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	

AQA

General Certificate of Education
Advanced Subsidiary Examination
June 2015

Statistics SS1B

Unit Statistics 1B

Wednesday 20 May 2015 9.00 am to 10.30 am

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.

Answer **all** questions.

Answer each question in the space provided for that question.

1 The number of passengers getting off the 11.45 am train at a railway station on each of 35 days is summarised as follows.

Number of passengers	6	7	8	10	11	12	14	15	18
Number of days	1	1	2	9	7	4	5	3	3

For these data:

(a) find values for the mode, the median and the interquartile range;

[4 marks]

(b) calculate the value for the mean.

[2 marks]

QUESTION PART REFERENCE

Answer space for question 1

QUESTION PART REFERENCE

Answer space for question 1

2 The length of aluminium baking foil on a roll may be modelled by a normal distribution with mean 91 metres and standard deviation 0.8 metres.

(a) Determine the probability that the length of foil on a particular roll is:

(i) less than 90 metres;

(ii) **not** exactly 90 metres;

(iii) between 91 metres and 92.5 metres.

[6 marks]

(b) The length of cling film on a roll may also be modelled by a normal distribution but with mean 153 metres and standard deviation σ metres.

It is required that 1% of rolls of cling film should have a length less than 150 metres.

Find the value of σ that is needed to satisfy this requirement.

[4 marks]

QUESTION PART REFERENCE

Answer space for question 2

QUESTION PART REFERENCE

Answer space for question 2

3 Fourteen candidates each sat two test papers, Paper 1 and Paper 2, on the same day. The marks, out of a total of 50, achieved by the students on each paper are shown in the table.

Candidate	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**
Mark on Paper 1 (x)	36	29	33	17	42	26	45	12	25	19	26	15	28	11
Mark on Paper 2 (y)	46	18	34	24	45	21	37	15	35	17	38	11	44	21

(a) (i) Calculate the value of the product moment correlation coefficient, r, between the marks on Paper 1 and those on Paper 2.

[3 marks]

(ii) Interpret your value in the context of this question.

[2 marks]

(b) It was then discovered that seven of the candidates, Group T, had been given extra tuition in preparation for the tests, whereas the other seven candidates, Group U, had been given only the usual tuition.

The summarised data for the two groups are as follows.

Group T: $r = 0.261$ $\bar{x} = 33.57$ $\bar{y} = 39.86$

Group U: $S_{xx} = 279.71$ $S_{yy} = 112.86$ $S_{xy} = 34.57$ $\bar{x} = 18.43$ $\bar{y} = 18.14$

(i) For Group U, calculate the value of r.

[2 marks]

(ii) Interpret, in the context of the question, the value of r for **each** group of candidates.

[2 marks]

(iii) Comment, with justification, on the apparent effect of the extra tuition.

[2 marks]

QUESTION PART REFERENCE

Answer space for question 3

QUESTION PART REFERENCE

Answer space for question 3

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Answer space for question 3

QUESTION PART REFERENCE

Answer space for question 3

4 (a) Chris shops at his local store on his way to and from work every Friday.

The event that he buys a morning newspaper is denoted by M, and the event that he buys an evening newspaper is denoted by E.

On any one Friday, Chris may buy neither, exactly one or both of these newspapers.

(i) Complete the table of probabilities, printed on the opposite page, where M' and E' denote the events 'not M' and 'not E' respectively.

[3 marks]

(ii) Hence, or otherwise, find the probability that, on any given Friday, Chris buys exactly one newspaper.

[2 marks]

(iii) Give a numerical justification for the following statement.

'The events M and E are **not** mutually exclusive.'

[2 marks]

(b) The event that Chris buys a morning newspaper on Saturday is denoted by S, and the event that he buys a morning newspaper on the following day, Sunday, is denoted by T. The event that he buys a morning newspaper on both Saturday and Sunday is denoted by $S \cap T$.

