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Surname	Other names

Pearson Edexcel
International
Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Statistics S2

Advanced/Advanced Subsidiary

Thursday 27 October 2016 – 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.

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1. A mobile phone company claims that each year 5% of its customers have their mobile phone stolen. An insurance company claims this percentage is higher. A random sample of 30 of the mobile phone company's customers is taken and 4 of them have had their mobile phone stolen during the last year.

(a) Test the insurance company's claim at the 10% level of significance. State your hypotheses clearly.

(6)

A new random sample of 90 customers is taken. A test is carried out using these 90 customers, to see if the percentage of customers who have had a mobile phone stolen in the last year is more than 5%

(b) Using a suitable approximation and a 10% level of significance, find the critical region for this test.

(4)

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Question 1 continued

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Question 1 continued

(Total 10 marks)

Q1

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2. The lifetime of a particular battery, T hours, is modelled using the cumulative distribution function

$$\mathrm{F}(t) = \begin{cases} 0 & t < 8 \\ \frac{1}{96}(74t - \frac{5}{2}t^2 + k) & 8 \leqslant t \leqslant 12 \\ 1 & t > 12 \end{cases}$$

(a) Show that $k = -432$

(2)

(b) Find the probability density function of T, for all values of t.

(2)

(c) Write down the mode of T.

(1)

(d) Find the median of T.

(3)

(e) Find the probability that a randomly selected battery has a lifetime of less than 9 hours.

(2)

A battery is selected at random. Given that its lifetime is at least 9 hours,

(f) find the probability that its lifetime is no more than 11 hours.

(4)

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Question 2 continued

(Total 14 marks)

Q2

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3. A large number of students sat an examination. All of the students answered the first question. The first question was answered correctly by 40% of the students.

In a random sample of 20 students who sat the examination, X denotes the number of students who answered the first question correctly.

(a) Write down the distribution of the random variable X

(1)

(b) Find $P(4 \leqslant X < 9)$

(2)

Students gain 7 points if they answer the first question correctly and they lose 3 points if they do not answer it correctly.

(c) Find the probability that the total number of points scored on the first question by the 20 students is more than 0

(4)

(d) Calculate the variance of the total number of points scored on the first question by a random sample of 20 students.

(3)

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Question 3 continued

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Q3

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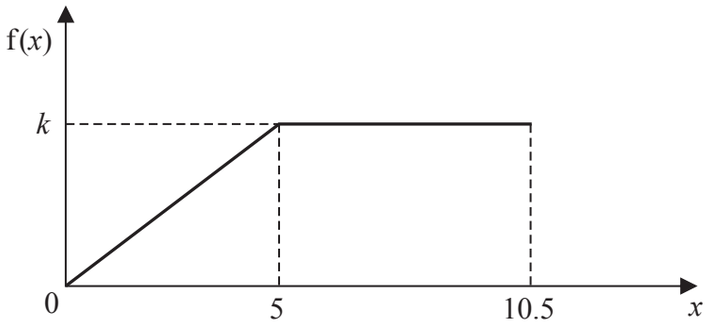

Figure 1

A continuous random variable X has the probability density function $f(x)$ shown in Figure 1

$$f(x) = \begin{cases} mx & 0 \leqslant x \leqslant 5 \\ k & 5 < x \leqslant 10.5 \\ 0 & \text{otherwise} \end{cases}$$

where m and k are constants.

(a) (i) Show that $k = \frac{1}{8}$

(ii) Find the value of m

(3)

(b) Find $E(X)$

(3)

(c) Find the interquartile range of X

(4)

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Question 4 continued

(Total 10 marks)

Q4

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5. A string of length 40 cm is cut into 2 pieces at a random point.
The continuous random variable L represents the length of the longer piece of string.

(a) Write down the distribution of L

(2)

(b) Find the probability that the length of the longer piece of string is 28 cm to the nearest cm

(2)

Each piece of string is used to form the perimeter of a square.

(c) Calculate the probability that the area of the larger square is less than 64 cm^2

(3)

(d) Calculate the probability that the difference in area between the two squares is greater than 81 cm^2

(4)

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Question 5 continued

(Total 11 marks)

Q5

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6. According to an electric company, power failures occur randomly at a rate of λ every 10 weeks, $1 < \lambda < 10$

(a) Write down an expression in terms of λ for the probability that there are fewer than 2 power failures in a randomly selected 10 week period.

(2)

(b) Write down an expression in terms of λ for the probability that there is exactly 1 power failure in a randomly selected 5 week period.

(2)

Over a 100 week period, the probability, using a normal approximation, that fewer than 15 power failures occur is 0.0179 (to 3 significant figures).

(c) (i) Justify the use of a normal approximation.

(ii) Find the value of λ.
Show each stage of your working clearly.

(8)

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Question 6 continued

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Q6

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7. An ice cream shop sells a large number of 1 scoop, 2 scoop and 3 scoop ice cream cones to its customers in the ratio 5 : 2 : 1

A random sample of 2 customers at the ice cream shop is taken. Each customer orders a 1 scoop or a 2 scoop or a 3 scoop ice cream cone.

Let S represent the total number of ice cream scoops ordered by these 2 customers.

(a) Find the sampling distribution of S

(5)

A random sample of n customers at the ice cream shop is taken. Each customer orders a 1 scoop or a 2 scoop or a 3 scoop ice cream cone. The probability that more than n scoops of ice cream are ordered by these customers is greater than 0.99

(b) Find the smallest possible value of n

(3)

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Question 7 continued

Q7

(Total 8 marks)

TOTAL FOR PAPER: 75 MARKS

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