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

# 6684/01

# **Edexcel GCE**

### **Statistics S2**

## Advanced/Advanced Subsidiary

Wednesday 9 June 2010 - Afternoon

Time: 1 hour 30 minutes

Materials required for	examination
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Mathematical Formulae (Pink)

Items included with question papers

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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Examiner's use only

Team Leader's use only

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		Leave
1.	Explain what you understand by	Diam
	(a) a population,	
	(1)	
	(b) a statistic.	
	(1)	
	A researcher took a sample of 100 voters from a certain town and asked them who they would vote for in an election. The proportion who said they would vote for Dr Smith was 35%.	
	(c) State the population and the statistic in this case.	
	(2)	
	(d) Explain what you understand by the sampling distribution of this statistic.  (1)	

Question 1 continued	L
Question 1 continued	
	Q:

2.	Bhim and Joe play each other at badminton and for each game, independently of all other the probability that Bhim loses is 0.2	ers,
	Find the probability that, in 9 games, Bhim loses	
	(a) exactly 3 of the games,	(3)
	(b) fewer than half of the games.	(2)
	Bhim attends coaching sessions for 2 months. After completing the coaching, probability that he loses each game, independently of all others, is 0.05	the
	Bhim and Joe agree to play a further 60 games.	
	(c) Calculate the mean and variance for the number of these 60 games that Bhim lose	es. (2)
	(d) Using a suitable approximation calculate the probability that Bhim loses more that games.	
		(3)

Question 2 continued	Leave blank
	Q2
(Total 10 marks)	

Find the probability that the length of the longer side of long.	the rectangle is more than 6 cm
	(5)

Question 3 continued	
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**4.** The lifetime, X, in tens of hours, of a battery has a cumulative distribution function F(x) given by

$$F(x) = \begin{cases} 0 & x < 1 \\ \frac{4}{9}(x^2 + 2x - 3) & 1 \le x \le 1.5 \\ 1 & x > 1.5 \end{cases}$$

(a) Find the median of X, giving your answer to 3 significant figures.

(3)

(b) Find, in full, the probability density function of the random variable X.

(3)

(c) Find  $P(X \ge 1.2)$ 

**(2)** 

A camping lantern runs on 4 batteries, all of which must be working. Four new batteries are put into the lantern.

(d) Find the probability that the lantern will still be working after 12 hours.

**(2)** 

	Leave blank
Question 4 continued	Diank

Question 4 continued	

Question 4 continued	Leave blank
	Q4
(Total 10 marks)	



Question 5 continued	Leave blank

Question 5 continued	b

Question 5 continued	Le bi

6.	A company claims that a quarter of the bolts sent to them are faulty. To test this claim the number of faulty bolts in a random sample of 50 is recorded.
	(a) Give two reasons why a binomial distribution may be a suitable model for the number of faulty bolts in the sample.
	(2)
	(b) Using a 5% significance level, find the critical region for a two-tailed test of the hypothesis that the probability of a bolt being faulty is $\frac{1}{4}$ . The probability of rejection in either tail should be as close as possible to 0.025
	(3)
	(c) Find the actual significance level of this test. (2)
	In the sample of 50 the actual number of faulty bolts was 8.
	(d) Comment on the company's claim in the light of this value. Justify your answer. (2)
	The machine making the bolts was reset and another sample of 50 bolts was taken. Only 5 were found to be faulty.
	(e) Test at the 1% level of significance whether or not the probability of a faulty bolt has decreased. State your hypotheses clearly.
	(6)

Question 6 continued	Leave blank

Question 6 continued	b

	Leave blank
Question 6 continued	
	Qe
(Total 15 marks)	

7. The random variable Y has probability density function f(y) given by

 $f(y) = \begin{cases} ky(a-y) & 0 \le y \le 3\\ 0 & \text{otherwise} \end{cases}$ 

where k and a are positive constants.

- (a) (i) Explain why  $a \ge 3$ 
  - (ii) Show that  $k = \frac{2}{9(a-2)}$

**(6)** 

Given that E(Y) = 1.75

(b) show that a = 4 and write down the value of k.

**(6)** 

For these values of a and k,

(c) sketch the probability density function,

**(2)** 

(d) write down the mode of Y.

(1)

Question 7 continued	Leave blank

Question 7 continued	Leave blank

Question 7 continued		Leave blank
		Q7
	(Total 15 marks)	
TOTA	AL FOR PAPER: 75 MARKS	
END		