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

Tuesday 19 January 2010 – Morning

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 (Pink or Green)

Items included with question papers
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.
You must write your answer to 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 24 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 should show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

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1. A manufacturer supplies DVD players to retailers in batches of 20. It has 5% of the players returned because they are faulty.

(a) Write down a suitable model for the distribution of the number of faulty DVD players in a batch.

(2)

Find the probability that a batch contains

(b) no faulty DVD players,

(2)

(c) more than 4 faulty DVD players.

(2)

(d) Find the mean and variance of the number of faulty DVD players in a batch.

(2)

Leave blank

2. A continuous random variable X has cumulative distribution function

$$\mathrm{F}(x) = \begin{cases} 0, & x < -2 \\ \dfrac{x+2}{6}, & -2 \leqslant x \leqslant 4 \\ 1, & x > 4 \end{cases}$$

(a) Find $\mathrm{P}(X < 0)$.

(2)

(b) Find the probability density function $\mathrm{f}(x)$ of X.

(3)

(c) Write down the name of the distribution of X.

(1)

(d) Find the mean and the variance of X.

(3)

(e) Write down the value of $\mathrm{P}(X = 1)$.

(1)

Leave blank

Question 2 continued

Leave blank

3. A robot is programmed to build cars on a production line. The robot breaks down at random at a rate of once every 20 hours.

(a) Find the probability that it will work continuously for 5 hours without a breakdown. **(3)**

Find the probability that, in an 8 hour period,

(b) the robot will break down at least once, **(3)**

(c) there are exactly 2 breakdowns. **(2)**

In a particular 8 hour period, the robot broke down twice.

(d) Write down the probability that the robot will break down in the following 8 hour period. Give a reason for your answer. **(2)**

Leave blank

Question 3 continued

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4. The continuous random variable X has probability density function $f(x)$ given by

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

where k is a constant.

(a) Show that $k = \frac{1}{9}$ **(4)**

(b) Find the cumulative distribution function $F(x)$. **(6)**

(c) Find the mean of X. **(3)**

(d) Show that the median of X lies between $x = 2.6$ and $x = 2.7$ **(4)**

Leave blank

Question 4 continued

Leave blank

5. A café serves breakfast every morning. Customers arrive for breakfast at random at a rate of 1 every 6 minutes.

Find the probability that

(a) fewer than 9 customers arrive for breakfast on a Monday morning between 10 am and 11 am.

(3)

The café serves breakfast every day between 8 am and 12 noon.

(b) Using a suitable approximation, estimate the probability that more than 50 customers arrive for breakfast next Tuesday.

(6)

Leave blank

6. (a) Define the critical region of a test statistic.

(2)

A discrete random variable X has a Binomial distribution B(30, p). A single observation is used to test $H_0 : p = 0.3$ against $H_1 : p \neq 0.3$

(b) Using a 1% level of significance find the critical region of this test. You should state the probability of rejection in each tail which should be as close as possible to 0.005

(5)

(c) Write down the actual significance level of the test.

(1)

The value of the observation was found to be 15.

(d) Comment on this finding in light of your critical region.

(2)

Leave blank

Question 6 continued

Q6

(Total 10 marks)

Leave blank

7. A bag contains a large number of coins. It contains only 1p and 2p coins in the ratio 1:3

(a) Find the mean μ and the variance σ^2 of the values of this population of coins.
(3)

A random sample of size 3 is taken from the bag.

(b) List all the possible samples.
(2)

(c) Find the sampling distribution of the mean value of the samples.
(6)

Leave blank

Question 7 continued