Write your name here

Surname		Other names

Pearson Edexcel
International
Advanced Level

Centre Number

Candidate Number

Statistics S2
Advanced/Advanced Subsidiary

Friday 17 January 2014 – Afternoon	Paper Reference
Time: 1 hour 30 minutes	**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. The probability of a leaf cutting successfully taking root is 0.05

    Find the probability that, in a batch of 10 randomly selected leaf cuttings, the number taking root will be

    (a) (i)   exactly 1
         (ii) more than 2

    (5)

    A second random sample of 160 leaf cuttings is selected.

    (b) Using a suitable approximation, estimate the probability of at least 10 leaf cuttings taking root.

    (3)

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2. Bill owns a restaurant. Over the next four weeks Bill decides to carry out a sample survey to obtain the customers' opinions.

(a) Suggest a suitable sampling frame for the sample survey.

(1)

(b) Identify the sampling units.

(1)

(c) Give one advantage and one disadvantage of taking a census rather than a sample survey.

(2)

Bill believes that only 30% of customers would like a greater choice on the menu. He takes a random sample of 50 customers and finds that 20 of them would like a greater choice on the menu.

(d) Test, at the 5% significance level, whether or not the percentage of customers who would like a greater choice on the menu is more than Bill believes. State your hypotheses clearly.

(6)

P 4 2 9 6 2 X A 0 4 2 4

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Question 2 continued

P 4 2 9 6 2 X A 0 5 2 4

3. The continuous random variable X has cumulative distribution function given by

$$F(x) = \begin{cases} 0 & x < 0 \\ \dfrac{1}{6}x(x+1) & 0 \leqslant x \leqslant 2 \\ 1 & x > 2 \end{cases}$$

(a) Find the value of a such that $P(X > a) = 0.4$

Give your answer to 3 significant figures.

(3)

(b) Use calculus to find (i) $E(X)$

(ii) $Var(X)$.

(8)

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Question 3 continued

P 4 2 9 6 2 X A 0 9 2 4

4. The number of telephone calls per hour received by a business is a random variable with distribution $Po(\lambda)$.

Charlotte records the number of calls, C, received in 4 hours.

A test of the null hypothesis $H_0: \lambda = 1.5$ is carried out.

H_0 is rejected if $C > 10$

(a) Write down the alternative hypothesis.

(1)

(b) Find the significance level of the test.

(3)

Given that $P(C > 10) < 0.1$

(c) find the largest possible value of λ that can be found by using the tables.

(3)

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5. A school photocopier breaks down randomly at a rate of 15 times per year.

(a) Find the probability that there will be exactly 3 breakdowns in the next month.

(3)

(b) Show that the probability that there will be at least 2 breakdowns in the next month is 0.355 to 3 decimal places.

(2)

(c) Find the probability of at least 2 breakdowns in each of the next 4 months.

(2)

The teachers would like a new photocopier. The head teacher agrees to monitor the situation for the next 12 months. The head teacher decides he will buy a new photocopier if there is more than 1 month when the photocopier has at least 2 breakdowns.

(d) Find the probability that the head teacher will buy a new photocopier.

(5)

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Question 5 continued

6. The continuous random variable X has probability density function given by

$$f(x) = \begin{cases} k(x+1)^2 & -1 \leqslant x \leqslant 1 \\ k(6-2x) & 1 < x \leqslant 3 \\ 0 & \text{otherwise} \end{cases}$$

where k is a positive constant.

(a) Sketch the graph of $f(x)$.

(2)

(b) Show that the value of k is $\dfrac{3}{20}$

(5)

(c) Define fully the cumulative distribution function $F(x)$.

(5)

(d) Find the median of X, giving your answer to 3 significant figures.

(3)

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Question 6 continued

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7. The random variable $Y \sim B(n, p)$.

Using a normal approximation the probability that Y is at least 65 is 0.2266 and the probability that Y is more than 52 is 0.8944

Find the value of n and the value of p.

(12)

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Question 7 continued

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P 4 2 9 6 2 X A 0 2 3 2 4