AQA

MATHEMATICS MS/SS1A/W
Unit Statistics 1A

STATISTICS
Unit Statistics 1A

Friday 9 January 2009   9.00 am to 10.15 am

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 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.

MS/SS1A/W

Answer **all** questions.

1 Ms N Parker always reads the columns of announcements in her local weekly newspaper. During each week of 2008, she notes the number of births announced. Her results are summarised in the table.

Number of births	1	2	3	4	5	6	7	8
Number of weeks	1	2	9	13	7	13	6	1

(a) Calculate the mean, median and modes of these data. *(5 marks)*

(b) State, with a reason, which of the three measures of average in part (a) you consider to be the **least** appropriate for summarising the number of births. *(2 marks)*

2 Monty, a young apprentice at a professional football club's academy for boys aged 11 to 18, is studying Statistics by a distance learning course. As part of his portfolio of work on correlation, he selects a sample of players from the club's academy and records their ages, heights and weights.

Monty then calculates that the value of the product moment correlation coefficient for his results is:

(a) −0.358 between age and height;

(b) 1.14 between height and weight;

(c) 0.469 between age and weight.

For **each** of Monty's calculations, state, with a reason, whether his result is probably correct, probably incorrect or definitely incorrect. *(6 marks)*

3 As part of her breakfast duties, Fatima, a newly-appointed trainee chef, fries eggs.

It may be assumed that, for a newly-appointed trainee chef, the proportion of egg yolks broken during frying is 0.15, and that the breaking of yolks is independent from egg to egg.

(a) Determine the probability that, on a day when Fatima fries 50 eggs for breakfast, the number of yolks that she breaks is:

(i) exactly 6; *(3 marks)*

(ii) more than 6 but at most 12. *(3 marks)*

(b) Calculate the mean and the variance for the number of yolks broken on a day when Fatima fries **80** eggs. *(2 marks)*

4 Gary and his neighbour Larry work at the same place.

On any day when Gary travels to work, he uses one of three options: his car only, a bus only or both his car and a bus. The probability that he uses his car, either on its own or with a bus, is 0.6. The probability that he uses both his car and a bus is 0.25.

(a) Calculate the probability that, on any particular day when Gary travels to work, he:

   (i)   does not use his car; *(1 mark)*

  (ii)   uses his car only; *(2 marks)*

(iii)   uses a bus. *(3 marks)*

(b) On any day, the probability that Larry travels to work with Gary is 0.9 when Gary uses his car only, is 0.7 when Gary uses both his car and a bus, and is 0.3 when Gary uses a bus only.

Calculate the probability that, on any particular day when Gary travels to work, Larry travels with him. *(4 marks)*

5 The times taken by new recruits to complete an assault course may be modelled by a normal distribution with a standard deviation of 8 minutes.

A group of 30 new recruits takes a total time of 1620 minutes to complete the course.

(a) Calculate the mean time taken by these 30 new recruits. *(1 mark)*

(b) Assuming that the 30 recruits may be considered to be a random sample, construct a 98% confidence interval for the mean time taken by new recruits to complete the course. *(4 marks)*

(c) Construct an interval within which approximately 98% of the times taken by individual new recruits to complete the course will lie. *(2 marks)*

Turn over for the next question

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

For a random sample of 10 patients who underwent hip-replacement operations, records were kept of their ages, x years, and of the number of days, y, following their operations before they were able to walk unaided safely.

Patient	A	B	C	D	E	F	G	H	I	J
x	55	51	62	66	72	59	78	55	62	70
y	34	33	39	49	48	43	51	41	46	51

(a) On **Figure 1**, complete the scatter diagram for these data. *(2 marks)*

(b) Calculate the equation of the least squares regression line of y on x. *(4 marks)*

(c) Draw your regression line on **Figure 1**. *(2 marks)*

(d) In fact, patients H, I and J were males and the other 7 patients were females.

   (i) Calculate the mean of the residuals for the 3 male patients. *(4 marks)*

   (ii) Hence estimate, for a male patient aged 65 years, the number of days following his hip-replacement operation before he is able to walk unaided safely. *(3 marks)*

7 The quarterly consumption, X m³, of water by two-person households may be modelled by a normal distribution with mean μ and variance σ^2.

From an analysis of records, it is found that $P(X < 45) = 0.98$.

(a) Show that

$$45 - \mu = 2.0537\sigma$$ *(3 marks)*

(b) Given also that $P(X > 30) = 0.95$, find, to one decimal place, values for μ and σ. *(4 marks)*

END OF QUESTIONS