

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	



General Certificate of Education
Advanced Subsidiary Examination
January 2013

Mathematics

Unit Statistics 1B

MS/SS1B

Statistics

Unit Statistics 1B

Friday 18 January 2013 1.30 pm to 3.00 pm

For this paper you must have:

- the blue AQA booklet of formulae and statistical tables.

You may use a graphics calculator.

Time allowed

- 1 hour 30 minutes

Instructions

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Write the question part reference (eg (a), (b)(i) etc) in the left-hand margin.
- You must answer each question in the space provided for that question. If you require extra space, use an AQA supplementary answer book; do **not** use the space provided for a different question.
- Do not write outside the box around each page.
- Show all necessary working; otherwise marks for method may be lost.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- The **final** answer to questions requiring the use of tables or calculators should normally be given to three significant figures.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.
- Unit Statistics 1B has a **written paper only**.

Advice

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.
- You do not necessarily need to use all the space provided.



J A N 1 3 M S / S S 1 B 0 1

Answer **all** questions.

Answer each question in the space provided for that question.

- 1** Bob, a church warden, decides to investigate the lifetime of a particular manufacturer's brand of beeswax candle. Each candle is 30 cm in length.

From a box containing a large number of such candles, he selects one candle at random. He lights the candle and, after it has burned continuously for x hours, he records its length, y cm, to the nearest centimetre. His results are shown in the table.

x	5	10	15	20	25	30	35	40	45
y	27	25	21	19	16	11	9	5	2

- (a) State the value that you would **expect** for a in the equation of the least squares regression line, $y = a + bx$. (1 mark)
- (b) (i) Calculate the equation of the least squares regression line, $y = a + bx$. (4 marks)
- (ii) Interpret the value that you obtain for b . (2 marks)
- (iii) It is claimed by the candle manufacturer that the total length of time that such candles are likely to burn for is more than 50 hours.
- Comment on this claim, giving a numerical justification for your answer. (2 marks)

QUESTION
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Answer space for question 1



QUESTION
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QUESTION
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Answer space for question 3

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QUESTION
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- 4** Ashok is a work-experience student with an organisation that offers two separate professional examination papers, I and II.

For each of a random sample of 12 students, A to L, he records the mark, x per cent, achieved on Paper I, and the mark, y per cent, achieved on Paper II.

	A	B	C	D	E	F	G	H	I	J	K	L
x	34	46	53	62	67	72	60	54	70	71	82	85
y	61	66	72	78	88	81	49	60	54	44	49	36

- (a) (i) Calculate the value of the product moment correlation coefficient, r , between x and y .
(3 marks)
- (ii) Interpret your value of r in the context of this question.
(2 marks)

