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

Paper Reference(s)

6684/01R

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.

Printer's Log. No.
P42832A
W850/R6684/57570 5/5/

P 4 2 8 3 2 A 0 1 2 4

Turn over

PEARSON

Leave blank

1. A bag contains a large number of counters. A third of the counters have a number 5 on them and the remainder have a number 1.

A random sample of 3 counters is selected.

(a) List all possible samples.

(2)

(b) Find the sampling distribution for the range.

(3)

Leave blank

2. The continuous random variable Y has cumulative distribution function

$$\mathrm{F}(y) = \begin{cases} 0 & y < 0 \\ \frac{1}{4}(y^3 - 4y^2 + ky) & 0 \leqslant y \leqslant 2 \\ 1 & y > 2 \end{cases}$$

where k is a constant.

(a) Find the value of k.

(2)

(b) Find the probability density function of Y, specifying it for all values of y.

(3)

(c) Find $\mathrm{P}(Y > 1)$.

(2)

Leave blank

3. The random variable X has a continuous uniform distribution on $[a, b]$ where a and b are positive numbers.

Given that $E(X) = 23$ and $Var(X) = 75$

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

(6)

Given that $P(X > c) = 0.32$

(b) find $P(23 < X < c)$.

(2)

Leave blank

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

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

where k is a constant.

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

(3)

(b) Find the mode of X.

(2)

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

(4)

By comparing your answers to parts (b) and (c),

(d) describe the skewness of X, giving a reason for your answer.

(2)

Leave blank

Question 4 continued

Leave blank

5. In a village shop the customers must join a queue to pay. The number of customers joining the queue in a 10 minute interval is modelled by a Poisson distribution with mean 3

Find the probability that

(a) exactly 4 customers join the queue in the next 10 minutes,

(2)

(b) more than 10 customers join the queue in the next 20 minutes.

(3)

When a customer reaches the front of the queue the customer pays the assistant. The time each customer takes paying the assistant, T minutes, has a continuous uniform distribution over the interval [0, 5]. The random variable T is independent of the number of people joining the queue.

(c) Find $P(T > 3.5)$

(1)

In a random sample of 5 customers, the random variable C represents the number of customers who took more than 3.5 minutes paying the assistant.

(d) Find $P(C \geqslant 3)$

(3)

Bethan has just reached the front of the queue and starts paying the assistant.

(e) Find the probability that in the next 4 minutes Bethan finishes paying the assistant and no other customers join the queue.

(4)

Leave blank

Question 5 continued

P 4 2 8 3 2 A 0 1 3 2 4

Leave blank

6. Frugal bakery claims that their packs of 10 muffins contain on average 80 raisins per pack. A Poisson distribution is used to describe the number of raisins per muffin.

A muffin is selected at random to test whether or not the mean number of raisins per muffin has changed.

(a) Find the critical region for a two-tailed test using a 10% level of significance. The probability of rejection in each tail should be less than 0.05

(4)

(b) Find the actual significance level of this test.

(2)

The bakery has a special promotion claiming that their muffins now contain even more raisins.

A random sample of 10 muffins is selected and is found to contain a total of 95 raisins.

(c) Use a suitable approximation to test the bakery's claim. You should state your hypotheses clearly and use a 5% level of significance.

(8)

Leave blank

Question 6 continued

Leave blank

7. As part of a selection procedure for a company, applicants have to answer all 20 questions of a multiple choice test. If an applicant chooses answers at random the probability of choosing a correct answer is 0.2 and the number of correct answers is represented by the random variable X.

(a) Suggest a suitable distribution for X.

(2)

Each applicant gains 4 points for each correct answer but loses 1 point for each incorrect answer. The random variable S represents the final score, in points, for an applicant who chooses answers to this test at random.

(b) Show that $S = 5X - 20$

(2)

(c) Find $\mathrm{E}(S)$ and $\mathrm{Var}(S)$.

(4)

An applicant who achieves a score of at least 20 points is invited to take part in the final stage of the selection process.

(d) Find $\mathrm{P}(S \geqslant 20)$

(4)

Cameron is taking the final stage of the selection process which is a multiple choice test consisting of 100 questions. He has been preparing for this test and believes that his chance of answering each question correctly is 0.4

(e) Using a suitable approximation, estimate the probability that Cameron answers more than half of the questions correctly.

(5)

Leave blank

Question 7 continued