Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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

General Certificate of Education
Advanced Subsidiary Examination
June 2012

Mathematics MS/SS1A/W
Unit Statistics 1A

Statistics
Unit Statistics 1A

Friday 18 May 2012 9.00 am to 10.15 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 15 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 60.
- Unit Statistics 1A has a **written paper and coursework**.

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

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Answer **all** questions.

Answer each question in the space provided for that question.

1 Steve, an employee at *HFM* gentlemen's hairdressers, was thinking of purchasing the business from the current owner, Keith.

Prior to deciding whether or not to purchase the business, Steve counted the daily number of customers, x, for a period of 25 days, with the following results.

x	18	20	23	24	28	30	32	35	36	38	**Total**
f	1	1	1	3	6	3	5	3	1	1	25

(a) Calculate the mean number of customers per day. *(2 marks)*

(b) Steve also noted that, of the above customers, 219 were children who paid £5.50 each, 73 were seniors who paid £6.50 each and 438 were adults who paid £9.50 each.

Calculate, in £, the mean takings per day. *(2 marks)*

(c) Steve estimated that, in order to make a success of the business, he would need an average of more than 28 customers per day **and** average takings of at least £250 per day.

Using your answers from parts **(a)** and **(b)**, advise Steve as to whether or not he should purchase the business. Give numerical justification for your answer.

(2 marks)

QUESTION PART REFERENCE

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QUESTION PART REFERENCE

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2 The table shows the maximum weight, y_A grams, of *Salt A* that will dissolve in 100 grams of water at various temperatures, x °C.

x	10	15	20	25	30	35	40	45	50	60	70	80
y_A	20	35	48	57	77	92	101	111	121	137	159	182

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

(b) The data in the above table are plotted on the scatter diagram on the opposite page.

Draw your regression line on this scatter diagram. *(2 marks)*

(c) For water temperatures in the range 10 °C to 80 °C, the maximum weight, y_B grams, of *Salt B* that will dissolve in 100 grams of water is given by the equation

$$y_B = 60.1 + 0.255x$$

(i) Draw this line on the scatter diagram. *(2 marks)*

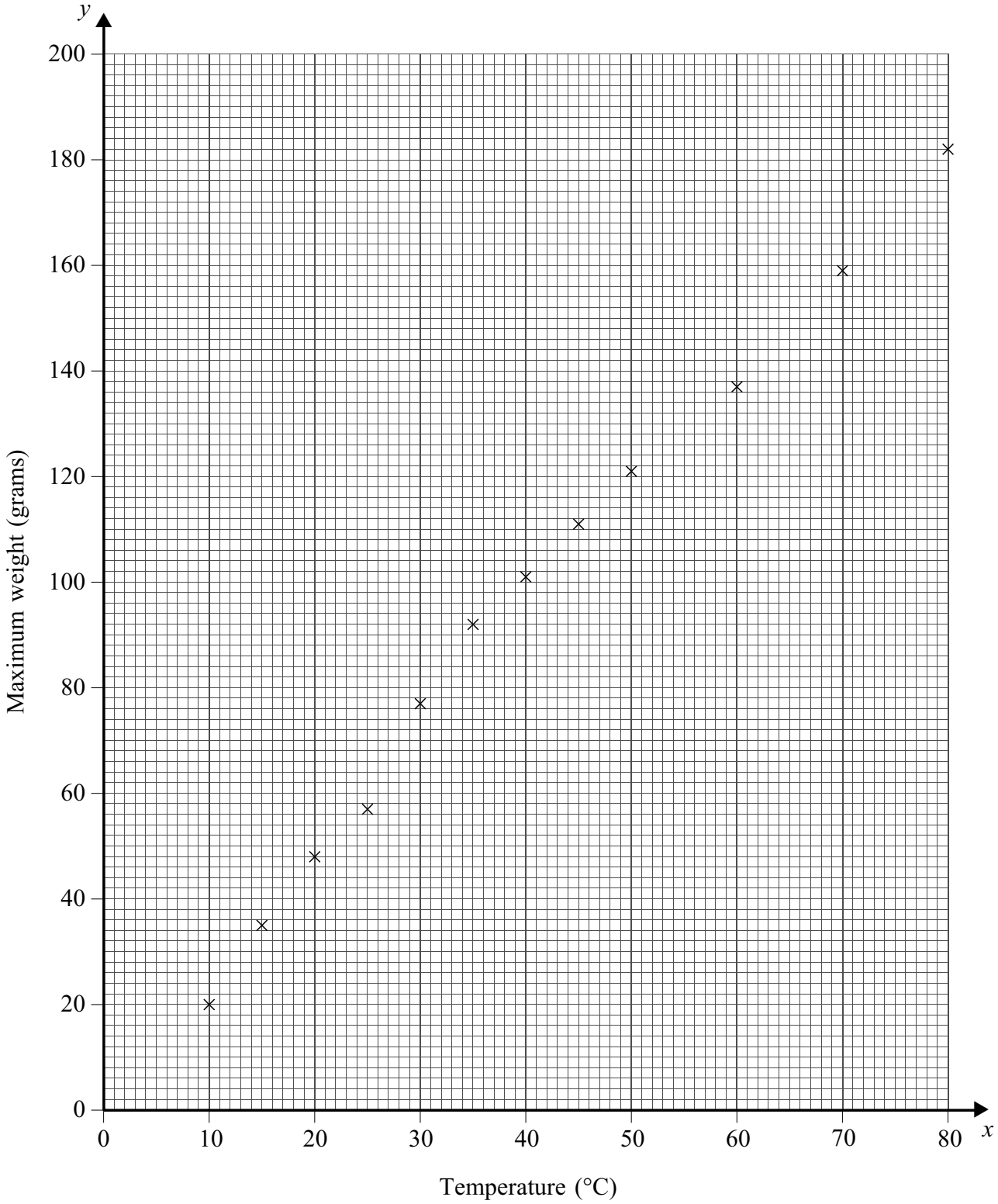
(ii) Estimate the water temperature at which the maximum weight of *Salt A* that will dissolve in 100 grams of water is the same as that of *Salt B*. *(1 mark)*

