Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	6	9	1	/	0	1	Signature	

Paper Reference(s)

6691/01

Edexcel GCE

Statistics S3

Advanced/Advanced Subsidiary

Friday 18 June 2010 – Afternoon

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, differentiation and 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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1. A report states that employees spend, on average, 80 minutes every working day on personal use of the Internet. A company takes a random sample of 100 employees and finds their mean personal Internet use is 83 minutes with a standard deviation of 15 minutes. The company's managing director claims that his employees spend more time on average on personal use of the Internet than the report states.

Test, at the 5% level of significance, the managing director's claim. State your hypotheses clearly.

(7)

Leave blank

Question 1 continued

Q1

(Total 7 marks)

Leave blank

2. Philip and James are racing car drivers. Philip's lap times, in seconds, are normally distributed with mean 90 and variance 9. James' lap times, in seconds, are normally distributed with mean 91 and variance 12. The lap times of Philip and James are independent. Before a race, they each take a qualifying lap.

(a) Find the probability that James' time for the qualifying lap is less than Philip's.

(4)

The race is made up of 60 laps. Assuming that they both start from the same starting line and lap times are independent,

(b) find the probability that Philip beats James in the race by more than 2 minutes.

(5)

Question 2 continued

Leave blank

Q2

(Total 9 marks)

Leave blank

3. A woodwork teacher measures the width, w mm, of a board. The measured width, X mm, is normally distributed with mean w mm and standard deviation 0.5 mm.

(a) Find the probability that X is within 0.6 mm of w.

(2)

The same board is measured 16 times and the results are recorded.

(b) Find the probability that the mean of these results is within 0.3 mm of w.

(4)

Given that the mean of these 16 measurements is 35.6 mm,

(c) find a 98% confidence interval for w.

(4)

N 3 5 3 9 7 A 0 6 2 4

Question 3 continued

Leave blank

Leave blank

Question 3 continued

Question 3 continued

Leave blank

(Total 10 marks)

Q3

Leave blank

4. A researcher claims that, at a river bend, the water gradually gets deeper as the distance from the inner bank increases. He measures the distance from the inner bank, b cm, and the depth of a river, s cm, at seven positions. The results are shown in the table below.

Position	*A*	*B*	*C*	*D*	*E*	*F*	*G*
Distance from inner bank b cm	100	200	300	400	500	600	700
Depth s cm	60	75	85	76	110	120	104

(a) Calculate Spearman's rank correlation coefficient between b and s.

(6)

(b) Stating your hypotheses clearly, test whether or not the data provides support for the researcher's claim. Use a 1% level of significance.

(4)

Leave blank

Question 4 continued

(Total 10 marks)

Q4

Leave blank

5. A random sample of 100 people were asked if their finances were worse, the same or better than this time last year. The sample was split according to their annual income and the results are shown in the table below.

Finances / Annual income	Worse	Same	Better
Under £15 000	14	11	9
£15 000 and above	17	20	29

Test, at the 5% level of significance, whether or not the relative state of their finances is independent of their income range. State your hypotheses and show your working clearly.

(10)

Question 5 continued

Leave blank

Question 5 continued

Leave blank

Question 5 continued

Leave blank

(Total 10 marks)

Q5

Leave blank

6. A total of 228 items are collected from an archaeological site. The distance from the centre of the site is recorded for each item. The results are summarised in the table below.

Distance from the centre of the site (m)	0–1	1–2	2–4	4–6	6–9	9–12
Number of items	22	15	44	37	52	58

Test, at the 5% level of significance, whether or not the data can be modelled by a continuous uniform distribution. State your hypotheses clearly.

(12)

N 3 5 3 9 7 A 0 1 6 2 4

Question 6 continued

Leave blank

Leave blank

Question 6 continued

N 3 5 3 9 7 A 0 1 8 2 4

Question 6 continued

Leave blank

(Total 12 marks)

Q6

Leave blank

7. A large company surveyed its staff to investigate the awareness of company policy. The company employs 6000 full time staff and 4000 part time staff.

(a) Describe how a stratified sample of 200 staff could be taken.

(3)

(b) Explain an advantage of using a stratified sample rather than a simple random sample.

(1)

A random sample of 80 full time staff and an independent random sample of 80 part time staff were given a test of policy awareness. The results are summarised in the table below.

	Mean score ($\bar{x}$)	Variance of scores (s^2)
Full time staff	52	21
Part time staff	50	19

(c) Stating your hypotheses clearly, test, at the 1% level of significance, whether or not the mean policy awareness scores for full time and part time staff are different.

(7)

(d) Explain the significance of the Central Limit Theorem to the test in part (c).

(2)

(e) State an assumption you have made in carrying out the test in part (c).

(1)

After all the staff had completed a training course the 80 full time staff and the 80 part time staff were given another test of policy awareness. The value of the test statistic z was 2.53

(f) Comment on the awareness of company policy for the full time and part time staff in light of this result. Use a 1% level of significance.

(2)

(g) Interpret your answers to part (c) and part (f).

(1)

Question 7 continued

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Question 7 continued

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Question 7 continued

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Question 7 continued

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Q7

(Total 17 marks)

TOTAL FOR PAPER: 75 MARKS

END