

Centre Number						Candidate Number				
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For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
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5	
6	
TOTAL	



General Certificate of Education  
Advanced Level Examination  
January 2012

# Statistics

# SS04

## Unit Statistics 4

Wednesday 25 January 2012 1.30 pm to 3.00 pm

**For this paper you must have:**

- the blue AQA booklet of formulae and statistical tables.
- You may use a graphics calculator.

**Time allowed**

- 1 hour 30 minutes

**Instructions**

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Write the question part reference (eg (a), (b)(i) etc) in the left-hand margin.
- You must answer the questions in the spaces provided. Do not write outside the box around each page.
- Show all necessary working; otherwise marks for method may be lost.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- The **final** answer to questions requiring the use of tables or calculators should normally be given to three significant figures.

**Information**

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.

**Advice**

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.
- You do not necessarily need to use all the space provided.



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**3** A company which sells tools claims that more than 40 per cent of people admit to having used kitchen cutlery, instead of the appropriate tools, when attempting a ‘do it yourself’ (DIY) job.

Students at a university were asked to complete a confidential questionnaire when applying for accommodation. The first question was:

Have you ever attempted a DIY job?      Yes/No

Those who answered ‘Yes’ were then asked the next question:

Have you ever used kitchen cutlery instead of the appropriate tools when attempting a DIY job?      Yes/No

**(a)** Of the 98 students who answered the first question, 48 answered ‘No’.

Calculate an approximate 95% confidence interval for the proportion of students applying for accommodation who claim not to have attempted a DIY job. Assume that students answering the question may be regarded as a random sample. *(5 marks)*

**(b)** Of the 50 students who answered ‘Yes’ to the first question, 25 answered ‘Yes’ to the next question.

Test whether there is evidence, significant at the 5% level, to support the claim that more than 40 per cent of students applying for accommodation who have attempted DIY jobs admit to having used kitchen cutlery instead of the appropriate tools. Use an exact distribution and assume that the sample is random. *(6 marks)*

**(c)** Summarise your results in the context of the company’s claim. *(3 marks)*

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**4** A travel company operates a service transporting passengers from a harbour on a Danish island to Copenhagen, which is situated on the mainland. A boat takes the passengers from the island to the mainland, where a bus is provided which takes them to Copenhagen.

The duration of the boat journey is normally distributed with mean 74 minutes and standard deviation 4.6 minutes.

The time to transfer passengers and luggage from the boat to the bus is normally distributed with mean 28 minutes and standard deviation 5.3 minutes.

The duration of the bus journey is normally distributed with mean 126 minutes and standard deviation 7.2 minutes.

- (a) (i)** Find the distribution of the total journey time from the island to Copenhagen. Assume that the three times which contribute to the total journey time are independent.
- (ii)** Find the probability that the total journey time will be more than 4 hours. *(6 marks)*

**(b)** Bergitte uses the service every Saturday. She leaves her home on the island by taxi at 9.45 am to travel to the harbour to catch the boat which leaves at 10.00 am. The time taken by the taxi to drive from Bergitte’s home to the harbour is normally distributed with mean 11 minutes and standard deviation 2.9 minutes.

- (i)** Find the probability that Bergitte reaches the harbour before 10.00 am. *(2 marks)*
- (ii)** If Bergitte does not reach the harbour before 10.00 am, she must wait for the next service to Copenhagen, which leaves at 2.00 pm.

Find the mean length of time that it takes Bergitte from leaving home to reaching Copenhagen.

You may assume that the journey time from the harbour to Copenhagen is the mean of the distribution considered in part **(a)**. *(3 marks)*

- (iii)** What advice would you give to Bergitte? *(1 mark)*

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**5** The times, in minutes, of a sample of 11 army recruits to complete an assault course were

57 62 74 49 63 65 61 58 79 66 61

- (a) Calculate a 95% confidence interval for the mean time for army recruits to complete the course. Assume that any necessary assumptions are satisfied. (6 marks)
- (b) Members of a local football club are invited to use the assault course. It is intended that a random sample of members will be timed and a 90% confidence interval for the mean time will be calculated.

For **each** of the statements given below, say whether it is:

- A Certainly true
- B Almost certainly true
- C Almost certainly untrue
- D Certainly untrue

For those statements to which you have answered B, C or D, explain the reason for your answer.

Statement 1. There is a probability of 0.9 that the confidence interval will contain the mean time taken by members of the club to complete the assault course.

Statement 2. There is a probability of 0.1 that the confidence interval will not contain the mean time taken by members of the **sample**.

Statement 3. 90% of the times taken by members of the club will be contained in the confidence interval. (5 marks)

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**6** Jiang decided to sell his house and asked Lorraine, an estate agent, to advertise the house for sale. Lorraine claimed that her advertising would lead to an average of at least 2 prospective buyers per week viewing the house until it was sold.

During the 15 weeks that Lorraine advertised the house for sale, a total of 24 prospective buyers viewed it.

**(a)** Assuming that the number of prospective buyers viewing the house may be modelled by a Poisson distribution, examine, using a distributional approximation, whether there is evidence that the mean was less than 2 per week. Use the 10% significance level. (8 marks)

**(b)** After these 15 weeks, the house had not been sold. Jiang was dissatisfied with the number of prospective buyers viewing the house and transferred to Imran’s estate agency. He told Imran that he had a mean of 1.6 prospective buyers per week viewing the house when Lorraine was advertising it. Imran promised to increase this mean number.

The numbers of prospective buyers viewing the house during Imran’s first five weeks of advertising it for sale were

3    1    2    0    4

Using an exact Poisson distribution, test whether there is evidence, at the 5% significance level, to show that the mean number of prospective buyers per week viewing the house was greater than 1.6 when Imran was advertising it. (5 marks)

**(c)** Based on your conclusions from parts **(a)** and **(b)**, was Jiang wise to change estate agents? Justify your answer. (2 marks)

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QUESTION  
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**END OF QUESTIONS**

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