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

Friday 23 May 2008 – Morning

Time: 1 hour 30 minutes

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
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5	
6	
7	
Total	

Materials required for examination	**Items included with question papers**
Mathematical Formulae (Green)	Nil

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 to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions. 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.
The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 7 questions in this question paper. The total mark for this paper is 75.
There are 28 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 not gain full credit.

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1. Jean regularly takes a break from work to go to the post office. The amount of time Jean waits in the queue to be served at the post office has a continuous uniform distribution between 0 and 10 minutes.

(a) Find the mean and variance of the time Jean spends in the post office queue. **(3)**

(b) Find the probability that Jean does not have to wait more than 2 minutes. **(2)**

Jean visits the post office 5 times.

(c) Find the probability that she never has to wait more than 2 minutes. **(2)**

Jean is in the queue when she receives a message that she must return to work for an urgent meeting. She can only wait in the queue for a further 3 minutes.

Given that Jean has already been queuing for 5 minutes,

(d) find the probability that she must leave the post office queue without being served. **(3)**

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Question 1 continued

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2. In a large college 58% of students are female and 42% are male. A random sample of 100 students is chosen from the college. Using a suitable approximation find the probability that more than half the sample are female.

(7)

Leave blank

3. A test statistic has a Poisson distribution with parameter λ.

Given that

$$H_0 : \lambda = 9,\ H_1 : \lambda \neq 9$$

(a) find the critical region for the test statistic such that the probability in each tail is as close as possible to 2.5%.

(3)

(b) State the probability of incorrectly rejecting H_0 using this critical region.

(2)

Leave blank

4. Each cell of a certain animal contains 11000 genes. It is known that each gene has a probability 0.0005 of being damaged.

A cell is chosen at random.

(a) Suggest a suitable model for the distribution of the number of damaged genes in the cell. **(2)**

(b) Find the mean and variance of the number of damaged genes in the cell. **(2)**

(c) Using a suitable approximation, find the probability that there are at most 2 damaged genes in the cell. **(4)**

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Question 4 continued

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5. Sue throws a fair coin 15 times and records the number of times it shows a head.

(a) State the distribution to model the number of times the coin shows a head.
(2)

Find the probability that Sue records

(b) exactly 8 heads,
(2)

(c) at least 4 heads.
(2)

Sue has a different coin which she believes is biased in favour of heads. She throws the coin 15 times and obtains 13 heads.

(d) Test Sue's belief at the 1% level of significance. State your hypotheses clearly.
(6)

Leave blank

Question 5 continued

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6. A call centre agent handles telephone calls at a rate of 18 per hour.

(a) Give two reasons to support the use of a Poisson distribution as a suitable model for the number of calls per hour handled by the agent.
(2)

(b) Find the probability that in any randomly selected 15 minute interval the agent handles

(i) exactly 5 calls,

(ii) more than 8 calls.
(5)

The agent received some training to increase the number of calls handled per hour. During a randomly selected 30 minute interval after the training the agent handles 14 calls.

(c) Test, at the 5% level of significance, whether or not there is evidence to support the suggestion that the rate at which the agent handles calls has increased. State your hypotheses clearly.
(6)

Leave blank

Question 6 continued

Leave blank

7. A random variable X has probability density function given by

$$f(x) = \begin{cases} \frac{1}{2}x & 0 \leqslant x < 1 \\ kx^3 & 1 \leqslant x \leqslant 2 \\ 0 & \text{otherwise} \end{cases}$$

where k is a constant.

(a) Show that $k = \frac{1}{5}$
(4)

(b) Calculate the mean of X.
(4)

(c) Specify fully the cumulative distribution function $F(x)$.
(7)

(d) Find the median of X.
(3)

(e) Comment on the skewness of the distribution of X.
(2)

Leave blank

Question 7 continued