



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2010

Mathematics

Assessment Unit S1

assessing

Module S1: Statistics 1

[AMS11]



FRIDAY 4 JUNE, MORNING

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number on the Answer Booklet provided.

Answer **all seven** questions.

Show clearly the full development of your answers.

Answers should be given to three significant figures unless otherwise stated.

You are permitted to use a graphic or scientific calculator in this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

A copy of the **Mathematical Formulae and Tables booklet** is provided.

Throughout the paper the logarithmic notation used is $\ln z$ where it is noted that

$\ln z \equiv \log_e z$.

Answer all seven questions.

Show clearly the full development of your answers.

Answers should be given to three significant figures unless otherwise stated.

- 1** A cinema manager recorded the number of people attending each showing at her cinema complex over a period of time. The results are given in **Table 1** below.

Table 1

Number of people	0–	50–	100–	150–	200–	250–300
Frequency	16	38	61	52	33	0

Find the mean and standard deviation of these data. [5]

- 2** (i) In a Binomial distribution, the trials need to be independent. Explain what this means. [1]
(ii) State the other conditions essential for a Binomial distribution. [2]

A survey in a town revealed that 35% of adults carry an organ donor card. Six adults chosen at random were asked if they carried an organ donor card. Find the probability that:

- (iii) exactly three carried an organ donor card; [2]
(iv) at least half of those questioned carried an organ donor card. [5]

- 3** Misprints in a newspaper occur at a constant average rate of 2.6 per page. A page is chosen at random. Find the probability that it contains:

- (i) exactly two misprints; [3]
(ii) at least three misprints. [4]
(iii) If there are at least three misprints, find the probability that there are exactly five. [4]

- 4 A game is played using two fair tetrahedral dice.
 One carries the values 1, 3, 5 and 7
 The other carries the values 2, 4, 6 and 8
 The player's score is the sum of the values on the two dice.

Fig. 1 below shows the possible outcomes

	1	3	5	7
2	3	5	7	9
4	5	7	9	11
6	7	9	11	13
8	9	11	13	15

Fig. 1

- (i) Construct a table for the probability distribution of X , the random variable “the sum of the values on the two dice”. [4]

The value of $E(X)$ is 9

- (ii) Using your table, explain how this can be observed. [2]
- (iii) Calculate the value of $\text{Var}(X)$. [4]

- 5 A continuous random variable X has the probability density function $f(x)$ defined by

$$f(x) = k(x - x^3) \quad 0 \leq x \leq 1$$

- (i) Show that $k = 4$ [4]
- (ii) Find $P\left(0 \leq X \leq \frac{1}{2}\right)$. [3]

The mean of this distribution is $\frac{8}{15}$

- (iii) Find $\text{Var}(X)$. [5]

- 6 A machine produces metal washers for use in flat pack furniture.
The internal diameter of the washers is Normally distributed with mean 4000 microns.
It is known that 24.2% of washers have internal diameter of at least 4035 microns.
- (i) Show that the standard deviation of the internal diameter of the washers is 50 microns. [5]
- Washers with internal diameter greater than 4110 microns or less than 3888 microns are considered unusable.
- (ii) Find the percentage of washers that are unusable. [8]
- 7 (a) Explain the meaning of the following terms.
Illustrate your answer with a probability statement for two events A and B.
- (i) Mutually exclusive. [2]
- (ii) Exhaustive. [2]
- (b) The results of a survey in a town reveal that 35% of residents play football and that 40% of residents play golf.
Furthermore, 61% of residents play football or play golf (or both).
Determine if the events “play football” and “play golf” are independent. [4]
- (c) As part of a scheme to develop computer competency at a college, all first year students must choose two short courses on various aspects of ICT.
Two of the possible options are Databases and Web Design.
Three quarters of students studying Databases also study Web Design.
The probability that a student studies Databases or Web Design (or both) is 0.36
The probability that a student studies Databases is x .
- (i) Find an expression, in terms of x , for the probability that a student studies Web Design. [4]
- (ii) Given that the ratio of Web Design students to Databases students is 5:4, find x . [2]