General Certificate of Education
June 2007
Advanced Subsidiary Examination

AQA

ASSESSMENT and
QUALIFICATIONS
ALLIANCE

MATHEMATICS   **MS/SS1B**
Unit Statistics 1B

STATISTICS
Unit Statistics 1B

Thursday 14 June 2007   1.30 pm to 3.00 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 30 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/SS1B.
- 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 75.
- The marks for questions are shown in brackets.
- Unit Statistics 1B has a **written paper only**.

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

MS/SS1B

Answer **all** questions.

1 The table shows the length, in centimetres, and maximum diameter, in centimetres, of each of 10 honeydew melons selected at random from those on display at a market stall.

Length	24	25	19	28	27	21	35	23	32	26
Maximum diameter	18	14	16	11	13	14	12	16	15	14

(a) Calculate the value of the product moment correlation coefficient. *(3 marks)*

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

2 The British and Irish Lions 2005 rugby squad contained 50 players. The nationalities and playing positions of these players are shown in the table.

		Nationality			
		English	**Welsh**	**Scottish**	**Irish**
Playing position	**Forward**	14	5	2	6
	Back	8	7	2	6

(a) A player was selected at random from the squad for a radio interview. Calculate the probability that the player was:

(i) a Welsh back; *(1 mark)*

(ii) English; *(2 marks)*

(iii) not English; *(1 mark)*

(iv) Irish, given that the player was a back; *(2 marks)*

(v) a forward, given that the player was not Scottish. *(2 marks)*

(b) Four players were selected at random from the squad to visit a school. Calculate the probability that all four players were English. *(3 marks)*

3 (a) A sample of 50 washed baking potatoes was selected at random from a large batch. The weights of the 50 potatoes were found to have a mean of 234 grams and a standard deviation of 25.1 grams.

Construct a 95% confidence interval for the mean weight of potatoes in the batch.

(4 marks)

(b) The batch of potatoes is purchased by a market stallholder. He sells them to his customers by allowing them to choose any 5 potatoes for £1.

Give a reason why such chosen potatoes are unlikely to represent a random sample from the batch. *(1 mark)*

4 A library allows each member to have up to 15 books on loan at any one time.

The table shows the numbers of books currently on loan to a random sample of 95 members of the library.

Number of books on loan	0	1	2	3	4	5–9	10–14	15
Number of members	4	13	24	17	15	11	5	6

(a) For these data:

(i) state values for the mode and range; *(2 marks)*

(ii) determine values for the median and interquartile range; *(4 marks)*

(iii) calculate estimates of the mean and standard deviation. *(4 marks)*

(b) Making reference to your answers to part (a), give a reason for preferring:

(i) the median and interquartile range to the mean and standard deviation for summarising the given data; *(1 mark)*

(ii) the mean and standard deviation to the mode and range for summarising the given data. *(1 mark)*

5 Bob, a gardener, measures the time taken, y minutes, for 60 grams of weedkiller pellets to dissolve in 10 litres of water at different set temperatures, $x\,°C$. His results are shown in the table.

x	16	20	24	28	32	36	40	44	48	52	56
y	4.7	4.3	3.8	3.5	3.0	2.7	2.4	2.0	1.8	1.6	1.1

(a) State why the explanatory variable is temperature. *(1 mark)*

(b) Calculate the equation of the least squares regression line $y = a + bx$. *(4 marks)*

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

    (ii) Explain why no sensible practical interpretation can be given for your value of a. *(2 marks)*

(d)   (i) Estimate the time taken to dissolve 60 grams of weedkiller pellets in 10 litres of water at $30\,°C$. *(2 marks)*

    (ii) Show why the equation cannot be used to make a valid estimate of the time taken to dissolve 60 grams of weedkiller pellets in 10 litres of water at $75\,°C$. *(2 marks)*

6 Each weekday, Monday to Friday, Trina catches a train from her local station. She claims that the probability that the train arrives on time at the station is 0.4, and that the train's arrival time is independent from day to day.

(a) Assuming her claims to be true, determine the probability that the train arrives on time at the station:

  (i) on at most 3 days during a 2-week period (10 days); *(2 marks)*

  (ii) on more than 10 days but fewer than 20 days during an 8-week period. *(3 marks)*

(b)   (i) Assuming Trina's claims to be true, determine the mean and standard deviation for the number of times during a week (5 days) that the train arrives on time at the station. *(3 marks)*

    (ii) Each week, for a period of 13 weeks, Trina's travelling colleague, Suzie, records the number of times that the train arrives on time at the station. Suzie's results are

        2   2   4   1   2   3   3   2   2   0   3   2   0

        Calculate the mean and standard deviation of these values. *(3 marks)*

    (iii) Hence comment on the likely validity of Trina's claims. *(2 marks)*

7 (a) Electra is employed by E & G Ltd to install electricity meters in new houses on an estate. Her time, X minutes, to install a meter may be assumed to be normally distributed with a mean of 48 and a standard deviation of 20.

Determine:

(i) $P(X < 60)$; *(2 marks)*

(ii) $P(30 < X < 60)$; *(3 marks)*

(iii) the time, k minutes, such that $P(X < k) = 0.9$. *(4 marks)*

(b) Gazali is employed by E & G Ltd to install gas meters in the same new houses. His time, Y minutes, to install a meter has a mean of 37 and a standard deviation of 25.

(i) Explain why Y is unlikely to be normally distributed. *(2 marks)*

(ii) State why $\overline{Y}$, the mean of a random sample of 35 gas meter installations, is likely to be approximately normally distributed. *(1 mark)*

(iii) Determine $P(\overline{Y} > 40)$. *(4 marks)*

END OF QUESTIONS
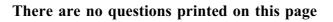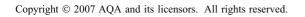
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