive in a 40-minute period. [2]

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