Paper Reference(s)

6684/01

Edexcel GCE

Statistics S2

Advanced/Advanced Subsidiary

Wednesday 8 June 2006 – Morning

Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
Mathematical Formulae (Lilac or Green)	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 on the answer book, write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Statistics S2), the paper reference (6684), your surname, other name and signature.
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.
This paper has 7 questions.
The total mark for this paper is 75.

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.

1. Before introducing a new rule, the secretary of a golf club decided to find out how members might react to this rule.

(*a*) Explain why the secretary decided to take a random sample of club members rather than ask all the members.

(1)

(*b*) Suggest a suitable sampling frame.

(1)

(*c*) Identify the sampling units.

(1)

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2. The continuous random variable L represents the error, in mm, made when a machine cuts rods to a target length. The distribution of L is continuous uniform over the interval $[-4.0, 4.0]$.

Find

(*a*) $P(L < -2.6)$,

(1)

(*b*) $P(L < -3.0 \text{ or } L > 3.0)$.

(2)

A random sample of 20 rods cut by the machine was checked.

(*c*) Find the probability that more than half of them were within 3.0 mm of the target length.

(4)

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3. An estate agent sells properties at a mean rate of 7 per week.

(*a*) Suggest a suitable model to represent the number of properties sold in a randomly chosen week. Give two reasons to support your model.

(3)

(*b*) Find the probability that in any randomly chosen week the estate agent sells exactly 5 properties.

(2)

(*c*) Using a suitable approximation find the probability that during a 24 week period the estate agent sells more than 181 properties.

(6)

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4. Breakdowns occur on a particular machine at random at a mean rate of 1.25 per week.

(*a*) Find the probability that fewer than 3 breakdowns occurred in a randomly chosen week.
(4)

Over a 4 week period the machine was monitored. During this time there were 11 breakdowns.

(*b*) Test, at the 5% level of significance, whether or not there is evidence that the rate of breakdowns has changed over this period. State your hypotheses clearly.
(7)

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5. A manufacturer produces large quantities of coloured mugs. It is known from previous records that 6% of the production will be green.

A random sample of 10 mugs was taken from the production line.

(*a*) Define a suitable distribution to model the number of green mugs in this sample.
(1)

(*b*) Find the probability that there were exactly 3 green mugs in the sample.
(3)

A random sample of 125 mugs was taken.

(*c*) Find the probability that there were between 10 and 13 (inclusive) green mugs in this sample, using

(i) a Poisson approximation,
(3)

(ii) a Normal approximation.
(6)

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6. The continuous random variable X has probability density function

$$\mathrm{f}(x) = \begin{cases} \dfrac{1+x}{k}, & 1 \le x \le 4, \\ 0, & \text{otherwise.} \end{cases}$$

(a) Show that $k = \dfrac{21}{2}$.

(3)

(b) Specify fully the cumulative distribution function of X.

(5)

(c) Calculate E(X).

(3)

(d) Find the value of the median.

(3)

(e) Write down the mode.

(1)

(f) Explain why the distribution is negatively skewed.

(1)

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7. It is known from past records that 1 in 5 bowls produced in a pottery have minor defects. To monitor production a random sample of 25 bowls was taken and the number of such bowls with defects was recorded.

(a) Using a 5% level of significance, find critical regions for a two-tailed test of the hypothesis that 1 in 5 bowls have defects. The probability of rejecting, in either tail, should be as close to 2.5% as possible.

(6)

(b) State the actual significance level of the above test.

(1)

At a later date, a random sample of 20 bowls was taken and 2 of them were found to have defects.

(c) Test, at the 10% level of significance, whether or not there is evidence that the proportion of bowls with defects has decreased. State your hypotheses clearly.

(7)

TOTAL FOR PAPER: 75 MARKS

END