



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2013

Mathematics

Assessment Unit S1

assessing

Module S1: Statistics 1

[AMS11]



TUESDAY 22 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** **Table 1** below shows the time, recorded to the nearest hour, spent watching TV in a particular week by a random sample of 60 students.

Table 1

Time (nearest hour)	1–10	11–20	21–25	26–30	31–35	36–49
Frequency	7	15	16	12	6	4

- (i)** Find an estimate of the mean time spent watching TV by this sample of students. [3]

A histogram was drawn to illustrate this data.

In this histogram the 31–35 group was represented by a bar of width 1 cm and height 3 cm.

- (ii)** Find the width and height of the 11–20 group. [4]

- 2** A factory makes porcelain picture frames.
It is known that 20% of the picture frames are faulty.
A random sample of 8 picture frames is taken and examined for faults.
The number of faulty picture frames in the sample is denoted by X .

Find the probability that:

- (i)** none of the picture frames inspected are faulty; [3]

- (ii)** at most one quarter of those inspected is faulty. [4]

- (iii)** Calculate the mean and standard deviation of the number of faulty picture frames in this sample. [2]

- 3 A media company uses drums of cable when installing broadband in houses. Each drum carries 100 m of cable. An installer noticed that flaws occur at random in the cable at a constant average rate of 2 per 100 m of cable.

Find the probability that a drum will have:

(i) 1 flaw; [3]

(ii) at least 3 flaws. [4]

The installer uses 5 such drums in one week.

(iii) Find the probability that 2 of these drums have at least 3 flaws. [4]

The installer uses bigger drums of the same cable when installing broadband in flats. Each drum carries 400 m of cable.

(iv) Find the probability that the cable in this drum has exactly 5 flaws. [2]

- 4 The discrete random variable X has the probability distribution given in **Table 2** below.

Table 2

x	1	2	3	4
$P(X = x)$	$3a$	a	b	b

Also, $P(X < 4) = 3P(X = 4)$

(i) Write down two equations involving a and b . [3]

(ii) Hence find a and b . [2]

(iii) Show that the expectation of X is 2.375 [3]

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

5 The continuous random variable X has probability density function $f(x)$ where:

$$f(x) = \begin{cases} k(16 - 2x) & 4 \leq x \leq 8 \\ 0 & \text{otherwise} \end{cases}$$

where k is a constant.

(i) Show that $k = \frac{1}{16}$ [4]

(ii) Sketch the probability density function. [2]

Find:

(iii) $E(X)$; [3]

(iv) $\text{Var}(X)$. [5]

6 A leisure centre offers two types of exercise class, Yoga and Zumba.

Y is the event that a person selected at random takes part in the Yoga class.

Z is the event that a person selected at random takes part in the Zumba class.

The events Y and Z are independent.

Also $P(Z) = \frac{2}{5}$ and $P(Y) = P(\bar{Y} \cap \bar{Z})$

By setting $y = P(Y)$ and forming an equation in y , or otherwise, find:

(i) $P(Y)$; [5]

(ii) $P(\bar{Y} \cap Z)$; [2]

(iii) Write down $P(Y|Z)$. [1]

- 7 The Stationery Co. has a machine which produces individual pencil sharpeners. The weight of each pencil sharpener produced is Normally distributed with mean μ and standard deviation σ . 7.35% of the pencil sharpeners produced weigh more than 33 g and 4.55% weigh less than 27 g.

(i) Find μ and σ . [10]

A rival company, Printing Inc., also has a machine which produces similar pencil sharpeners. The pencil sharpeners produced by this machine are Normally distributed with mean 30 g and standard deviation 4 g.

(ii) Briefly comment on the production capabilities of the machines producing these two types of pencil sharpener. [2]

THIS IS THE END OF THE QUESTION PAPER

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA
will be happy to rectify any omissions of acknowledgement in future if notified.