Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2017

Centre Number

Candidate Number

# Mathematics

Assessment Unit S1
*assessing*
Module S1: Statistics 1

ML

## [AMS11]
## TUESDAY 30 MAY, MORNING

**TIME**

1 hour 30 minutes, plus your additional time allowance.

**INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer **all seven** questions in the spaces provided.
**Do not write outside the boxed area on each page or on blank pages.**
Complete in black ink only.
Questions which require drawing or sketching should be completed using an H.B. pencil.
All working should be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions. **Answers without working may not gain full credit**.
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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**1** The probability that Bob arrives late for school on any given morning is 0.35

**(i)** Find the probability that in a school week he will be late exactly twice. [3]

**(ii)** Find the probability that in a school week he will be late at least once. [4]

Bob's weekly pocket money is £10 with a deduction of £2 for each day that he is late for school.

**(iii)** Find Bob's expected weekly pocket money. [4]

**2** A discrete random variable $X$ has distribution given in **Table 1** below.

**Table 1**

| $x$ | –2 | –1 | 0 | 1 | 2 |
|---|---|---|---|---|---|
| $P(X = x)$ | $a$ | 0.16 | 0.16 | $b$ | 0.08 |

Given that $E(X) = -0.12$

**(i)** find the values of $a$ and $b$ [6]

**(ii)** find Var($X$). [4]

**3** A jar contains twelve marbles: 5 red, 4 green and 3 yellow.
Two marbles are selected at random without replacement.

Find the probability that their colours are different. [6]

**4** Pauline is analysing information about the times spent parked in a hospital car park. She has lost her original data but still has the cumulative frequency table, shown in **Table 2** below.

**Table 2**

| Time (hours) | < 0.5 | < 1.0 | < 1.5 | < 2.0 | < 2.5 | < 3.0 |
|---|---|---|---|---|---|---|
| Cumulative frequency | 38 | 87 | 154 | 207 | 235 | 250 |

**(i)** Find an estimate for the median time spent in the car park. [6]

**(ii)** Find an estimate for the mean time spent in the car park. [5]

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

**5** The scores of an aptitude test are normally distributed with mean 150 and standard deviation 20

Successful candidates are awarded a 'pass', 'merit' or 'distinction'.
The pass mark is 120 and 165 is needed for a 'merit'.
Only the top 5% of candidates are awarded a 'distinction'.

**(i)** Find the percentage of candidates awarded a 'pass'. [6]

**(ii)** Find the percentage of candidates awarded a 'merit'. [4]

**(iii)** Find the minimum mark needed to be awarded a 'distinction'. [4]

**6** On an archery range the circular target has radius 1 m.
The continuous random variable $X$ represents the distance from the centre, of arrows hitting the target.
The probability density function of $X$ is given by

$$f(x) = kx(1 - x)^2 \qquad 0 \leqslant x \leqslant 1$$

**(i)** Show that $k = 12$ [4]

**(ii)** Find the probability that an arrow hits the target closer to the centre than to the circumference. [3]

**(iii)** Find the mean distance from the centre of arrows hitting the target. [4]

7 A bakery sells luxury cream cakes.
Requests to buy a luxury cream cake occur at random at an average rate of 3.2 per day.
Today the bakery has four luxury cream cakes for sale.

**(i)** Find the probability that two cakes are sold by lunchtime (half a day). [3]

**(ii)** Find the probability that they are sold out of cakes by the end of the day. [4]

**(iii)** By the end of the day if more than one cake is sold, find the probability that exactly three are sold. [5]

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| For Examiner's use only | |
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| **Question Number** | **Marks** |
| 1 | |
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| 4 | |
| 5 | |
| 6 | |
| 7 | |
| **Total Marks** | |

**Examiner Number**