



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2014

Mathematics

Assessment Unit S1

assessing

Module S1: Statistics 1

[AMS11]



WEDNESDAY 29 JANUARY, 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** The same 55 students take end of term examinations in Mathematics and Science.
Table 1 below shows a summary of the marks obtained in the Mathematics examination.

Table 1

| Marks | 1–10 | 11–20 | 21–30 | 31–40 | 41–50 |
|-----------|------|-------|-------|-------|-------|
| Frequency | 1 | 15 | 25 | 12 | 2 |

- (i)** Find the mean and standard deviation of these marks. [5]

The Mathematics examination was marked out of 50

These marks need to be doubled so that they can be reported as marks out of 100

- (ii)** Find the mean and standard deviation of these adjusted marks. [2]

The science marks are given as marks out of 100

The mean and standard deviation of the Science marks are 47.2 and 11.2 respectively.

- (iii)** State 2 differences in the performances of the students in the two examinations. [2]

- 2** An insurance company is known to receive an average of 2 major claims per day.

- (i)** State one assumption that would have to be made if a Poisson distribution is to be used to model the number of major claims received in a day. [1]

Assuming that the number of major claims does follow a Poisson distribution, find the probability that on a day the company receives:

- (ii)** no major claims; [2]

- (iii)** at least 2 major claims; [4]

- (iv)** more than 3 major claims, given that at least 2 major claims are received. [5]

3 A discrete random variable X has the probability distribution given in **Table 2** below.

Table 2

| | | | | | |
|------------|-----|-----|-----|-----|-----|
| x | 0 | 1 | 2 | b | 8 |
| $P(X = x)$ | 0.1 | 0.2 | 0.1 | a | 0.3 |

where a and b are positive constants.

(i) Find a . [2]

(ii) If $E(X) = 4.9$, find b . [3]

(iii) If instead $E(X^2) = 22.5$, find b . [3]

4 (i) State 2 of the conditions necessary for a random variable to be modelled by a binomial distribution. [2]

The probability that a boy chosen at random has a birthday on a Saturday this year is $\frac{1}{7}$

8 boys are chosen at random.

(ii) Find the probability that none of these boys has a birthday on a Saturday this year. [4]

(iii) Find the probability that at most 2 of these boys have a birthday on a Saturday this year. [4]

(iv) Find the mean and variance of the number of boys with a birthday on a Saturday this year. [2]

- 5 A machine produces metal disks.
The diameters of the disks are Normally distributed with mean 25 cm and standard deviation 0.2 cm.
A disk is rejected if its diameter is more than 25.5 cm or less than 24.7 cm.

(i) Find the percentage of the disks that are accepted. [7]

The machine setting is altered so that larger disks can be made.
The standard deviation does not change but the mean diameter does.

(ii) Find the new mean diameter if 4% of the disks produced are larger than 30 cm in diameter. [4]

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

$$f(x) = \begin{cases} x^2(2-x) & 0 \leq x \leq 1 \\ 1 & 1 \leq x \leq k \\ 0 & \text{otherwise} \end{cases}$$

where k is a constant.

(i) Find k . [6]

(ii) Find $E(X)$. [5]

7 A biased die, in the shape of a cube, has the numbers 1, 2, 3, 4, 5 and 6 respectively on its faces.

When the die is thrown:

the probability of getting 3 is equal to the probability of getting 1;

the probability of getting 6 is twice the probability of getting 1;

the probability of getting 5 is twice the probability of getting 6;

the probabilities of getting 2, 4, 6 are equal.

(i) When this die is thrown find the probability of getting 1 [3]

When a biased coin is tossed the probability of getting a head is $\frac{2}{3}$

A trial consists of tossing the coin and throwing the die.

(ii) Find the probability of getting:

(a) a head and a 6; [2]

(b) a tail and a prime number. [4]

(iii) Find the probability, in 4 trials, of getting a head together with a 6 only once. [3]

THIS IS THE END OF THE QUESTION PAPER

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