

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Education  
Advanced Subsidiary Examination  
June 2009

# Mathematics

Unit Statistics 1B

**MS/SS1B**

# Statistics

Unit Statistics 1B

**Specimen paper for examinations in June 2010 onwards**

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

## 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 the questions in the space provided. 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.

**MS/SS1B**

Answer **all** questions in the spaces provided.

- 1** A large bookcase contains two types of book: hardback and paperback. The number of books of each type in each of four subject categories is shown in the table.

		Subject category				Total
		Crime	Romance	Science fiction	Thriller	
Type	Hardback	8	16	18	18	60
	Paperback	16	40	14	30	100
Total		24	56	32	48	160

- (a) A book is selected at random from the bookcase. Calculate the probability that the book is:
- (i) a paperback; (1 mark)
  - (ii) not science fiction; (2 marks)
  - (iii) science fiction or a hardback; (2 marks)
  - (iv) a thriller, given that it is a paperback. (2 marks)
- (b) Three books are selected at random, without replacement, from the bookcase.
- Calculate, to three decimal places, the probability that one is crime, one is romance and one is science fiction. (4 marks)

QUESTION  
PART  
REFERENCE



QUESTION  
PART  
REFERENCE

Turn over ►



0 3

- 2** Hermione, who is studying reptiles, measures the length,  $x$  cm, and the weight,  $y$  grams, of a sample of 11 adult snakes of the same type. Her results are shown in the table.

Snake	A	B	C	D	E	F	G	H	I	J	K
$x$	46	39	54	79	47	58	73	35	43	51	36
$y$	55	48	58	88	61	55	82	51	50	66	57

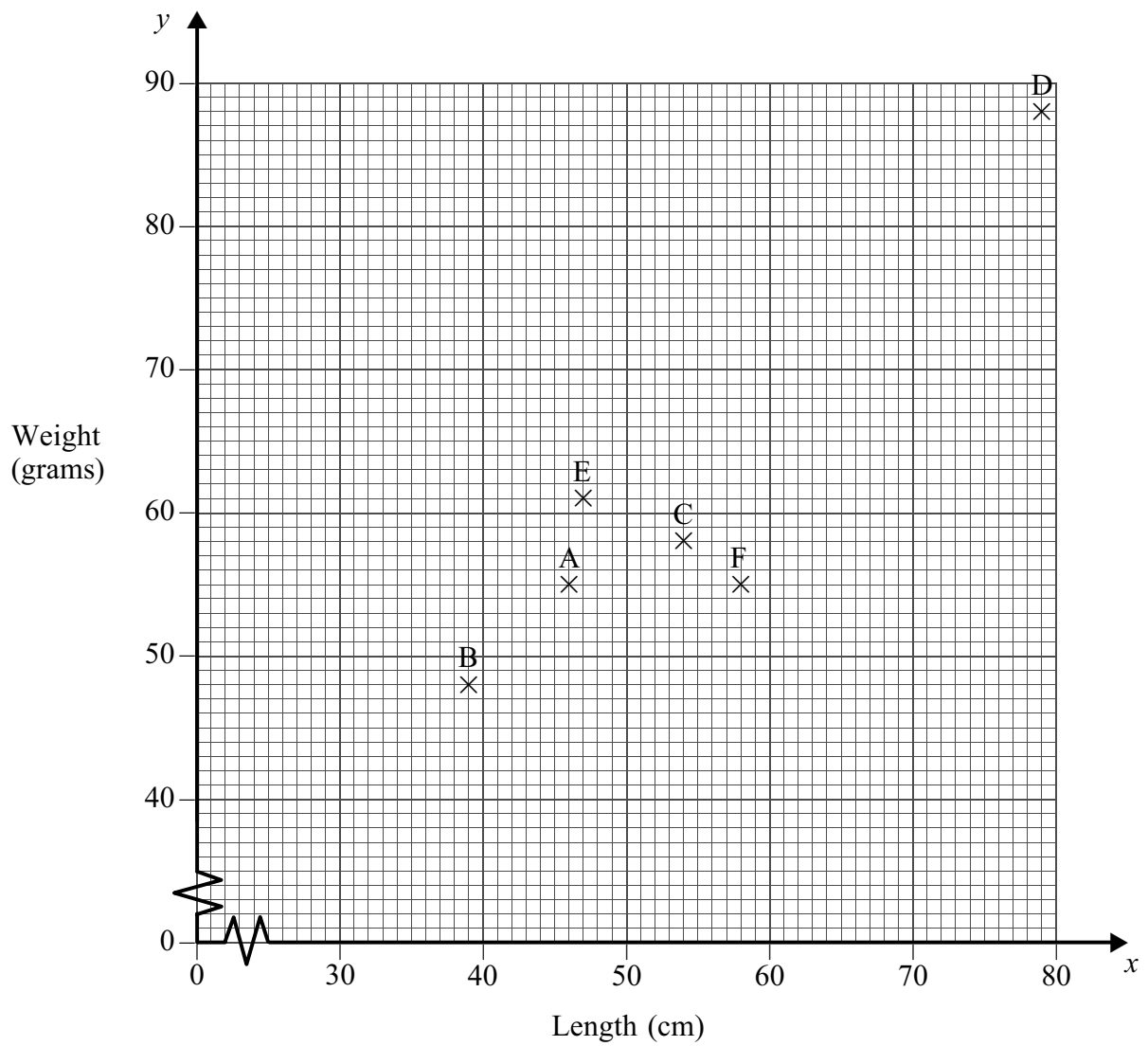
- (a) Calculate the value of the product moment correlation coefficient,  $r$ , between  $x$  and  $y$ . (3 marks)
- (b) Interpret your value in context. (2 marks)
- (c) Complete the scatter diagram, opposite, for these data. (2 marks)
- (d) Subsequently it is found that, of the 11 adult snakes, 9 are male and 2 are female.
- (i) Given that female adult snakes are generally larger than male adult snakes, identify the 2 snakes which are most likely to be female. (1 mark)
- (ii) Hence, **without further calculation**, estimate the value of  $r$  for the 9 male snakes and revise, as necessary, your interpretation in part (b). (2 marks)

