Examiner's use only

Team Leader's use only

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

Paper Reference(s)

### 6684/01

# **Edexcel GCE**

## **Statistics S2**

# Advanced/Advanced Subsidiary

Friday 14 January 2011 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination	Items included with question paper
Mathematical Formulae (Pink)	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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Turn over

**Total** 



W850/R6684/57570 5/3/2/

Leave	
blank	

A disease occurs in 3% of a population.	
(a) State any assumptions that are required to model the number disease in a random sample of size <i>n</i> as a binomial distribution	n.
	(2)
(b) Using this model, find the probability of exactly 2 people h random sample of 10 people.	naving the disease in a
	(3)
(c) Find the mean and variance of the number of people with the sample of 100 people.	ne disease in a random
	(2)
A doctor tests a random sample of 100 patients for the disease. patients a vaccination to protect them from the disease if more that the disease.	
(d) Using a suitable approximation, find the probability that th patients a vaccination.	
	(3)



2. A student takes a multiple choice test. The test is made up of 10 questions each with 5 possible answers. The student gets 4 questions correct. Her teacher claims she was guessing the answers. Using a one tailed test, at the 5% level of significance, test whether or not there is evidence to reject the teacher's claim. State your hypotheses clearly.	Leave blank
(6)	



3.	The continuous random variable $X$ is uniformly distributed over the interval $[-1,3]$ . Find		blank
	(a) $E(X)$	(1)	
	(b) $Var(X)$	(2)	
	(c) $E(X^2)$	(2)	
	(d) $P(X < 1.4)$	(1)	
	A total of 40 observations of <i>X</i> are made.		
	(e) Find the probability that at least 10 of these observations are negative.	(5)	



Question 3 continued	bla



## January 2011

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4.	Richard regularly travels to work on a ferry. Over a long period of time, Richard has found that the ferry is late on average 2 times every week. The company buys a new ferry to improve the service. In the 4-week period after the new ferry is launched, Richard finds the ferry is late 3 times and claims the service has improved. Assuming that the number of times the ferry is late has a Poisson distribution, test Richard's claim at the 5% level of significance. State your hypotheses clearly.	bla
	(0)	
_		



Leave blank

**5.** A continuous random variable X has the probability density function f(x) shown in Figure 1.

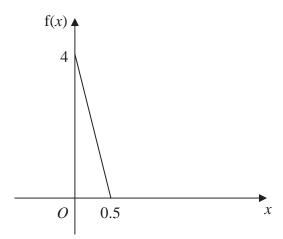


Figure 1

(a) Show that f(x) = 4 - 8x for  $0 \le x \le 0.5$  and specify f(x) for all real values of x.

**(4)** 

(b) Find the cumulative distribution function F(x).

**(4)** 

(c) Find the median of X.

**(3)** 

(d) Write down the mode of X.

**(1)** 

(e) State, with a reason, the skewness of X.

**(1)** 





Question 5 continued	blaı



Cars a	arrive at a motorway toll booth at an average rate of 150 per hour.	
	Suggest a suitable distribution to model the number of cars arriving at the toll booth, I, per minute.	
	(2)	
(b) S	state clearly any assumptions you have made by suggesting this model. (2)	
Using	g your model,	
(c) fi	ind the probability that in any given minute	
(i	i) no cars arrive,	
(i	ii) more than 3 cars arrive. (3)	
(d) I <sub>1</sub>	n any given 4 minute period, find $m$ such that $P(X > m) = 0.0487$	
(u) 11	if any given 4 influte period, find $m$ such that $\Gamma(X > m) = 0.0407$ (3)	
	Using a suitable approximation find the probability that fewer than 15 cars arrive in my given 10 minute period.	
u	(6)	



	b]
Question 6 continued	



Leave blank

7. The queuing time in minutes, X, of a customer at a post office is modelled by the probability density function

$$f(x) = \begin{cases} kx(81 - x^2) & 0 \le x \le 9 \\ 0 & \text{otherwise} \end{cases}$$

(a) Show that  $k = \frac{4}{6561}$ .

(3)

Using integration, find

(b) the mean queuing time of a customer,

**(4)** 

(c) the probability that a customer will queue for more than 5 minutes.

**(3)** 

Three independent customers shop at the post office.

(d) Find the probability that at least 2 of the customers queue for more than 5 minutes.

(3)



Question 7 continued	