Each combination of the events S and T is independent of any combination of the events M and E. However, the events S and T are **not** independent, with

$$\mathrm{P}(S) = 0.85, \quad \mathrm{P}(T \mid S) = 0.20 \quad \text{and} \quad \mathrm{P}(T \mid S') = 0.75$$

Find the probability that, on a particular Friday, Saturday and Sunday, Chris buys:

(i) all four newspapers;

[2 marks]

(ii) none of the four newspapers.

[2 marks]

(c) (i) State, as briefly as possible, in the context of the question, the event that is denoted by $M \cap E' \cap S \cap T'$.

[2 marks]

(ii) Calculate the value of $\mathrm{P}(M \cap E' \cap S \cap T')$.

[2 marks]

QUESTION PART REFERENCE

Answer space for question 4

(a)(i)

	M	M'	**Total**
E	0.16		0.28
E'			
Total		0.60	1.00

QUESTION PART REFERENCE

Answer space for question 4

QUESTION PART REFERENCE

Answer space for question 4

5 The table shows the number of customers, x, and the takings, £y, recorded to the nearest £10, at a local butcher's shop on each of 10 randomly selected weekdays.

x	86	60	65	46	71	93	56	81	75	57
y	940	790	620	530	770	1050	690	780	860	550

(a) The first 6 pairs of data values in this table are plotted on the scatter diagram shown on the opposite page.

Plot the final 4 pairs of data values on the scatter diagram.

[1 mark]

(b) (i) Calculate the equation of the least squares regression line in the form $y = a + bx$ and draw your line on the scatter diagram.

[6 marks]

(ii) Interpret your value for b in the context of the question.

[2 marks]

(iii) State why your value for a has no practical interpretation.

[1 mark]

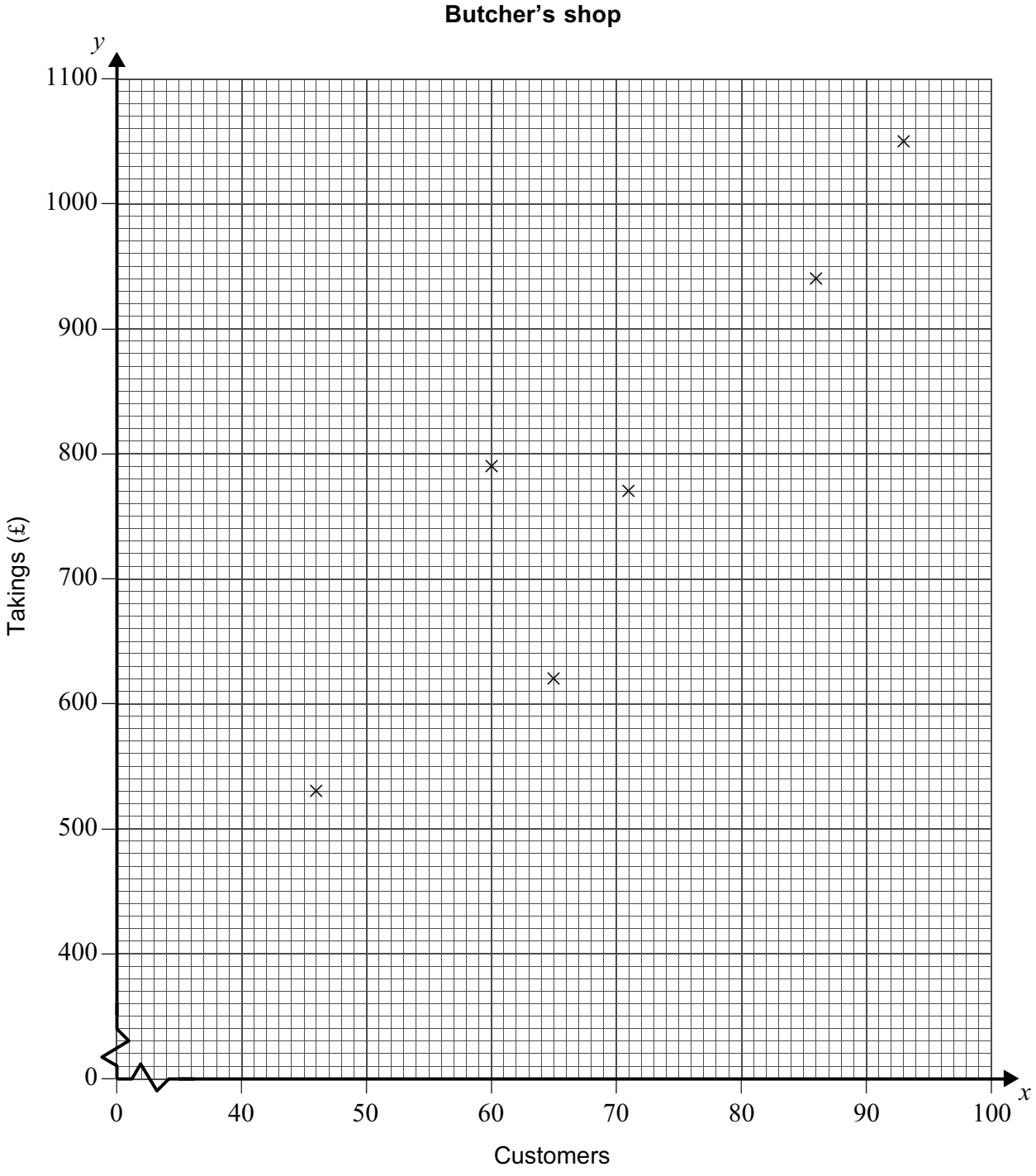
(c) Estimate, to the nearest £10, the shop's takings when the number of customers is 50.

