

**Solomon Press**  
**Statistics S1**  
**Paper H**  
**(Question paper)**

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# GCE Examinations

## Statistics

### Module S1

Advanced Subsidiary / Advanced Level

Paper H

Time: 1 hour 30 minutes

#### *Instructions and Information*

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Candidates may use any calculator except those with a facility for symbolic algebra and/or calculus.

Full marks may be obtained for answers to ALL questions.

Mathematical and statistical formulae and tables are available.

This paper has 7 questions.

#### *Advice to Candidates*

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You must show sufficient working to make your methods clear to an examiner. Answers without working will gain no credit.



*Written by Shaun Armstrong & Chris Huffer*

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1. The discrete random variable  $X$  has the following probability distribution.

$x$	$k$	$k + 4$	$2k$
$P(X = x)$	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{1}{2}$

- (a) Find and simplify an expression in terms of  $k$  for  $E(X)$ . **(3 marks)**

Given that  $E(X) = 9$ ,

- (b) find the value of  $k$ . **(2 marks)**
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2. (a) Explain briefly what is meant by a statistical model. **(2 marks)**

- (b) State, with a reason, whether or not the normal distribution might be suitable for modelling each of the following:

(i) The number of children in a family;

(ii) The time taken for a particular employee to cycle to work each day using the same route;

(iii) The quarterly electricity bills for a particular house. **(6 marks)**

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3. The probability that Ajita gets up before 6.30 am in the morning is 0.7  
The probability that she goes for a run in the morning is 0.35  
The probability that Ajita gets up after 6.30 am and does not go for a run is 0.22

Let  $A$  represent the event that Ajita gets up before 6.30 am and  $B$  represent the event that she goes for a run in the morning.

Find

- (a)  $P(A \cup B)$ , **(2 marks)**

- (b)  $P(A \cap B')$ , **(2 marks)**

- (c)  $P(B | A)$ . **(3 marks)**

- (d) State, with a reason, whether or not events  $A$  and  $B$  are independent. **(2 marks)**
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4. A company produces jars of English Honey. The weight of the glass jars used is normally distributed with a mean of 122.3 g and a standard deviation of 2.6 g.

Calculate the probability that a randomly chosen jar will weigh

(a) less than 127 g, **(3 marks)**

(b) less than 121.5 g. **(3 marks)**

The weight of honey put into each jar by a machine is normally distributed with a standard deviation of 1.6 g. The machine operator can adjust the mean weight of the honey put into each jar without changing the standard deviation.

(c) Find, correct to 4 significant figures, the minimum that the mean weight can be set to such that at most 1 in 20 of the jars will contain less than 454 g.

**(4 marks)**

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5. The letters of the word DISTRIBUTION are written on separate cards. The cards are then shuffled and the top three are turned over.

Let the random variable  $V$  be the number of vowels that are turned over.

(a) Show that  $P(V = 1) = \frac{21}{44}$ . **(3 marks)**

(b) Find the probability distribution of  $V$ . **(4 marks)**

(c) Find  $E(V)$  and  $\text{Var}(V)$ . **(6 marks)**

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*Turn over*

6. A cinema recorded the number of people at each showing of each film during a one-week period. The results are summarised in the table below.

Number of people	Number of showings
1 - 40	36
41 - 60	20
61 - 80	33
81 - 100	24
101 - 150	36
151 - 200	39
201 - 300	52

- (a) Draw a histogram on graph paper to illustrate these data. **(4 marks)**
- (b) Calculate estimates of the median and quartiles of these data. **(6 marks)**
- (c) Use your answers to part (b) to show that the data is positively skewed. **(3 marks)**
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7. A new vaccine is tested over a six-month period in one health authority.

The table shows the number of new cases of the disease,  $d$ , reported in the  $m$ th month after the trials began.

$m$	1	2	3	4	5	6
$d$	102	69	61	58	52	48

A doctor suggests that a relationship of the form  $d = a + bx$  where  $x = \frac{1}{m}$  can be used to model the situation.

- (a) Tabulate the values of  $x$  corresponding to the given values of  $d$  and plot a scatter diagram of  $d$  against  $x$ . **(5 marks)**
- (b) Explain how your scatter diagram supports the suggested model. **(1 mark)**

You may use

$$\Sigma x = 2.45, \quad \Sigma d = 390, \quad \Sigma x^2 = 1.491, \quad \Sigma xd = 189.733$$

- (c) Find an equation of the regression line  $d$  on  $x$  in the form  $d = a + bx$ . **(7 marks)**
- (d) Use your regression line to estimate how many new cases of the disease there will be in the 13th month after the trial began. **(3 marks)**
- (e) Comment on the reliability of your answer to part (d). **(1 mark)**

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**END**