Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2015

Mathematics

Assessment Unit S1

assessing

Module S1: Statistics 1

AMS11

[AMS11]
WEDNESDAY 3 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 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.

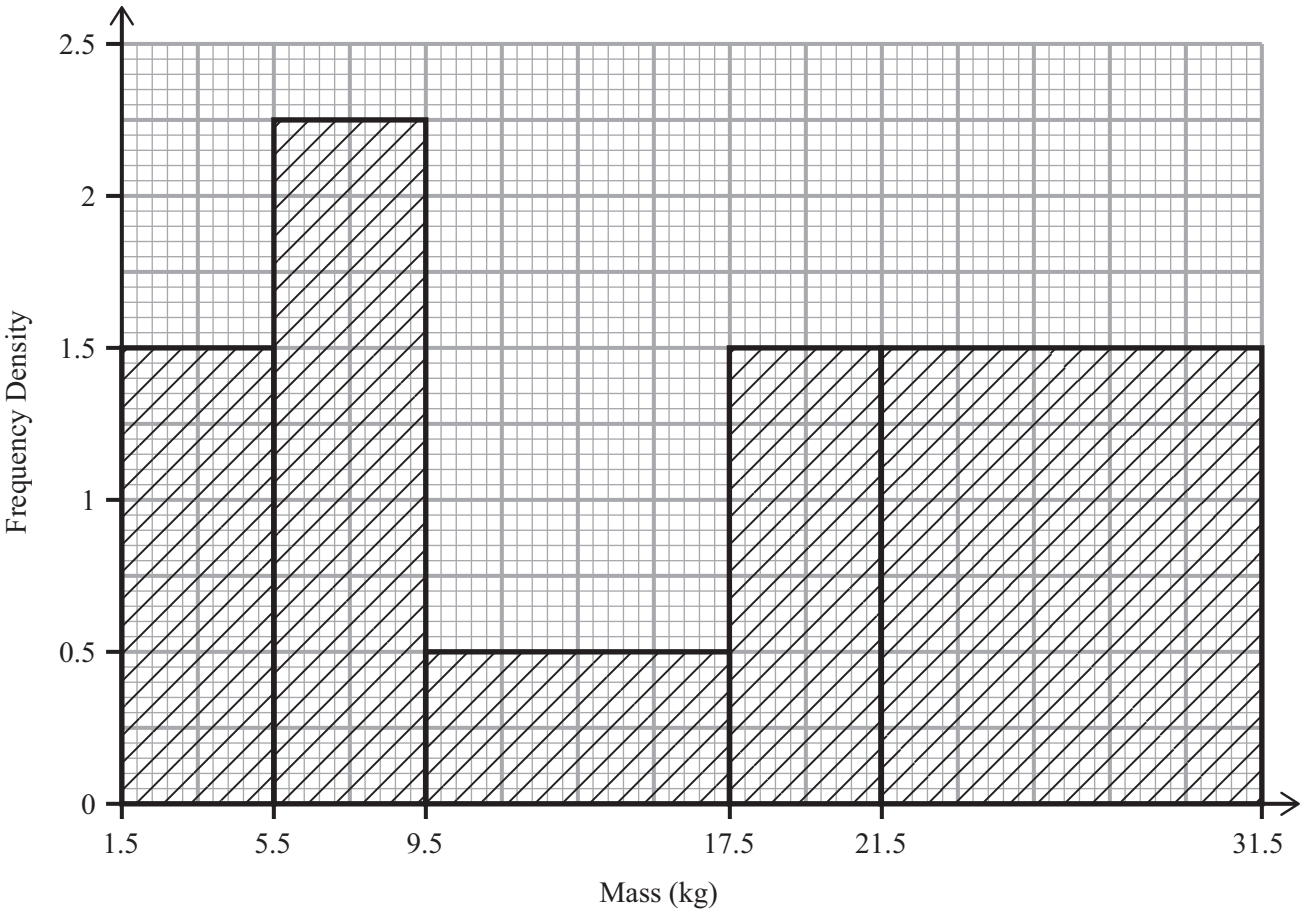

Fig. 1

(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:

$$f(x) = kx^2 \qquad 0 \leqslant x \leqslant 3$$

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

(ii) Given that $E(X) = \frac{9}{4}$, find 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 $Var(X)$. [6]

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

(iii) Given that a is positive, $E(Y) = 30$ and $Var(Y) = 121$, 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]

THIS IS THE END OF THE QUESTION PAPER