Rewarding Learning

## ADVANCED SUBSIDIARY (AS) <br> General Certificate of Education <br> January 2009

## Mathematics

## Assessment Unit S1 <br> assessing <br> Module S1: Statistics 1

[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
$\ln z \equiv \log _{\mathrm{e}} z$

## 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 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{P}(X=x)$ | 0.12 | 0.21 | 0.2 | 0.16 | 0.14 | $k$ |

(i) Find the value of $k$.
(ii) Find $\mathrm{P}(2<X \leqslant 5)$.
(iii) Find $\mathrm{E}(X)$ and $\operatorname{Var}(X)$

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
(ii) there are exactly 4 hits in a two-minute period
(iii) there are at least 2 hits in a one-minute period.

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.
(ii) Find the probability that she guesses at least 1 of the answers correctly.
(iii) How many answers would Brenda be expected to guess correctly? Explain why.

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.
(b) $X$ is the number of misprints in a magazine.
(c) $X$ is the age, in complete years, of the audience at a cinema.

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).

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

The charges for using Cyber Zone are as follows:

| Up to one hour | Between one hour and <br> one and a half hours | Longer than one <br> and a half hours |
| :---: | :---: | :---: |
| $£ 1.50$ | $£ 2.50$ | $£ 3.50$ |

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

6 A continuous random variable $X$ has the probability density function $\mathrm{f}(x)$ defined by

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

(i) Find $\mathrm{P}(2 \leqslant X \leqslant 3)$
(ii) Show that $\mathrm{E}(X)=3 \frac{3}{4}$
(iii) Find $\operatorname{Var}(X)$

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.

The probability that he passes at the second attempt is 0.176
(ii) Find the value of $p$.
(iii) Find the probability that Louis passes his test on the third attempt.

