Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2009

Mathematics

Assessment Unit S1

assessing

Module S1: Statistics 1

[AMS11]

AMS11

MONDAY 19 JANUARY, AFTERNOON

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 The probability distribution of a random variable X is shown in **Table 1** below.

Table 1

x	1	2	3	4	5	6
$P(X = x)$	0.12	0.21	0.2	0.16	0.14	k

(i) Find the value of k. [2]

(ii) Find $P(2 < X \leqslant 5)$. [2]

(iii) Find $E(X)$ and $Var(X)$ [6]

2 Hits on a website occur independently at a constant average rate of 2.6 per minute.
Find the probability that:

(i) there are exactly 4 hits in a **one-minute** period [3]

(ii) there are exactly 4 hits in a **two-minute** period [3]

(iii) there are at least 2 hits in a **one-minute** period. [4]

3 Brenda is given a multiple choice chemistry test on a part of the course that she has not prepared so she relies totally on guesswork!
Each question has 5 answers from which to choose the correct one.
There are 10 questions.

(i) Find the probability that she guesses exactly 4 of the answers correctly. [4]

(ii) Find the probability that she guesses at least 1 of the answers correctly. [3]

(iii) How many answers would Brenda be expected to guess correctly? Explain why. [2]

4 Anna is calculating the mean and standard deviation for a set of data for a random variable X. The data is summarised in **Table 2** below.

Table 2

x	10 –	20 –	30 –	40 – 50
Frequency	8	20	12	0

(i) For each of the following cases, write down the appropriate mid-values of the four intervals.

(a) X is the weight of a letter, in grams. [1]

(b) X is the number of misprints in a magazine. [2]

(c) X is the age, in complete years, of the audience at a cinema. [2]

The mean and standard deviation of X in case **(a)** are 26 grams and 7 grams respectively.

(ii) **Write down** (do not calculate) the mean and standard deviation for X in cases **(b)** and **(c)**. [3]

5 The time spent by customers at Cyber Zone internet cafe is Normally distributed with mean 72 minutes and standard deviation 15 minutes.
Find the probability that a customer chosen at random spends:

(i) less than one hour at Cyber Zone [5]

(ii) between one hour and one and a half hours at Cyber Zone. [5]

The charges for using Cyber Zone are as follows:

Up to one hour	Between one hour and one and a half hours	Longer than one and a half hours
£1.50	£2.50	£3.50

(iii) Find, to the nearest penny, the expected charge for using Cyber Zone. [5]

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

$$\begin{cases} \mathrm{f}(x) = \frac{3}{125}x^2 & 0 \leqslant x \leqslant 5 \\ = 0 & \text{otherwise} \end{cases}$$

(i) Find P($2 \leqslant X \leqslant 3$) [3]

(ii) Show that $\mathrm{E}(X) = 3\frac{3}{4}$ [3]

(iii) Find Var(X) [5]

7 Louis is not very confident about passing his driving test.
The probability that he passes first time is p, where $p < 0.5$
Louis will continue to retake his test until he passes.
The probability of passing increases by a factor of 10% each time he retakes the test.

(i) Find an expression, in terms of p, for the probability that Louis passes his driving test at the second attempt. [3]

The probability that he passes at the second attempt is 0.176

(ii) Find the value of p. [3]

(iii) Find the probability that Louis passes his test on the third attempt. [6]