Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2016

Mathematics

Assessment Unit S1
assessing
Module S1: Statistics 1

AMS11

[AMS11]
THURSDAY 9 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.

Normal distribution values should be read from the tables provided.

1 Births in a regional maternity unit occur randomly at an average rate of 2.1 per hour. Midwife Cathy has just arrived on duty.

(i) Find the probability that there are exactly 3 births during the first hour of her duty. [3]

Cathy goes for a break after 3 hours.

(ii) Find the probability that there were at least 5 births before she goes for her break. [5]

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

$$f(x) = k(6x - x^2) \qquad 0 \leqslant x \leqslant 6$$

(i) Show that $k = \frac{1}{36}$ [4]

(ii) Find $P(1 < X < 4)$. [4]

(iii) Given that $E(X) = 3$, find $\text{Var}(X)$. [5]

3 When a biased die is thrown the probability of a score of 3 occurring is $\frac{13}{40}$
This die is thrown 8 times and the scores recorded.

Find the probability that:

(i) a score of 3 occurs exactly four times; [3]

(ii) a score of 3 occurs at most two times. [5]

(iii) Find the expected value and variance of the number of times that a score of 3 occurs. [3]

4 The times, in minutes, to manufacture a shirt are normally distributed with standard deviation 4 minutes.
It is known that 10.56% of shirts take longer than 124 minutes to manufacture.

(i) Find the mean time to manufacture a shirt. [5]

(ii) Find the percentage of shirts taking between 117 and 126 minutes to manufacture. [5]

(iii) Given that a shirt takes less than 2 hours to manufacture, find the probability that the time taken was greater than 117 minutes. [5]

5 Each day a medical practice records the number of times patients missed their appointments.
When planning for the next financial year, the practice manager selected the information for the month of March for one G.P.
The results are given in **Table 1** below.

Table 1

Number of missed appointments per day	0	1	2	3	4
Number of days	1	8	6	4	2

(i) Find the mean and standard deviation of the number of missed appointments per day. [4]

The local health board published figures which stated that the mean number of missed appointments per G.P. in the area was 2.4 per day with a standard deviation of 0.65 per day.

(ii) Suggest two factors which may have contributed to the differences between the results of the medical practice and those of the health board. [2]

6 **(a)** Exhaustive events A and B are such that

$$P(B) = 0.72 \text{ and } P(B|A) = 0.3$$

Find $P(A)$. [4]

(b) Children attending a summer scheme choose one or more activities.
These activities include football and tennis amongst others.

The probability that a child chooses football but not tennis is $\frac{2}{5}$

The probability that a child chooses tennis but not football is $\frac{2}{15}$

The events "chooses football" and "chooses tennis" are independent.

The probability that a child chooses both tennis and football is x.

Find x. [6]

7 A bag contains 6 sweets in identical wrappers.
Two of the sweets have hard centres and the remainder have soft centres.
Tom is eating the sweets one at a time in the hope of getting one with a hard centre.

Let X be the random variable: "the number of sweets eaten up to and including the first hard-centred sweet".

Find:

(i) $P(X = 2)$, [2]

(ii) $E(X)$, [6]

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

THIS IS THE END OF THE QUESTION PAPER