Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2012

Mathematics

Assessment Unit S1

assessing

Module S1: Statistics 1

[AMS11]

AMS11

WEDNESDAY 6 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 All members of a youth club filled in a questionnaire which included a question about the amount of time spent watching television the previous week.

The results are given in **Table 1** below.

Table 1

Time (nearest hour)	2–4	5–9	10–14	15–20
Frequency	16	38	42	9

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

2 Telephone calls at a software help centre arrive randomly at an average rate of 1 every 2 minutes.

Find the probability that in a one-minute period:

(i) no calls arrive; [3]

(ii) fewer than three calls arrive; [3]

(iii) one call arrives given that fewer than three calls arrive. [3]

Find the probability that, in a five-minute period:

(iv) two or more calls arrive. [5]

3 A discrete random variable X has probability distribution

X	0	1	2	3
$P(X = x)$	0.25	a	b	0.35

where a and b are constants.

Given that $E(X) = 1.7$, find:

(i) a and b; [5]

(ii) $\text{Var}(X)$. [4]

Given that $Y = 3 + 2X$, find:

(iii) $E(Y)$ and $\text{Var}(Y)$. [3]

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

$$f(x) = \frac{x^2}{9} \qquad 0 \leq x \leq t$$

(i) Show that $t = 3$ [4]

(ii) Given that $P(X \leq a) = 0.25$, find a. [3]

(iii) Similarly, given that $P(X \leq b) = 0.75$, find b. [2]

(iv) Find the interquartile range of X. [2]

5 The heights of fir trees in a forest are Normally distributed with mean 3.2 m and standard deviation 0.8 m.
A garden centre sells these trees classified into three types according to their height.
The height classification and profit made on each type is shown in **Table 2** below.

Table 2

Tree Type	A	B	C
Tree Height	Less than 3 m	Between 3 m and 4 m	4 m and above
Profit	£8	£12	£15

Find the probability that a fir tree chosen at random is of:

(i) Type A; [4]

(ii) Type B. [4]

(iii) Find the expected profit made per tree. [4]

6 **(a)** Members of a sports club were asked about which flavours of fizzy drink they liked.
52% liked cola.
42% liked lemon.
20% did not like either cola or lemon.

Find the probability that a member chosen at random likes cola given that they also like lemon. [5]

(b) A and B are two events where $P(A) = p$, $P(B) = 0.5$ and $P(A \cup B) = 0.8$

(i) If A and B are mutually exclusive events, find the value of p. [3]

(ii) If A and B are independent events, find the value of p. [3]

7 In the autumn Gail plants 10 snowdrop bulbs.
The probability of a bulb flowering in the spring is p.
If X is the random variable "the number of bulbs flowering in the spring", find an expression, in terms of p, for:

(i) $P(X = 1)$; [2]

(ii) $P(X = 2)$. [2]

It is known that $P(X = 1) = P(X = 2)$:

(iii) find p; [2]

(iv) hence find the probability that at most 3 bulbs flower in the spring. [4]

THIS IS THE END OF THE QUESTION PAPER