General Certificate of Education
Advanced Subsidiary Examination
January 2013

Mathematics MS/SS1B

Unit Statistics 1B

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.

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)*

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2 The volume of *Everwhite* toothpaste in a pump-action dispenser may be modelled by a normal distribution with a mean of 106 ml and a standard deviation of 2.5 ml.

Determine the probability that the volume of *Everwhite* in a randomly selected dispenser is:

(a) less than 110 ml; *(3 marks)*

(b) more than 100 ml; *(2 marks)*

(c) between 104 ml and 108 ml; *(3 marks)*

(d) **not** exactly 106 ml. *(1 mark)*

3 *Stopoff* owns a chain of hotels. Guests are presented with the bills for their stays when they check out.

(a) Assume that the number of bills that contain errors may be modelled by a binomial distribution with parameters n and p, where $p = 0.30$.

Determine the probability that, in a random sample of 40 bills:

(i) at most 10 bills contain errors;

(ii) at least 15 bills contain errors;

(iii) exactly 12 bills contain errors. *(6 marks)*

(b) Calculate the mean and the variance for **each** of the distributions B(16, 0.20) and B(16, 0.125). *(3 marks)*

(c) Stan, who is a travelling salesperson, always uses *Stopoff* hotels. He holds one of its diamond customer cards and so should qualify for special customer care. However, he regularly finds errors in his bills when he checks out.

Each month, during a 12-month period, Stan stayed in *Stopoff* hotels on exactly 16 occasions. He recorded, each month, the number of occasions on which his bill contained errors. His recorded values were as follows.

2 1 4 3 1 3 0 3 1 0 5 1

(i) Calculate the mean and the variance of these 12 values. *(2 marks)*

(ii) Hence state with reasons which, if either, of the distributions B(16, 0.20) and B(16, 0.125) is likely to provide a satisfactory model for these 12 values. *(3 marks)*

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)*

(b) (i) Give **two** possible advantages of plotting data on a graph before calculating the value of a product moment correlation coefficient. *(2 marks)*

(ii) Complete the plotting of Ashok's data on the scatter diagram on page 5. *(2 marks)*

