Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2009

Mathematics

Assessment Unit S1

assessing

Module S1: Statistics 1

[AMS11]

MONDAY 1 JUNE, MORNING

AMS11

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 Peter is working on his biology coursework. The data for the heights of his sample of plant shoots are given in **Table 1** below.

Table 1

Height (cm)	0–	10–	20–	30–	40–50
Frequency	6	17	34	13	5

Calculate the mean and standard deviation of Peter's data. [5]

2 In a certain town 14% of the population is left-handed.
Eight customers in a supermarket are chosen at random and asked if they are left-handed.

(i) Give **two** reasons why the binomial distribution would be suited to model this situation. [2]

Find the probability:

(ii) that exactly one customer is left-handed; [2]

(iii) that at least three customers are left-handed. [4]

3 The probability distribution of the random variable X is shown in **Table 2** below.

Table 2

x	5	6	7	8	9	10	11	12
$P(X = x)$	k	k	k	k	k	k	k	k

(i) Find k [2]

(ii) Explain why $E(X) = 8.5$ [1]

(iii) Find $Var(X)$ [4]

The random variable Y is related to X by $Y = 2X - 5$

(iv) Find $E(Y)$ and $Var(Y)$ [3]

4 Footballer Paul is paid bonuses depending on the number of goals he scores.
Last season Paul scored 21 goals in 35 games.

Using a Poisson distribution, find the probability that:

(i) he scores during a match; [4]

(ii) he scores either one or two goals during a match. [3]

Paul is paid a £1000 bonus if he scores either one or two goals during a match and a £5000 bonus if he scores three or more goals during a match.

(iii) Find Paul's expected bonus per match. [5]

5 The masses of year 14 students at a large school are Normally distributed with mean μ kg and standard deviation 12 kg.
Five per cent of students weigh more than 111.74 kg.

(i) Show that $\mu = 92$ [4]

Find the probability that a student chosen at random:

(ii) weighs less than 89 kg; [4]

(iii) weighs between 89 kg and 98 kg. [4]

Eighty per cent of students weigh less than W kg.

(iv) Find W [4]

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

$$f(x) = \begin{cases} kx & 0 \leqslant x \leqslant 2 \\ 2 - 2kx & 2 < x \leqslant 3 \\ 0 & \text{otherwise} \end{cases}$$

Fig. 1 below shows the graph of the function f(x)

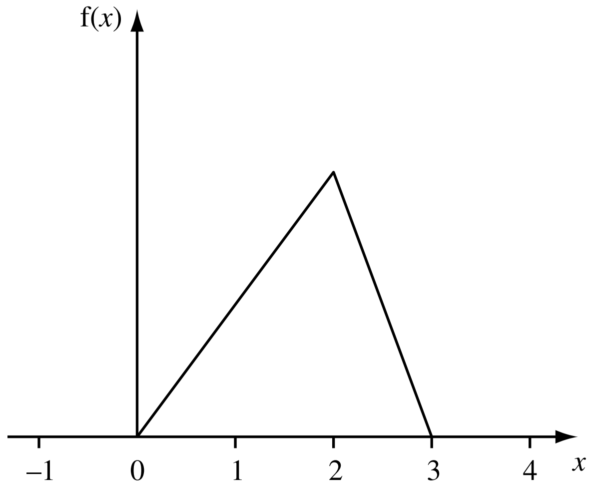

Fig. 1

(i) Write down f(2) in terms of k [1]

(ii) Hence or otherwise show that $k = \dfrac{1}{3}$ [3]

(iii) Using **Fig. 1**, or otherwise, find $P(1 \leqslant X \leqslant 3)$ [3]

(iv) Using **Fig. 1**, or otherwise, find the median of X [5]

7 In a large school 8.2% of students study both Chemistry and French.
One fifth of French students study Chemistry and one quarter of Chemistry students study French.

Find the probability that a student chosen at random:

(i) studies French; [2]

(ii) studies Chemistry; [2]

(iii) studies neither French nor Chemistry. [3]

A student does not study Chemistry.

(iv) Find the probability that the student studies French. [5]

THIS IS THE END OF THE QUESTION PAPER