

General Certificate of Education
June 2008
Advanced Subsidiary Examination



MATHEMATICS
Unit Statistics 1A

MS/SS1A/W

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.

Type	Colour			
	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

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Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

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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

Turn over ►

Figure 1 (for use in Question 3)

Decorative Plaques

