

**Edexcel GCE**  
**Statistics S2**  
**Gold Level G4**  
**(Question Paper)**

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Paper Reference(s)

**6684/01**

**Edexcel GCE**

**Statistics S2**

**Gold Level G4**

**Time: 1 hour 30 minutes**

**Materials required for examination papers**

Mathematical Formulae (Green)

**Items included with question**

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 formulas stored in them.

### **Instructions to Candidates**

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Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Statistics S2), the paper reference (6684), your surname, initials and signature.

### **Information for Candidates**

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A booklet 'Mathematical Formulae and Statistical Tables' is provided.

Full marks may be obtained for answers to ALL questions.

There are 8 questions in this question paper. The total mark for this paper is 75.

### **Advice to Candidates**

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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.

### **Suggested grade boundaries for this paper:**

<b>A*</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
<b>60</b>	<b>49</b>	<b>36</b>	<b>28</b>	<b>20</b>	<b>13</b>

1. Explain what you understand by
- (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)
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2. A bag contains a large number of 1p, 2p and 5p coins.

50% are 1p coins

20% are 2p coins

30% are 5p coins

A random sample of 3 coins is chosen from the bag.

- (a) List all the possible samples of size 3 with median 5p. (2)
- (b) Find the probability that the median value of the sample is 5p. (4)
- (c) Find the sampling distribution of the median of samples of size 3. (5)
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3. A rectangle has a perimeter of 20 cm. The length,  $X$  cm, of one side of this rectangle is uniformly distributed between 1 cm and 7 cm.

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

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4. A bag contains a large number of coins:

75% are 10p coins,

25% are 5p coins.

A random sample of 3 coins is drawn from the bag.

Find the sampling distribution for the median of the values of the 3 selected coins. (7)

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5. The continuous random variable  $T$  is used to model the number of days,  $t$ , a mosquito survives after hatching.

The probability that the mosquito survives for more than  $t$  days is

$$\frac{225}{(t+15)^2}, \quad t \geq 0.$$

- (a) Show that the cumulative distribution function of  $T$  is given by

$$F(t) = \begin{cases} 1 - \frac{225}{(t+15)^2}, & t \geq 0, \\ 0, & \text{otherwise.} \end{cases}$$

(1)

- (b) Find the probability that a randomly selected mosquito will die within 3 days of hatching. (2)

- (c) Given that a mosquito survives for 3 days, find the probability that it will survive for at least 5 more days. (3)

A large number of mosquitoes hatch on the same day.

- (d) Find the number of days after which only 10% of these mosquitoes are expected to survive. (4)

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6. Frugal bakery claims that their packs of 10 muffins contain on average 80 raisins per pack. A Poisson distribution is used to describe the number of raisins per muffin.

A muffin is selected at random to test whether or not the mean number of raisins per muffin has changed.

- (a) Find the critical region for a two-tailed test using a 10% level of significance. The probability of rejection in each tail should be less than 0.05. (4)

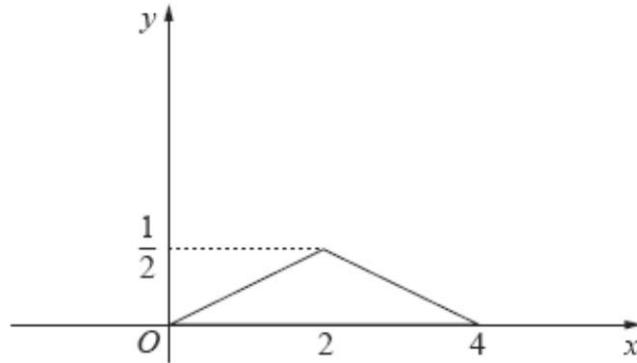
- (b) Find the actual significance level of this test. (2)

The bakery has a special promotion claiming that their muffins now contain even more raisins.

A random sample of 10 muffins is selected and is found to contain a total of 95 raisins.

- (c) Use a suitable approximation to test the bakery's claim. You should state your hypotheses clearly and use a 5% level of significance. (8)

7.



**Figure 1**

Figure 1 shows a sketch of the probability density function  $f(x)$  of the random variable  $X$ . The part of the sketch from  $x = 0$  to  $x = 4$  consists of an isosceles triangle with maximum at  $(2, 0.5)$ .

(a) Write down  $E(X)$ . (1)

The probability density function  $f(x)$  can be written in the following form.

$$f(x) = \begin{cases} ax & 0 \leq x < 2 \\ b - ax & 2 \leq x \leq 4 \\ 0 & \text{otherwise} \end{cases}$$

(b) Find the values of the constants  $a$  and  $b$ . (2)

(c) Show that  $\sigma$ , the standard deviation of  $X$ , is 0.816 to 3 decimal places. (7)

(d) Find the lower quartile of  $X$ . (3)

(e) State, giving a reason, whether  $P(2 - \sigma < X < 2 + \sigma)$  is more or less than 0.5 (2)

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8. In a large restaurant an average of 3 out of every 5 customers ask for water with their meal.

A random sample of 10 customers is selected.

(a) Find the probability that

(i) exactly 6 ask for water with their meal,

(ii) less than 9 ask for water with their meal.

(5)

A second random sample of 50 customers is selected.

(b) Find the smallest value of  $n$  such that

$$P(X < n) \geq 0.9,$$

where the random variable  $X$  represents the number of these customers who ask for water.

(3)

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**TOTAL FOR PAPER: 75 MARKS**

**END**