



Rewarding Learning

ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
2011

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## Mathematics

Assessment Unit S1

*assessing*

Module S1: Statistics 1

[AMS11]



WEDNESDAY 8 JUNE, MORNING

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### 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  $\ln z \equiv \log_e z$ .



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**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 owner of a post office wishes to investigate the masses of letters that are handled at the counter.  
He records the masses of a sample of letters.  
His results are shown in **Table 1** below.

**Table 1**

Mass (g)	10 –	20 –	40 –	60 –	80 – 120
Number of letters	44	47	24	7	3

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

A number of weeks later the owner repeated the experiment and found the mean and standard deviation differed slightly from his values in part **(i)**.

- (ii)** Briefly explain why this should not be unexpected. [1]

- 2** Clara works as a teller in a bank where she serves customers at a constant average rate of 0.6 per minute.

In a five minute period find the probability that she serves:

- (i)** exactly 3 customers; [4]

- (ii)** at least 2 customers. [4]

- 3** Dennis works at a telephone-sales centre where he has to telephone members of the public and encourage them to sign up for a broadband package.  
Overall he has a 28% success rate.  
During each session he makes 8 calls.

Find the probability that during a session Dennis has:

**(i)** exactly 1 successful call; [3]

**(ii)** fewer than 3 successful calls. [3]

The company operates a bonus scheme where operators who have 3 or more successful calls in a session are given a £50 bonus.

**(iii)** Find Dennis's expected bonus per session. [4]

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

$$f(x) = kx^3 \quad 0 \leq x \leq 2$$

**(i)** Show that  $k = \frac{1}{4}$  [3]

Find:

**(ii)**  $E(X)$ ; [3]

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

A second random variable  $Y$  is related to  $X$  by the formula  $Y = 11 - 5X$ .

**(iv)** Find  $E(Y)$  and  $\text{Var}(Y)$ . [3]

- 5 Margaret's young children were playing a game with six tins of soup from the cupboard and took off all the labels leaving the tins identical in appearance. She knows that just one of the tins contains the tomato soup she had planned to use at lunchtime.

Clearly the probability that the first tin she opens is the tomato soup is  $\frac{1}{6}$

- (i) Find the probability that she has to open 2 tins to find the tomato soup. [3]

Let  $X$  be the discrete random variable "the number of tins Margaret needs to open until the tomato soup is found".

- (ii) Copy and complete **Table 2** below.

**Table 2**

$x$	1	2	3	4	5	6
$P(X = x)$	$\frac{1}{6}$					

[3]

Find:

- (iii)  $E(X)$ ; [2]

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

- 6 The random variable  $X$  is such that  $X \sim N(\mu, \sigma^2)$ .  
Furthermore  $P(X < 58.84) = 0.7389$  and  $P(X > 46.84) = 0.9131$

Find  $\mu$  and  $\sigma$ . [10]

7 Consider the following Venn diagram showing two events  $A$  and  $B$ .

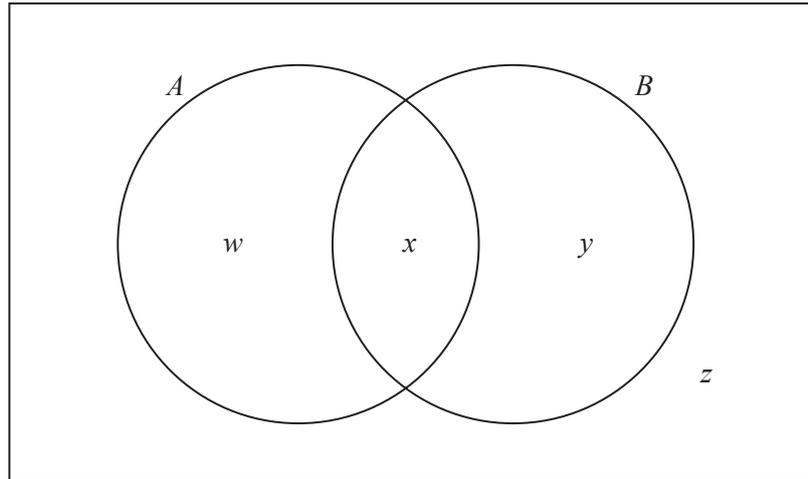


Fig. 1

In Fig. 1 above,  $w$ ,  $x$ ,  $y$  and  $z$  are probabilities where  $w + x + y + z = 1$

Write down the **events** whose probabilities are:

(i)  $x + y$  [1]

(ii)  $w + x + y$  [1]

(iii)  $w$  [1]

(iv)  $z$  [2]

(v)  $\frac{x}{w+x}$  [2]

(vi) If  $P(B | A) = \frac{1}{4}$ ,  $P(A | B) = \frac{1}{5}$  and  $P(B | \bar{A}) = \frac{1}{8}$ , show that  $P(A) = \frac{1}{9}$  [8]

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**THIS IS THE END OF THE QUESTION PAPER**

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