Paper Reference(s)

6685

Edexcel GCE

Statistics S3

Advanced/Advanced Subsidiary

Thursday 5 June 2003 – Morning

Time: 1 hour 30 minutes

Materials required for examination
Answer Book (AB16)
Graph Paper (ASG2)
Mathematical Formulae (Lilac)

Items included with question papers
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 S3), the paper reference (6685), 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 seven questions.

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. Explain how to obtain a sample from a population using

(*a*) stratified sampling,

(2)

(*b*) quota sampling.

(2)

Give one advantage and one disadvantage of each sampling method.

(4)

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2. A random sample of 30 apples was taken from a batch. The mean weight of the sample was 124 g with standard deviation 20 g.

(*a*) Find a 99% confidence interval for the mean weight μ grams of the population of apples. Write down any assumptions you made in your calculations.

(6)

Given that the actual value of μ is 140,

(*b*) state, with a reason, what you can conclude about the sample of 30 apples.

(2)

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3. Given the random variables $X \sim N(20, 5)$ and $Y \sim N(10, 4)$ where X and Y are independent, find

(*a*) $E(X - Y)$,

(2)

(*b*) $\text{Var}(X - Y)$,

(2)

(*c*) $P(13 < X - Y < 16)$.

(5)

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4. A new drug to treat the common cold was used with a randomly selected group of 100 volunteers. Each was given the drug and their health was monitored to see if they caught a cold. A randomly selected control group of 100 volunteers was treated with a dummy pill. The results are shown in the table below.

	Cold	No cold
Drug	34	66
Dummy pill	45	55

Using a 5% significance level, test whether or not the chance of catching a cold is affected by taking the new drug. State your hypotheses clearly.

(11)

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5. A scientist monitored the levels of river pollution near a factory. Before the factory was closed down she took 100 random samples of water from different parts of the river and found an average weight of pollutants of 10 mg l^{-1} with a standard deviation of 2.64 mg l^{-1}. After the factory was closed down the scientist collected a further 120 random samples and found that they contained 8 mg l^{-1} of pollutants on average with a standard deviation of 1.94 mg l^{-1}.

Test, at the 5% level of significance, whether or not the mean river pollution fell after the factory closed down.

(11)

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6. Two judges ranked 8 ice skaters in a competition according to the table below.

Skater / Judge	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
A	2	5	3	7	8	1	4	6
B	3	2	6	5	7	4	1	8

(*a*) Evaluate Spearman's rank correlation coefficient between the ranks of the two judges.

(6)

(*b*) Use a suitable test, at the 5% level of significance, to interpret this result.

(5)

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7. A bag contains a large number of coins of which 30% are 50p coins, 20% are 10p coins and the rest are 2p coins.

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

(4)

A random sample of 2 coins is drawn from the bag one after the other.

(*b*) List all possible samples that could be drawn.

(2)

(*c*) Find the sampling distribution of $\overline{X}$, the mean of the coins drawn.

(4)

(*d*) Find P($2 \leq \overline{X} < 7$).

(2)

(*e*) Use the sampling distribution of $\overline{X}$ to verify E($\overline{X}$) = μ and Var($\overline{X}$) = $\frac{1}{2}\sigma^2$.

(5)

END