(iii) For *Salt A* and *Salt B*, compare the effects of water temperature on the maximum weight that will dissolve in 100 grams of water. Your answer should identify **two** distinct differences. *(2 marks)*

QUESTION PART REFERENCE

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Temperatures and Maximum Weights



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QUESTION PART REFERENCE

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3 A survey of the 640 properties on an estate was undertaken. Part of the information collected related to the number of bedrooms and the number of toilets in each property.

This information is shown in the table.

		Number of toilets				
		1	**2**	**3**	**4 or more**	**Total**
Number of bedrooms	**1**	46	14	0	0	60
	2	24	67	23	0	114
	3	7	72	99	16	194
	4	0	19	123	48	190
	5 or more	0	0	11	71	82
	Total	77	172	256	135	640

(a) A property on the estate is selected at random.

Find, giving your answer to three decimal places, the probability that the property has:

(i) exactly 3 bedrooms; *(1 mark)*

(ii) at least 2 toilets; *(2 marks)*

(iii) exactly 3 bedrooms and at least 2 toilets; *(2 marks)*

(iv) at most 3 bedrooms, given that it has exactly 2 toilets. *(3 marks)*

(b) Three properties are selected at random from those on the estate which have exactly 3 bedrooms.

Calculate the probability that one property has 2 toilets, one has 3 toilets and the other has at least 4 toilets. Give your answer to three decimal places. *(4 marks)*

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QUESTION PART REFERENCE

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4 A bank issues three versions of its credit card: classic, gold and platinum. A customer's application for a credit card may be refused because of the customer's poor credit rating.

(a) The proportion of customers who are refused the classic version of the bank's credit card is 0.275 .

Calculate the probability that, from a random sample of 10 customers applying for the classic version, exactly 2 applications are refused. *(3 marks)*

(b) The proportion of customers who are refused the gold version of the bank's credit card is 0.65 .

Determine the probability that, from a random sample of 40 customers applying for the gold version, the number of applications that are **accepted** is:

(i) no more than 15 ; *(2 marks)*

(ii) at least 10 but at most 20 . *(3 marks)*

(c) The proportion of customers who are refused the platinum version of the bank's credit card is 0.85 .

Determine the probability that, from a random sample of 50 customers applying for the platinum version, more than 40 applications are refused. *(3 marks)*

QUESTION PART REFERENCE

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QUESTION PART REFERENCE

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5 A general store sells lawn fertiliser in 2.5 kg bags, 5 kg bags and 10 kg bags.

(a) The actual weight, W kilograms, of fertiliser in a 2.5 kg bag may be modelled by a normal random variable with mean 2.75 and standard deviation 0.15.

Determine the probability that the weight of fertiliser in a 2.5 kg bag is:

(i) less than 2.8 kg;

(ii) more than 2.5 kg. *(5 marks)*

(b) The actual weight, X kilograms, of fertiliser in a 5 kg bag may be modelled by a normal random variable with mean 5.25 and standard deviation 0.20.

(i) Show that $P(5.1 < X < 5.3) = 0.372$, correct to three decimal places. *(2 marks)*

(ii) A random sample of **four** 5 kg bags is selected. Calculate the probability that none of the four bags contains between 5.1 kg and 5.3 kg of fertiliser. *(2 marks)*

(c) The actual weight, Y kilograms, of fertiliser in a 10 kg bag may be modelled by a normal random variable with mean 10.75 and standard deviation 0.50.

A random sample of **six** 10 kg bags is selected. Calculate the probability that the mean weight of fertiliser in the six bags is less than 10.5 kg. *(4 marks)*

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6 The volume of bleach in a 5-litre bottle may be modelled by a random variable with a standard deviation of 75 millilitres.

The volume, in litres, of bleach in each of a random sample of 36 such bottles was measured. The 36 measurements resulted in a mean volume of 5.05 litres and exactly 8 bottles contained less than 5 litres.

(a) Construct a 98% confidence interval for the mean volume of bleach in a 5-litre bottle. *(4 marks)*

(b) It is claimed that the mean volume of bleach in a 5-litre bottle exceeds 5 litres and also that fewer than 10 per cent of such bottles contain less than 5 litres.

Comment, with numerical justification, on **each** of these two claims. *(3 marks)*

QUESTION PART REFERENCE

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QUESTION PART REFERENCE

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END OF QUESTIONS

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