

ADVANCED SUBSIDIARY (AS) General Certificate of Education January 2009

Mathematics

Assessment Unit S1 assessing Module S1: Statistics 1



[AMS11]

MONDAY 19 JANUARY, AFTERNOON

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 $\ln z \equiv \log_a z$

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 probability distribution of a random variable *X* is shown in **Table 1** below.

	x	1	2	3	4	5	6]
	$\mathbf{P}(X=x)$	0.12	0.21	0.2	0.16	0.14	k	
(i) Find the value of k . [2]								
(ii)	(ii) Find $P(2 < X \le 5)$.					[2]		
(iii	(iii) Find $E(X)$ and $Var(X)$					[6]		

2 Hits on a website occur independently at a constant average rate of 2.6 per minute. Find the probability that:

(i)	there are exactly 4 hits in a one-minute period	[3]
(ii) there are exactly 4 hits in a two-minute period	[3]
(ii	i) there are at least 2 hits in a one-minute period.	[4]

- Brenda is given a multiple choice chemistry test on a part of the course that she has not prepared so she relies totally on guesswork!
 Each question has 5 answers from which to choose the correct one.
 There are 10 questions.
 - (i) Find the probability that she guesses exactly 4 of the answers correctly. [4]
 (ii) Find the probability that she guesses at least 1 of the answers correctly. [3]
 - (iii) How many answers would Brenda be expected to guess correctly? Explain why. [2]

2 www.StudentBounty.com Homework Help & Pastpapers 4 Anna is calculating the mean and standard deviation for a set of data for a random variable *X*. The data is summarised in **Table 2** below.

Table	2
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x	10 –	20 -	30 -	40 - 50
Frequency	8	20	12	0

(i) For each of the following cases, write down the appropriate mid-values of the four intervals.

(a) X is the weight of a letter, in grams.	[1]
(b) X is the number of misprints in a magazine.	[2]
(c) X is the age, in complete years, of the audience at a cinema.	[2]

The mean and standard deviation of X in case (a) are 26 grams and 7 grams respectively.

(ii) Write down (do not calculate) the mean and standard deviation for X in cases (b) and (c).

5 The time spent by customers at Cyber Zone internet cafe is Normally distributed with mean 72 minutes and standard deviation 15 minutes.Find the probability that a customer chosen at random spends:

(i)	less than one hour at Cyber Zone	[5]

(ii) between one hour and one and a half hours at Cyber Zone. [5]

The charges for using Cyber Zone are as follows:

Up to one hour	Between one hour and one and a half hours	Longer than one and a half hours	
£1.50	£2.50	£3.50	

(iii) Find, to the nearest penny, the expected charge for using Cyber Zone. [5]

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

$$\begin{cases} f(x) = \frac{3}{125}x^2 & 0 \le x \le 5\\ = 0 & \text{otherwise} \end{cases}$$
[3]

[5]

(ii) Show that
$$E(X) = 3\frac{3}{4}$$
 [3]

(iii) Find
$$Var(X)$$

(i) Find $P(2 \le X \le 3)$

7 Louis is not very confident about passing his driving test. The probability that he passes first time is p, where p < 0.5Louis will continue to retake his test until he passes. The probability of passing increases by a factor of 10% each time he retakes the test.

(i) Find an expression, in terms of *p*, for the probability that Louis passes his driving test at the second attempt. [3]

The probability that he passes at the second attempt is 0.176

(ii) Find the value of <i>p</i> .	[3]
(iii) Find the probability that Louis passes his test on the third attempt.	[6]