QUESTION  
PART  
REFERENCE



QUESTION  
PART  
REFERENCE

(c)



Turn over ►



**3** The weight,  $X$  grams, of talcum powder in a tin may be modelled by a normal distribution with mean 253 and standard deviation  $\sigma$ .

**(a)** Given that  $\sigma = 5$ , determine:

**(i)**  $P(X < 250)$ ; (3 marks)

**(ii)**  $P(245 < X < 250)$ ; (2 marks)

**(iii)**  $P(X = 245)$ . (1 mark)

**(b)** Assuming that the value of the mean remains unchanged, determine the value of  $\sigma$  necessary to ensure that 98% of tins contain more than 245 grams of talcum powder. (4 marks)

QUESTION  
PART  
REFERENCE



QUESTION  
PART  
REFERENCE

Turn over ►



4

As part of an investigation, a chlorine block is immersed in a large tank of water held at a constant temperature. The block slowly dissolves, and its weight,  $y$  grams, is noted  $x$  days after immersion. The results are shown in the table.

$x$ days	5	10	15	20	30	40	50	60	75
$y$ grams	47	44	42	38	35	27	23	16	9

- (a) Calculate the equation of the least squares regression line of  $y$  on  $x$ . (4 marks)
- (b) Hence estimate, to the nearest gram, the initial weight of the block. (1 mark)
- (c) A company which markets the chlorine blocks claims that a block will usually dissolve completely after about 13 weeks. Comment, with justification, on this claim. (3 marks)

QUESTION  
PART  
REFERENCE





QUESTION  
PART  
REFERENCE

Turn over ►



- 5** A survey of all the households on an estate is undertaken to provide information on the number of children per household.

The results, for the 99 households with children, are shown in the table.

<b>Number of children (<math>x</math>)</b>	1	2	3	4	5	6	7
<b>Number of households (<math>f</math>)</b>	14	35	25	13	9	2	1

- (a)** For these 99 households, calculate values for:
- (i)** the median and the interquartile range; *(3 marks)*
  - (ii)** the mean and the standard deviation. *(3 marks)*
- (b)** In fact, 163 households were surveyed, of which 64 contained no children.
- (i)** For all 163 households, calculate the value for the mean number of children per household. *(2 marks)*
  - (ii)** State whether the value for the standard deviation, when calculated for all 163 households, will be smaller than, the same as, or greater than that calculated in part **(a)(ii)**. *(1 mark)*
  - (iii)** It is claimed that, for all 163 households on the estate, the number of children per household may be modelled approximately by a normal distribution.

Comment, with justification, on this claim. Your comment should refer to a fact other than the discrete nature of the data. *(2 marks)*

QUESTION  
PART  
REFERENCE



[illegible]

- | QUESTION | PART | REFERENCE |
|----------|------|-----------|
|----------|------|-----------|

[illegible]

[illegible]

(a) The number of letters per batch,  $R$ , sorted incorrectly by Mr Alott when sorting batches of 50 letters may be modelled by the distribution  $B(50, 0.15)$ .

**(i)**  $P(R < 10)$ ;

**(ii)**  $P(5 \leq R \leq 10)$ . (4 marks)

(i) Calculate the probability that, when sorting a batch of **22** letters, Miss Fewer sorts exactly 2 letters incorrectly. (3 marks)

(ii) Calculate the probability that, when sorting a batch of **35** letters, Miss Fewer sorts at least 1 letter incorrectly. (2 marks)

(iii) Calculate the mean and the variance for the number of letters sorted **correctly** by Miss Fewer when she sorts a batch of **120** letters. (2 marks)

Comment on the assumptions that the probability that Miss Fewer sorts a letter incorrectly is 0.06, and that her sorting of a letter incorrectly is independent from letter to letter. (3 marks)

QUESTION	PART	REFERENCE
----------	------	-----------



QUESTION  
PART  
REFERENCE

Turn over ►



QUESTION  
PART  
REFERENCE**END OF QUESTIONS**

Copyright © 2010 AQA and its licensors. All rights reserved.





Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

General Certificate of Education  
June 2009  
Advanced Subsidiary Examination



**MATHEMATICS**  
**Unit Statistics 1B**

**MS/SS1B**

**STATISTICS**  
**Unit Statistics 1B**

## Insert

Insert for use in **Question 2**.

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 2)****Lengths and Weights of Snakes**