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 24 May 2013 – 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)

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 or symbolic differentiation/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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PEARSON

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1. A bag contains a large number of 1p, 2p and 5p coins.

50% are 1p coins
20% are 2p coins
30% are 5p coins

A random sample of 3 coins is chosen from the bag.

(a) List all the possible samples of size 3 with median 5p.

(2)

(b) Find the probability that the median value of the sample is 5p.

(4)

(c) Find the sampling distribution of the median of samples of size 3

(5)

Leave blank

Question 1 continued

Leave blank

Question 1 continued

Leave blank

Question 1 continued

(Total 11 marks)

Q1

Leave blank

2. The number of defects per metre in a roll of cloth has a Poisson distribution with mean 0.25

Find the probability that

(a) a randomly chosen metre of cloth has 1 defect,

(2)

(b) the total number of defects in a randomly chosen 6 metre length of cloth is more than 2

(3)

A tailor buys 300 metres of cloth.

(c) Using a suitable approximation find the probability that the tailor's cloth will contain less than 90 defects.

(5)

Leave blank

Question 2 continued

Q2

(Total 10 marks)

Leave blank

3. An online shop sells a computer game at an average rate of 1 per day.

(a) Find the probability that the shop sells more than 10 games in a 7 day period.

(3)

Once every 7 days the shop has games delivered before it opens.

(b) Find the least number of games the shop should have in stock immediately after a delivery so that the probability of running out of the game before the next delivery is less than 0.05

(3)

In an attempt to increase sales of the computer game, the price is reduced for six months. A random sample of 28 days is taken from these six months. In the sample of 28 days, 36 computer games are sold.

(c) Using a suitable approximation and a 5% level of significance, test whether or not the average rate of sales per day has increased during these six months. State your hypotheses clearly.

(7)

Leave blank

Question 3 continued

Leave blank

Question 3 continued

Leave blank

Question 3 continued

Q3

(Total 13 marks)

Leave blank

4. A continuous random variable X is uniformly distributed over the interval $[b, 4b]$ where b is a constant.

(a) Write down E(X).

(1)

(b) Use integration to show that $\text{Var}(X) = \frac{3b^2}{4}$.

(3)

(c) Find Var(3 – 2X).

(2)

Given that $b = 1$ find

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

(2)

(e) the median of X.

(1)

Leave blank

Question 4 continued

Leave blank

Question 4 continued

Leave blank

Question 4 continued

Q4

(Total 9 marks)

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5. The continuous random variable X has a cumulative distribution function

$$F(x) = \begin{cases} 0 & x < 1 \\ \frac{x^3}{10} + \frac{3x^2}{10} + ax + b & 1 \leqslant x \leqslant 2 \\ 1 & x > 2 \end{cases}$$

where a and b are constants.

(a) Find the value of a and the value of b.

(4)

(b) Show that $f(x) = \frac{3}{10}(x^2 + 2x - 2), \quad 1 \leqslant x \leqslant 2$

(1)

(c) Use integration to find $E(X)$.

(4)

(d) Show that the lower quartile of X lies between 1.425 and 1.435

(3)

Leave blank

Question 5 continued

Leave blank

Question 5 continued

Leave blank

Question 5 continued

Q5

(Total 12 marks)

Leave blank

6. In a manufacturing process 25% of articles are thought to be defective. Articles are produced in batches of 20

(a) A batch is selected at random. Using a 5% significance level, find the critical region for a two tailed test that the probability of an article chosen at random being defective is 0.25
You should state the probability in each tail which should be as close as possible to 0.025

(5)

The manufacturer changes the production process to try to reduce the number of defective articles. She then chooses a batch at random and discovers there are 3 defective articles.

(b) Test at the 5% level of significance whether or not there is evidence that the changes to the process have reduced the percentage of defective articles. State your hypotheses clearly.

(5)

Leave blank

Question 6 continued

Q6

(Total 10 marks)

Leave blank

7. A telesales operator is selling a magazine. Each day he chooses a number of people to telephone. The probability that each person he telephones buys the magazine is 0.1

(a) Suggest a suitable distribution to model the number of people who buy the magazine from the telesales operator each day.

(1)

(b) On Monday, the telesales operator telephones 10 people. Find the probability that he sells at least 4 magazines.

(3)

(c) Calculate the least number of people he needs to telephone on Tuesday, so that the probability of selling at least 1 magazine, on that day, is greater than 0.95

(3)

A call centre also sells the magazine. The probability that a telephone call made by the call centre sells a magazine is 0.05
The call centre telephones 100 people every hour.

(d) Using a suitable approximation, find the probability that more than 10 people telephoned by the call centre buy a magazine in a randomly chosen hour.

(3)

Leave blank

Question 7 continued

Leave blank

Question 7 continued

Q7

(Total 10 marks)

TOTAL FOR PAPER: 75 MARKS

END