

General Certificate of Education  
June 2006  
Advanced Subsidiary Examination



**MATHEMATICS**  
**Unit Statistics 1A**

**MS/SS1A/W**

**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,  $\pounds y$ , 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:

<b>Time after fitting (<math>x</math> months)</b>	0	3	6	9	12	15	18	21	24
<b>Tyre pressure (<math>y</math> kPa)</b>	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**

**Turn over ►**

- 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				Total
	None	One	Two	At least three	
<b>Detached house</b>	24	32	41	23	120
<b>Semi-detached house</b>	40	37	88	35	200
<b>Total</b>	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)  $P(D)$ ; (1 mark)

(ii)  $P(D \cap R)$ ; (1 mark)

(iii)  $P(D | R)$ ; (2 marks)

(iv)  $P(R | D')$ . (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:

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

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**

**There are no questions printed on this page**

**There are no questions printed on this page**

**There are no questions printed on this page**