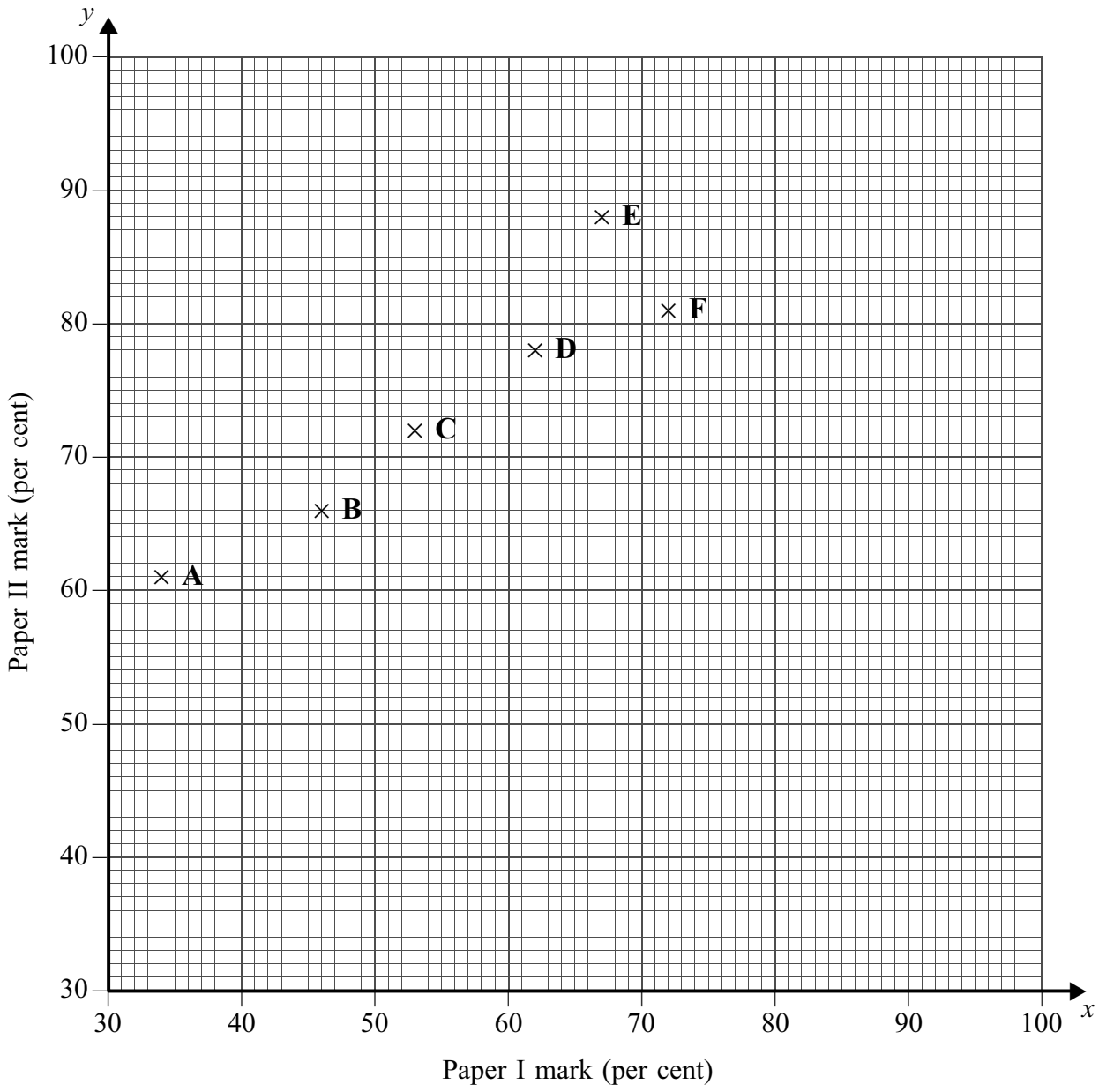
(iii) State what is now revealed by the scatter diagram. *(1 mark)*

(c) Ashok subsequently discovers that students A to F have a more scientific background than students G to L.

With reference to your scatter diagram, estimate the value of the product moment correlation coefficient for **each** of the two groups of students. You are **not** expected to calculate the two values. *(2 marks)*

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

Examination Marks



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)

6 (a) The length of one-metre galvanised-steel straps used in house building may be modelled by a normal distribution with a mean of 1005 mm and a standard deviation of 15 mm.

The straps are supplied to house builders in packs of 12, and the straps in a pack may be assumed to be a random sample.

Determine the probability that the **mean** length of straps in a pack is less than one metre. *(4 marks)*

(b) Tania, a purchasing officer for a nationwide house builder, measures the **thickness**, x millimetres, of each of a random sample of 24 galvanised-steel straps supplied by a manufacturer. She then calculates correctly that the value of $\bar{x}$ is 4.65 mm.

(i) Assuming that the thickness, X mm, of such a strap may be modelled by the distribution $N(\mu, 0.15^2)$, construct a 99% confidence interval for μ. *(4 marks)*

(ii) Hence comment on the manufacturer's specification that the mean thickness of such straps is greater than 4.5 mm. *(2 marks)*

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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)*

Key to mark scheme abbreviations

M	mark is for method
m or dM	mark is dependent on one or more M marks and is for method
A	mark is dependent on M or m marks and is for accuracy
B	mark is independent of M or m marks and is for method and accuracy
E	mark is for explanation
√or ft or F	follow through from previous incorrect result
CAO	correct answer only
CSO	correct solution only
AWFW	anything which falls within
AWRT	anything which rounds to
ACF	any correct form
AG	answer given
SC	special case
OE	or equivalent
A2,1	2 or 1 (or 0) accuracy marks
–*x* EE	deduct *x* marks for each error
NMS	no method shown
PI	possibly implied
SCA	substantially correct approach
c	candidate
sf	significant figure(s)
dp	decimal place(s)

No Method Shown

Where the question specifically requires a particular method to be used, we must usually see evidence of use of this method for any marks to be awarded.