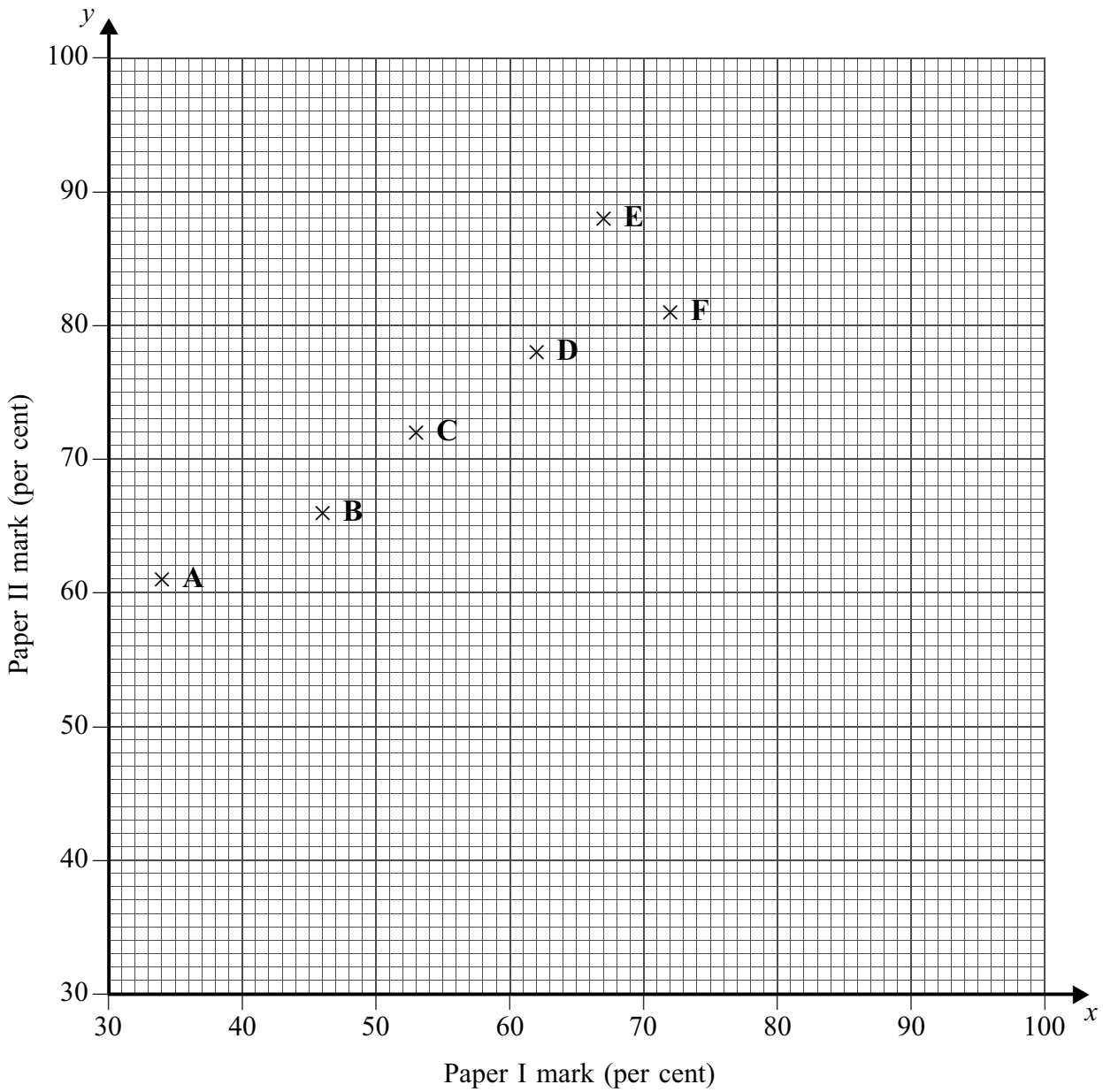
QUESTION
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	G	H	I	J	K	L
x	60	54	70	71	82	85
y	49	60	54	44	49	36

Examination Marks



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- 5** Roger is an active retired lecturer. Each day after breakfast, he decides whether the weather for that day is going to be fine (F), dull (D) or wet (W). He then decides on only one of four activities for the day: cycling (C), gardening (G), shopping (S) or relaxing (R). His decisions from day to day may be assumed to be independent.

The table shows Roger's probabilities for each combination of weather and activity.

		Weather		
		Fine (F)	Dull (D)	Wet (W)
Activity	Cycling (C)	0.30	0.10	0
	Gardening (G)	0.25	0.05	0
	Shopping (S)	0	0.10	0.05
	Relaxing (R)	0	0.05	0.10

- (a) Find the probability that, on a particular day, Roger decided:
- (i) that it was going to be fine and that he would go cycling;
 - (ii) on either gardening or shopping;
 - (iii) to go cycling, given that he had decided that it was going to be fine;
 - (iv) **not** to relax, given that he had decided that it was going to be dull;
 - (v) that it was going to be fine, given that he did **not** go cycling. (9 marks)
- (b) Calculate the probability that, on a particular Saturday and Sunday, Roger decided that it was going to be fine and decided on the same activity for both days. (3 marks)

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QUESTION
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QUESTION
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QUESTION
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7 A machine, which cuts bread dough for loaves, can be adjusted to cut dough to any specified set weight. For any set weight, μ grams, the actual weights of cut dough are known to be approximately normally distributed with a mean of μ grams and a fixed standard deviation of σ grams.

It is also known that the machine cuts dough to within 10 grams of any set weight.

(a) Estimate, with justification, a value for σ . (2 marks)

(b) The machine is set to cut dough to a weight of 415 grams.

As a training exercise, Sunita, the quality control manager, asked Dev, a recently employed trainee, to record the weight of each of a random sample of 15 such pieces of dough selected from the machine's output. She then asked him to calculate the mean and the standard deviation of his 15 recorded weights.

Dev subsequently reported to Sunita that, for his sample, the mean was 391 grams and the standard deviation was 95.5 grams.

Advise Sunita on whether or not **each** of Dev's values is likely to be correct. Give numerical support for your answers. (3 marks)

(c) Maria, an experienced quality control officer, recorded the weight, y grams, of each of a random sample of 10 pieces of dough selected from the machine's output when it was set to cut dough to a weight of 820 grams. Her summarised results were as follows.

$$\sum y = 8210.0 \quad \text{and} \quad \sum (y - \bar{y})^2 = 110.00$$

Explain, with numerical justifications, why **both** of these values are likely to be correct. (4 marks)

QUESTION
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