General Certificate of Education
June 2006
Advanced Subsidiary Examination

MATHEMATICS **MS/SS1A/W**
Unit Statistics 1A

STATISTICS
Unit Statistics 1A

Wednesday 24 May 2006 1.30 pm to 2.45 pm

For this paper you must have:
- an 8-page answer book
- the **blue** AQA booklet of formulae and statistical tables

You may use a graphics calculator.

Time allowed: 1 hour 15 minutes

Instructions
- Use blue or black ink or ball-point pen. Pencil should only be used for drawing.
- Write the information required on the front of your answer book. The *Examining Body* for this paper is AQA. The *Paper Reference* is MS/SS1A/W.
- Answer **all** questions.
- Show all necessary working; otherwise marks for method may be lost.
- The **final** answer to questions requiring the use of tables or calculators should normally be given to three significant figures.

Information
- The maximum mark for this paper is 60.
- The marks for questions are shown in brackets.
- Unit Statistics 1A has a **written paper and coursework**.

Advice
- Unless stated otherwise, you may quote formulae, without proof, from the booklet.

Answer **all** questions.

1 The table shows, for each of a random sample of 8 paperback fiction books, the number of pages, x, and the recommended retail price, £y, to the nearest 10p.

x	223	276	374	433	564	612	704	766
y	6.50	4.00	5.50	8.00	4.50	5.00	8.00	5.50

(a) Calculate the value of the product moment correlation coefficient between x and y. *(3 marks)*

(b) Interpret your value in the context of this question. *(2 marks)*

(c) Suggest one other variable, in addition to the number of pages, which may affect the recommended retail price of a paperback fiction book. *(1 mark)*

2 A new car tyre is fitted to a wheel. The tyre is inflated to its recommended pressure of 265 kPa and the wheel left unused. At 3-month intervals thereafter, the tyre pressure is measured with the following results:

Time after fitting (x months)	0	3	6	9	12	15	18	21	24
Tyre pressure (y kPa)	265	250	240	235	225	215	210	195	180

(a) Calculate the equation of the least squares regression line of y on x. *(4 marks)*

(b) Interpret in context the value for the gradient of your line. *(2 marks)*

(c) Comment on the value for the intercept with the y-axis of your line. *(2 marks)*

3 Kirk and Les regularly play each other at darts.

(a) The probability that Kirk wins any game is 0.3, and the outcome of each game is independent of the outcome of every other game.

Find the probability that, in a match of 15 games, Kirk wins:

(i) fewer than half of the games; *(4 marks)*

(ii) more than 2 but fewer than 7 games. *(3 marks)*

(b) Kirk attends darts coaching sessions for three months. He then claims that he has a probability of 0.4 of winning any game, and that the outcome of each game is independent of the outcome of every other game.

(i) Assuming this claim to be true, calculate the mean and standard deviation for the number of games won by Kirk in a match of 15 games. *(3 marks)*

(ii) To assess Kirk's claim, Les keeps a record of the number of games won by Kirk in a series of 10 matches, each of 15 games, with the following results:

8 5 6 3 9 12 4 2 6 5

Calculate the mean and standard deviation of these values. *(2 marks)*

(iii) Hence comment on the validity of Kirk's claim. *(3 marks)*

Turn over for the next question

4 A housing estate consists of 320 houses: 120 detached and 200 semi-detached. The numbers of children living in these houses are shown in the table.

	Number of children				
	None	**One**	**Two**	**At least three**	**Total**
Detached house	24	32	41	23	120
Semi-detached house	40	37	88	35	200
Total	64	69	129	58	320

A house on the estate is selected at random.

D denotes the event 'the house is detached'.
R denotes the event 'no children live in the house'.
S denotes the event 'one child lives in the house'.
T denotes the event 'two children live in the house'.
(D' denotes the event 'not D'.)

(a) Find:

(i) $\mathrm{P}(D)$; *(1 mark)*

(ii) $\mathrm{P}(D \cap R)$; *(1 mark)*

(iii) $\mathrm{P}(D \mid R)$; *(2 marks)*

(iv) $\mathrm{P}(R \mid D')$. *(3 marks)*

(b) (i) Name two of the events D, R, S and T that are mutually exclusive. *(1 mark)*

(ii) Determine whether the events D and R are independent. Justify your answer. *(2 marks)*

(c) Define, in the context of this question, the event:

(i) $D' \cup T$; *(2 marks)*

(ii) $D \cap (R \cup S)$. *(2 marks)*

5 Currants are sold in 1000-gram packets and in 500-gram packets.

(a) The weights of 1000-gram packets may be assumed to be normally distributed with a mean of 1012 grams and a standard deviation of 5 grams.

Determine the probability that a randomly selected packet weighs:

(i) less than 1015 grams; *(3 marks)*

(ii) more than 1005 grams; *(3 marks)*

(iii) between 1005 grams and 1015 grams. *(2 marks)*

(b) The weight, y grams, of each of a random sample of fifty 500-gram packets of currants was recorded with the following results, where $\bar{y}$ denotes the sample mean:

$$n = 50 \qquad \sum y = 25\,142.5 \qquad \sum (y - \bar{y})^2 = 2519.0361$$

Number of packets weighing less than 500 grams = 6

(i) Construct a 98% confidence interval for the mean weight of 500-gram packets of currants, giving the limits to two decimal places. *(6 marks)*

(ii) On each packet it states 'Contents 500 grams'.

Comment on this statement using **both** the given information **and** your confidence interval. *(3 marks)*

END OF QUESTIONS

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