



Rewarding Learning

ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
2015

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# Mathematics

Assessment Unit S1

*assessing*

Module S1: Statistics 1



[AMS11]

WEDNESDAY 3 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  $\ln z \equiv \log_e z$

**Answer all seven questions.**

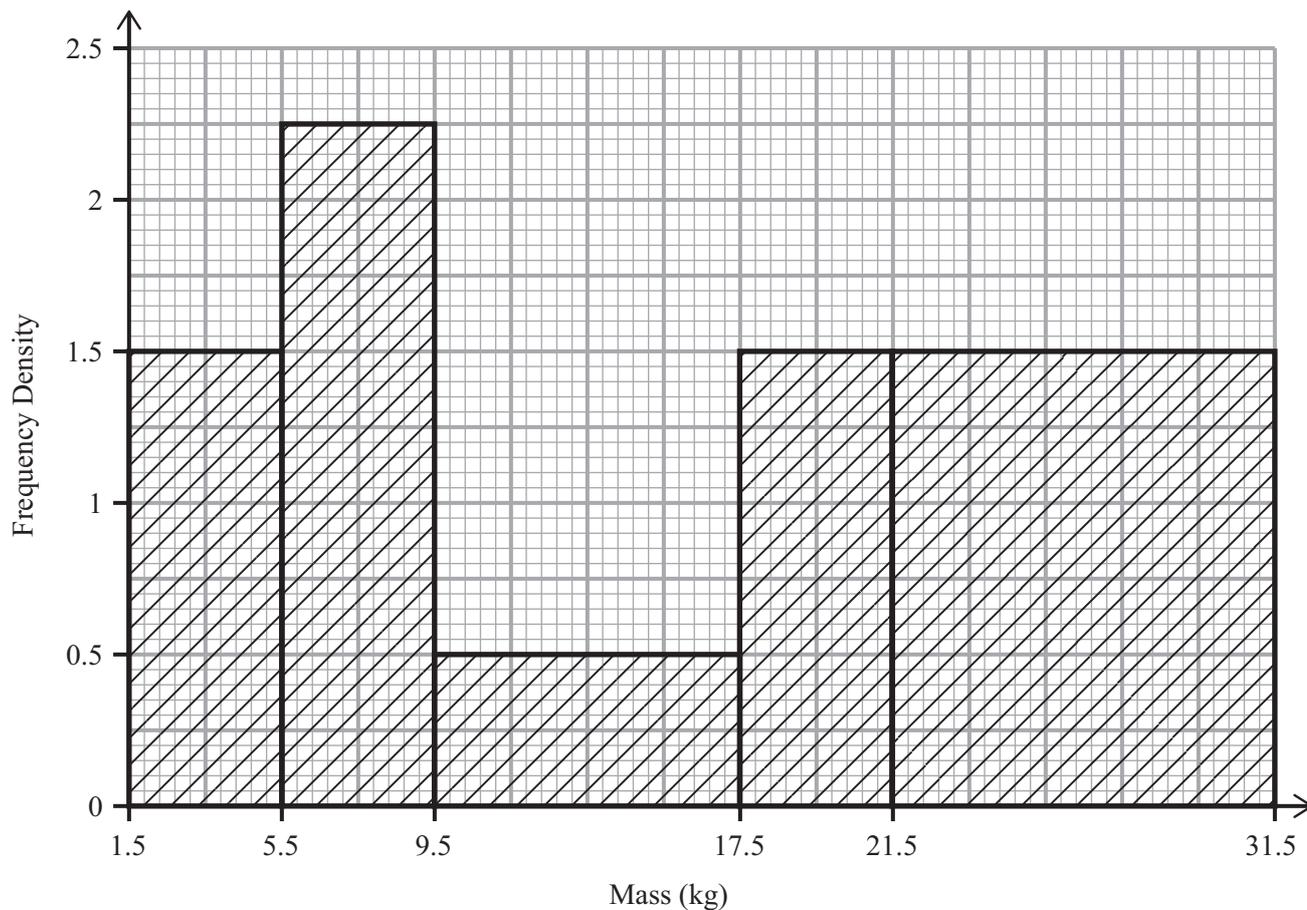
**Show clearly the full development of your answers.**

**Answers should be given to three significant figures unless otherwise stated.**

**Normal distribution values should be read from the tables provided.**

- 1** On Wednesdays the number of vehicles found speeding on a particular stretch of road is on average 6 per hour. Assuming a Poisson model, find the probability that on a particular Wednesday:
- (i) exactly 4 vehicles are found speeding between 10.30 and 11.30 [2]
- (ii) at least 1 vehicle is found speeding between 11.00 and 11.30 [4]

- 2 The masses of 40 objects were recorded to the nearest kilogram. The histogram in **Fig. 1** below illustrates the data obtained.



**Fig. 1**

- (i) Given that the number of objects in the first group is 6, write out the frequency distribution table for the data. [5]
- (ii) Find an estimate for the mean mass of the 40 objects. [2]
- (iii) Find an estimate for their median mass. [5]

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

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

(i) Show that  $k = \frac{1}{9}$  [3]

(ii) Given that  $E(X) = \frac{9}{4}$ , find  $\text{Var}(X)$ . [5]

4 Last year Pauline visited her local newsagent on 219 out of the 365 days in the year. Assuming that her visits were at random, find the probability that during a particular week Pauline visited the newsagent on:

(i) exactly five days; [3]

(ii) at most two days; [3]

(iii) at least two days. [3]

5 In a standard IQ test 5.48% of candidates scored above 120 whilst 91.92% of candidates scored above 105  
IQ scores are given as whole numbers.

(i) Assuming the distribution to be normal, find the mean and standard deviation of the scores. [8]

An employer wishes to only employ candidates whose IQ is in the top 3%.

(ii) Find the minimum score that these candidates should achieve in their IQ test. [4]

- 6 A discrete random variable  $X$  has the probability distribution given in **Table 1** below.

**Table 1**

$x$	2	4	6	8	10
$P(X=x)$	0.1	$5k^2 + k$	$1.5k$	0.1	0.1

- (i) Show that  $k = 0.2$  [5]

- (ii) Hence find the values of  $E(X)$ ,  $E(X^2)$  and  $\text{Var}(X)$ . [6]

The random variable  $Y$  is related to  $X$  by  $Y = aX + b$

- (iii) Given that  $a$  is positive,  $E(Y) = 30$  and  $\text{Var}(Y) = 121$ , find  $a$  and  $b$ . [4]

- 7 At a crossroads vehicle drivers can choose to: go straight on, turn left or turn right. A traffic survey shows that of drivers approaching the crossroads from the same direction:

40% went straight on;  
35% turned left;  
25% turned right.

Assume that drivers choose direction independently.

Find the probability that of the next three vehicles approaching the crossroads:

- (i) all turn right; [2]

- (ii) all go in the same direction; [3]

- (iii) at least one turns left; [3]

- (iv) all turn left given that none turns right. [5]

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

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