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Pearson Edexcel
International
Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Statistics S2

Advanced/Advanced Subsidiary

Tuesday 24 June 2014 – Morning
Time: 1 hour 30 minutes

Paper Reference
WST02/01

You must have:
Mathematical Formulae and Statistical Tables (Blue)

Total Marks

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B). Coloured pencils and highlighter pens must not be used.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
  – there may be more space than you need.
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Values from the statistical tables should be quoted in full. When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information

- The total mark for this paper is 75.
- The marks for **each** question are shown in brackets
  – use this as a guide as to how much time to spend on each question.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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1. (a) State the conditions under which the Poisson distribution may be used as an approximation to the binomial distribution.

(1)

A farmer supplies a bakery with eggs. The manager of the bakery claims that the proportion of eggs having a double yolk is 0.009
The farmer claims that the proportion of his eggs having a double yolk is more than 0.009

(b) State suitable hypotheses for testing these claims.

(1)

In a batch of 500 eggs the baker records 9 eggs with a double yolk.

(c) Using a suitable approximation, test at the 5% level of significance whether or not this supports the farmer's claim.

(5)

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Question 1 continued

Q1

(Total 7 marks)

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2. The amount of flour used by a factory in a week is Y thousand kg where Y has probability density function

$$f(y) = \begin{cases} k(4 - y^2) & 0 \leqslant y \leqslant 2 \\ 0 & \text{otherwise} \end{cases}$$

(a) Show that the value of k is $\frac{3}{16}$

(4)

Use algebraic integration to find

(b) the mean number of kilograms of flour used by the factory in a week,

(4)

(c) the standard deviation of the number of kilograms of flour used by the factory in a week,

(5)

(d) the probability that more than 1500 kg of flour will be used by the factory next week.

(3)

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Question 2 continued

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Question 2 continued

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Question 2 continued

(Total 16 marks)

Q2

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3. The continuous random variable T is uniformly distributed on the interval $[\alpha, \beta]$ where $\beta > \alpha$

Given that $E(T) = 2$ and $Var(T) = \frac{16}{3}$, find

(a) the value of α and the value of β,

(5)

(b) $P(T < 3.4)$

(2)

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Question 3 continued

Q3

(Total 7 marks)

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4. Pieces of ribbon are cut to length L cm where $L \sim N(\mu, 0.5^2)$

(a) Given that 30% of the pieces of ribbon have length more than 100 cm, find the value of μ to the nearest 0.1 cm.

(3)

John selects 12 pieces of ribbon at random.

(b) Find the probability that fewer than 3 of these pieces of ribbon have length more than 100 cm.

(3)

Aditi selects 400 pieces of ribbon at random.

(c) Using a suitable approximation, find the probability that more than 127 of these pieces of ribbon will have length more than 100 cm.

(6)

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Question 4 continued

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Question 4 continued

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Question 4 continued

(Total 12 marks)

Q4

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5. A company claims that 35% of its peas germinate. In order to test this claim Ann decides to plant 15 of these peas and record the number which germinate.

(a) (i) State suitable hypotheses for a two-tailed test of this claim.

(ii) Using a 5% level of significance, find an appropriate critical region for this test. The probability in each of the tails should be as close to 2.5% as possible.

(4)

(b) Ann found that 8 of the 15 peas germinated. State whether or not the company's claim is supported. Give a reason for your answer.

(2)

(c) State the actual significance level of this test.

(1)

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Question 5 continued

Q5

(Total 7 marks)

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6. A continuous random variable X has cumulative distribution function $F(x)$ given by

$$F(x) = \begin{cases} 0 & x < 0 \\ \frac{x^2}{20}(9 - 2x) & 0 \leqslant x \leqslant 2 \\ 1 & x > 2 \end{cases}$$

(a) Verify that the median of X lies between 1.23 and 1.24

(3)

(b) Specify fully the probability density function $f(x)$.

(3)

(c) Find the mode of X.

(2)

(d) Describe the skewness of this distribution. Justify your answer.

(2)

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Question 6 continued

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Question 6 continued

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Question 6 continued

(Total 10 marks)

Q6

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7. Flaws occur at random in a particular type of material at a mean rate of 2 per 50 m.

(a) Find the probability that in a randomly chosen 50 m length of this material there will be exactly 5 flaws.

(2)

This material is sold in rolls of length 200 m. Susie buys 4 rolls of this material.

(b) Find the probability that only one of these rolls will have fewer than 7 flaws.

(6)

A piece of this material of length x m is produced.

Using a normal approximation, the probability that this piece of material contains fewer than 26 flaws is 0.5398

(c) Find the value of x.

(8)

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Question 7 continued

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Question 7 continued

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Question 7 continued

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Question 7 continued

Q7

(Total 16 marks)

TOTAL FOR PAPER: 75 MARKS

END