

General Certificate of Education
Advanced Level Examination

MATHEMATICS A

Statistics 2

Paper A

Time allowed: 1 hour 20 minutes

Instructions and Information

- A graphics calculator may be used.
- Answer **all** questions.
- All necessary working should be shown or marks for method may be lost.
- The maximum mark for this paper is 60.
- You are reminded of the need for good English and clear presentation.
- Final answers to questions requiring the use of statistical tables or calculators should normally be given to three significant figures.



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1. The continuous random variable X has the following cumulative distribution function:

$$F(x) = \begin{cases} 0, & x < 0, \\ \frac{1}{64}(16x - x^2), & 0 \leq x \leq 8, \\ 1, & x > 8. \end{cases}$$

(a) Find $P(X > 5)$. (2 marks)

(b) Find and specify fully the probability density function $f(x)$ of X . (3 marks)

5 marks

2. The discrete random variable X is defined by

$$P(X = n + 1) = 0.8 \times P(X = n),$$

for all positive integer values of n .

(a) Show that $P(X = 1) = 0.2$ (4 marks)

(b) Name the distribution of X . (1 mark)

(c) Find the mean and variance of X . (2 marks)

7 marks

3. A company with a banner advert at an internet chatroom believes that 1 in 40 new visitors to the chatroom will visit its site.

(a) Find the probability that of 30 new visitors to the chatroom, at most one will visit the advertiser's site. (4 marks)

During one day there are 200 new visitors to the chatroom.

(b) Using a suitable distributional approximation, find the probability that more than 10 of these will visit the advertiser's site.

(4 marks)

8 marks

4. The time that a school pupil spends on French homework each week is normally distributed with a mean of 55 minutes and a standard deviation of 10 minutes.

The time that this pupil spends on English homework each week is normally distributed with a mean of 1 hour 30 minutes and a standard deviation of 18 minutes.

Find the probability that in a randomly chosen week

- (a) the pupil spends more than 2 hours in total doing French and English homework,

(4 marks)

- (b) the pupil spends more than twice as long doing English homework as he spends doing French homework.

(5 marks)

9 marks

5. A group of 40 males and 40 females were asked which of three “Reality TV” shows they liked most – *Watched*, *Stranded* or *One-2-Win*. The results were as follows:

	<i>Watched</i>	<i>Stranded</i>	<i>One-2-Win</i>
Males	21	6	13
Females	15	10	15

Stating your hypotheses clearly, test at the 10% level whether or not there is a significant difference in the preferences of males and females.

10 marks

TURN OVER

6. A shoe shop sells on average 4 pairs of shoes per hour on a weekday morning.
- (a) Suggest a suitable distribution for modelling the number of sales made per hour on a weekday morning and state the value of any parameters needed. (1 mark)
- (b) Explain why this model might have to be modified for modelling the number of sales made per hour on a Saturday morning. (1 mark)
- (c) Find the probability that on a weekday morning the shop sells
- (i) more than 4 pairs in a one-hour period,
- (ii) no pairs in a half-hour period. (4 marks)

The area manager visits the shop on a weekday morning, the day after an advert appears in a local paper. In a one-hour period the shop sells 9 pairs of shoes, leading the manager to believe that the advert has increased the shop's sales.

- (d) Stating your hypotheses clearly, test at the 5% level of significance whether or not there is evidence of an increase in sales following the appearance of the advert. (4 marks)

10 marks

7. A student collects data on whether competitors in local tennis tournaments are right, or left-handed. The table below shows the number of left-handed players who reached the last 16 for fifty tournaments.

No. of Left-handed Players	0	1	2	3	4	≥ 5
No. of Tournaments	4	12	18	11	5	0

The student believes that a binomial distribution with $n = 16$ and $p = 0.1$ could be a suitable model for these data.

Stating your hypotheses clearly test the student's model at the 5% level of significance.

11 marks

Total 60 marks

END