

General Certificate of Education
January 2007
Advanced Subsidiary Examination



MATHEMATICS
Unit Statistics 1A

MS/SS1A/W

STATISTICS
Unit Statistics 1A

Tuesday 23 January 2007 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 6 (enclosed).

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.
- 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 times, in seconds, taken by 20 people to solve a simple numerical puzzle were

17 19 22 26 28 31 34 36 38 39
41 42 43 47 50 51 53 55 57 58

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

(b) In fact, 23 people solved the puzzle. However, 3 of them failed to solve it within the allotted time of 60 seconds.

Calculate the median and the interquartile range of the times taken by all 23 people.

(4 marks)

(c) For the times taken by all 23 people, explain why:

(i) the mode is **not** an appropriate numerical measure;

(ii) the range is **not** an appropriate numerical measure.

(2 marks)

2 The post office in a market town is located within a small supermarket.

The probability that an individual customer entering the supermarket requires a service from:

- the post office only is 0.48;
- the supermarket only is 0.30;
- both the post office and the supermarket is 0.22.

It may be assumed that the service required is independent from customer to customer.

(a) For a random sample of 12 individual customers, calculate the probability that exactly 5 of them require a service from the post office only. *(3 marks)*

(b) For a random sample of 40 individual customers, determine the probability that more than 10 but fewer than 15 of them require a service from the supermarket only.

(3 marks)

(c) For a random sample of 100 individual customers, calculate the mean and the standard deviation for the number of them requiring a service from both the post office and the supermarket. *(3 marks)*

3 A very popular play has been performed at a London theatre on each of 6 evenings per week for about a year. Over the past 13 weeks (78 performances), records have been kept of the proceeds from the sales of programmes at each performance. An analysis of these records has found that the mean was £184 and the standard deviation was £32.

(a) Assuming that the 78 performances may be considered to be a random sample, construct a 90% confidence interval for the mean proceeds from the sales of programmes at an evening performance of this play. *(4 marks)*

(b) Comment on the likely validity of the assumption in part (a) when constructing a confidence interval for the mean proceeds from the sales of programmes at an evening performance of:

(i) this particular play;

(ii) any play. *(3 marks)*

4 Rea, Suki and Tora take part in a shooting competition. The final round of the competition requires each of them to try to hit the centre of a target, placed at 100 metres, with a single shot. The independent probabilities that Rea, Suki and Tora hit the centre of this target with a single shot are 0.7, 0.6 and 0.8 respectively.

Find the probability that, in the final round of the competition, the centre of the target will be hit by:

(a) Tora only; *(2 marks)*

(b) exactly one of the three competitors; *(3 marks)*

(c) at least one of the three competitors. *(3 marks)*

Turn over for the next question

Turn over ►

5 When Monica walks to work from home, she uses either route A or route B.

- (a) Her journey time, X minutes, by route A may be assumed to be normally distributed with a mean of 37 and a standard deviation of 8.

Determine:

- (i) $P(X < 45)$; (3 marks)
- (ii) $P(30 < X < 45)$. (3 marks)

- (b) Her journey time, Y minutes, by route B may be assumed to be normally distributed with a mean of 40 and a standard deviation of σ .

Given that $P(Y > 45) = 0.12$, calculate the value of σ . (4 marks)

- (c) If Monica leaves home at 8.15 am to walk to work hoping to arrive by 9.00 am, state, with a reason, which route she should take. (2 marks)

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

Stan is a retired academic who supplements his pension by mowing lawns for customers who live nearby.

As part of a review of his charges for this work, he measures the areas, $x \text{ m}^2$, of a random sample of eight of his customers' lawns and notes the times, y minutes, that it takes him to mow these lawns. His results are shown in the table.

Customer	A	B	C	D	E	F	G	H
x	360	140	860	600	1180	540	260	480
y	50	25	135	70	140	90	55	70

- (a) On **Figure 1**, plot a scatter diagram of these data. (2 marks)
- (b) Calculate the equation of the least squares regression line of y on x . Draw your line on **Figure 1**. (6 marks)
- (c) Calculate the value of the residual for Customer H and indicate how your value is confirmed by your scatter diagram. (3 marks)
- (d) Given that Stan charges £12 per hour, estimate the charge for mowing a customer's lawn that has an area of 560 m^2 . (4 marks)

END OF QUESTIONS

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

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Insert

Insert for use in **Question 6**.

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 6)**Lawn Areas and Mowing Times**