June 2005

Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	6	8	4	/	0	1	Signature	

Paper Reference(s)

6684/01

Edexcel GCE

Statistics S2

Advanced/Advanced Subsidiary

Wednesday 22 June 2005 – Afternoon

Time: 1 hour 30 minutes

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
Total	

Materials required for examination
Mathematical Formulae (Lilac or Green)

Items included with question papers
Nil

Candidates may use any calculator EXCEPT those with the facility for symbolic algebra, differentiation and/or integration. Thus candidates may NOT use calculators such as the Texas Instruments TI 89, TI 92, Casio CFX 9970G, Hewlett Packard HP 48G.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper.
You must write your answer for each question in the space following the question.
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 for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
Marks for individual questions and parts of questions are shown in round brackets: e.g. **(2)**.
There are 7 questions in this question paper. The total for this question paper is 75.
There are 20 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the examiner. Answers without working may gain no credit.

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1. It is estimated that 4% of people have green eyes. In a random sample of size n, the expected number of people with green eyes is 5.

(a) Calculate the value of n.

(3)

The expected number of people with green eyes in a second random sample is 3.

(b) Find the standard deviation of the number of people with green eyes in this second sample.

(4)

Leave blank

2. The continuous random variable X is uniformly distributed over the interval [2, 6].

(a) Write down the probability density function f(x).

(2)

Find

(b) E(X),

(1)

(c) Var(X),

(2)

(d) the cumulative distribution function of X, for all x,

(4)

(e) P($2.3 < X < 3.4$).

(2)

Leave blank

3. The random variable X is the number of misprints per page in the first draft of a novel.

(a) State two conditions under which a Poisson distribution is a suitable model for X.

(2)

The number of misprints per page has a Poisson distribution with mean 2.5. Find the probability that

(b) a randomly chosen page has no misprints,

(2)

(c) the total number of misprints on 2 randomly chosen pages is more than 7.

(3)

The first chapter contains 20 pages.

(d) Using a suitable approximation find, to 2 decimal places, the probability that the chapter will contain less than 40 misprints.

(7)

Leave blank

Question 3 continued

Leave blank

4. Explain what you understand by

(a) a sampling unit,

(1)

(b) a sampling frame,

(1)

(c) a sampling distribution.

(2)

Q4

(Total 4 marks)

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5. In a manufacturing process, 2% of the articles produced are defective. A batch of 200 articles is selected.

(a) Giving a justification for your choice, use a suitable approximation to estimate the probability that there are exactly 5 defective articles.

(5)

(b) Estimate the probability there are less than 5 defective articles.

(2)

Leave blank

6. A continuous random variable X has probability density function f(x) where

$$f(x) = \begin{cases} k(4x - x^3), & 0 \leqslant x \leqslant 2, \\ 0, & \text{otherwise,} \end{cases}$$

where k is a positive integer.

(a) Show that $k = \frac{1}{4}$.

(4)

Find

(b) E(X),

(3)

(c) the mode of X,

(3)

(d) the median of X.

(4)

(e) Comment on the skewness of the distribution.

(2)

(f) Sketch f(x).

(2)

Leave blank

Question 6 continued

Leave blank

7. A drugs company claims that 75% of patients suffering from depression recover when treated with a new drug.

A random sample of 10 patients with depression is taken from a doctor's records.

(a) Write down a suitable distribution to model the number of patients in this sample who recover when treated with the new drug.

(2)

Given that the claim is correct,

(b) find the probability that the treatment will be successful for exactly 6 patients.

(2)

The doctor believes that the claim is incorrect and the percentage who will recover is lower. From her records she took a random sample of 20 patients who had been treated with the new drug. She found that 13 had recovered.

(c) Stating your hypotheses clearly, test, at the 5% level of significance, the doctor's belief.

(6)

(d) From a sample of size 20, find the greatest number of patients who need to recover for the test in part (c) to be significant at the 1% level.

(4)

Leave blank

Question 7 continued