[1 mark]

QUESTION PART REFERENCE

Answer space for question 5

Answer space for question 5



QUESTION PART REFERENCE

QUESTION PART REFERENCE

Answer space for question 5

QUESTION PART REFERENCE

Answer space for question 5

6 Customers at a supermarket can pay at a checkout either by cash, debit card or credit card.

(a) The probability that a customer pays by cash is 0.22.

Calculate the probability that exactly 2 customers from a random sample of 24 customers pay by cash.

[3 marks]

(b) The probability that a customer pays by debit card is 0.45.

Determine the probability that the number of customers who pay by debit card from a random sample of **40** customers is:

(i) fewer than 20;

(ii) more than 15;

(iii) at least 12 but at most 24.

[6 marks]

(c) The random variable W denotes the number of customers who pay by **credit card** from a random sample of **200** customers.

Calculate values for the mean and the variance of W.

[3 marks]

QUESTION PART REFERENCE

Answer space for question 6

QUESTION PART REFERENCE

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Answer space for question 6

QUESTION PART REFERENCE

Answer space for question 6

7 (a) A greengrocer displays apples in trays. Each customer selects the apples he or she wishes to buy and puts them into a bag.

Records show that the weight of such bags of apples may be modelled by a normal distribution with mean $1.16\,\text{kg}$ and standard deviation $0.43\,\text{kg}$.

Determine the probability that the **mean** weight of a random sample of 10 such bags of apples exceeds $1.25\,\text{kg}$.

[4 marks]

(b) The greengrocer also displays pears in trays. Each customer selects the pears he or she wishes to buy and puts them into a bag.

A random sample of 40 such bags of pears had a mean weight of $0.86\,\text{kg}$ and a standard deviation of $0.65\,\text{kg}$.

(i) Construct a **96%** confidence interval for the mean weight of a bag of pears.

[4 marks]

(ii) Hence comment on a claim that customers wish to buy, on average, a greater weight of apples than of pears.

[2 marks]

QUESTION PART REFERENCE

Answer space for question 7

QUESTION PART REFERENCE

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Answer space for question 7

END OF QUESTIONS