General Certificate of Education
June 2008
Advanced Subsidiary Examination

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

STATISTICS
Unit Statistics 1A

Wednesday 21 May 2008 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
- an insert for use in Question 3 (enclosed).

You may use a graphics calculator.

Time allowed: 1 hour 15 minutes

Instructions
- Use black ink or black 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.
- Fill in the boxes at the top of the insert.

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 the times taken, y minutes, for a wood glue to dry at different air temperatures, x °C.

x	10	12	15	18	20	22	25	28	30
y	42.9	40.6	38.5	35.4	33.0	30.7	28.0	25.3	22.6

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

(b) Estimate the time taken for the glue to dry when the air temperature is 21 °C. *(2 marks)*

2 A basket in a stationery store contains a total of 400 marker and highlighter pens. Of the marker pens, some are permanent and the rest are non-permanent. The colours and types of pen are shown in the table.

	Colour			
Type	**Black**	**Blue**	**Red**	**Green**
Permanent marker	44	66	32	18
Non-permanent marker	36	53	21	10
Highlighter	0	41	37	42

A pen is selected at random from the basket. Calculate the probability that it is:

(a) a blue pen; *(1 mark)*

(b) a marker pen; *(2 marks)*

(c) a blue pen or a marker pen; *(2 marks)*

(d) a green pen, given that it is a highlighter pen. *(2 marks)*

3 [**Figure 1**, printed on the insert, is provided for use in this question.]

The table shows, for each of a sample of 12 handmade decorative ceramic plaques, the length, x millimetres, and the width, y millimetres.

Plaque	x	y
A	232	109
B	235	112
C	236	114
D	234	118
E	230	117
F	230	113
G	246	121
H	240	125
I	244	128
J	241	122
K	246	126
L	245	123

(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) On **Figure 1**, complete the scatter diagram for these data. *(3 marks)*

(d) In fact, the 6 plaques A, B, ..., F are from a different source to the 6 plaques G, H, ..., L.

With reference to your scatter diagram, **but without further calculations**, estimate the value of the product moment correlation coefficient between x and y for **each** source of plaque. *(2 marks)*

4 For the adult population of the UK, 35 per cent of men and 29 per cent of women do not wear glasses or contact lenses.

(a) Determine the probability that, in a random sample of 40 men, at most 15 do not wear glasses or contact lenses. *(3 marks)*

(b) Calculate the probability that, in a random sample of 10 women, exactly 3 do not wear glasses or contact lenses. *(3 marks)*

(c) (i) Calculate the mean and the variance for the number who **do** wear glasses or contact lenses in a random sample of 20 women. *(3 marks)*

(ii) The numbers wearing glasses or contact lenses in 10 groups, each of 20 women, had a mean of 16.5 and a variance of 2.50 .

Comment on the claim that these 10 groups were **not** random samples. *(3 marks)*

5 Vernon, a service engineer, is expected to carry out a boiler service in one hour.

One hour is subtracted from each of his actual times, and the resulting differences, x minutes, for a random sample of 100 boiler services have a mean, $\bar{x}$, of 1.90 and a standard deviation, s, of 3.32 .

(a) Deduce, in minutes, the mean and the standard deviation of Vernon's actual service times for this sample. *(3 marks)*

(b) Construct a 98% confidence interval for the mean time taken by Vernon to carry out a boiler service. *(4 marks)*

(c) Vernon claims that, on average, a boiler service takes much longer than an hour.

Comment, with a justification, on this claim. *(1 mark)*

6 The length, L centimetres, of *Slimline* bin liners may be modelled by a normal distribution with a mean of 69.5 and a standard deviation of 0.55 .

(a) Determine:

(i) $P(L < 70)$; *(3 marks)*

(ii) $P(69 < L < 70)$; *(3 marks)*

(iii) $P(L = 70)$. *(1 mark)*

(b) Determine the maximum length exceeded by 90% of bin liners. *(4 marks)*

(c) The bin liners are sold in packets of 20, and those in each packet may be considered to be a random sample.

Determine the probability that:

(i) all the bin liners in a packet have lengths less than 70 cm; *(2 marks)*

(ii) the mean length of the bin liners in a packet is greater than 69.25 cm. *(4 marks)*

END OF QUESTIONS

There are no questions printed on this page

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There are no questions printed on this page

Surname		Other Names	
Centre Number						Candidate Number				
Candidate Signature										

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ASSESSMENT and QUALIFICATIONS ALLIANCE

MATHEMATICS **MS/SS1A/W**
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Insert

Insert for use in **Question 3**.

Fill in the boxes at the top of this page.

Fasten this insert securely to your answer book.

Turn over for Figure 1

Figure 1 (for use in Question 3)

Decorative Plaques