Where the answer can be reasonably obtained without showing working and it is very unlikely that the correct answer can be obtained by using an incorrect method, we must award **full marks**. However, the obvious penalty to candidates showing no working is that incorrect answers, however close, earn **no marks**.

Where a question asks the candidate to state or write down a result, no method need be shown for full marks.

Where the permitted calculator has functions which reasonably allow the solution of the question directly, the correct answer without working earns **full marks**, unless it is given to less than the degree of accuracy accepted in the mark scheme, when it gains **no marks**.

Otherwise we require evidence of a correct method for any marks to be awarded.

MS/SS1B

Q	Solution	Marks	Total	Comments
1 (a)	a = **30**	B1	**1**	CAO
(b)(i)	b (gradient) = **–0.64** b (gradient) = **–0.6 to –0.7**	B2 (B1)		CAO (–0.64) AWFW *Treat rounding of correct answers as ISW* *Written form of equation is **not** required*
	a (intercept) = **31** a (intercept) = **30 to 32**	B2 (B1)		CAO (31) AWFW
	Attempt at $\sum x$ $\sum x^2$ $\sum y$ & $\sum xy$ $\left(\sum y^2\right)$ **or** Attempt at S_{xx} & S_{xy} $\left(S_{yy}\right)$ Attempt at **correct** formula for b (gradient) b (gradient) = **–0.64** a (intercept) = **31**	(M1) (m1) (A1 A1)	**4**	225 7125 135 & **2415** (2643) (all 4 attempted) 1500 & **–960** (618) (both attempted) CAO both
(ii)	Candle **length reduces** by **0.64 (**cm) **per hour** Candle **burns 0.64 (**cm) **each/per hour** Candle **reduces** by **–0.64 (**cm) **each/per hour**	B1 BF1 (BF2) (BF1)		OE; must be in context OE; must be in context OE; must be in context OE; must be in context (double –ve) F on $-0.6 \le b \le -0.7$ from (i)
	(Length, y, cm) **decreases** with (time, x, hours) **or** As (time, x, hours) **increases** then (length, y, cm) **decreases**	(B1)	**2**	OE; context **not** required B0 for reference only to correlation
(iii)	When x = 50, y = (31 or 30) – 0.64 × 50 = **–1 or –2** **or** When y = 0, x = 31 ÷ 0.64 = **48 to 48.5** **or** 30 ÷ 0.64 = **46.8 to 47**	B1		CAO; accept **correct** comparison of 32 with either 30 or 31 AWFW AWFW
	Claim **not** justified **or** –1 is impossible **or** value < 50 Claim cannot be answered due to uneven burning **or** unlikely to burn completely	Bdep1 (B1)	**2**	OE; dependent on previous B1 Extrapolation required
			9	

MS/SS1B (cont)

Q	Solution	Marks	Total	Comments
2				**In (a), ignore the inclusion of a lower limit of 0; it has no effect on the answer**
	Volume, $V \sim N(106, 2.5^2)$			
(a)	$P(V < 110) = P\left(Z < \frac{110-106}{2.5}\right)$	M1		Standardising 110 with 106 and 2.5; allow $(106 - 110)$
	$= P(Z < \underline{\mathbf{1.6}})$	A1		CAO; ignore inequality and sign May be implied by a **correct** answer
	$= \underline{\mathbf{0.945}}$	A1	**3**	AWRT (0.94520)
(b)	$P(V > 100) = P(Z > -2.4) = P(Z < +2.4)$	M1		**Correct** area change May be implied by a **correct** answer **or** by an answer **> 0.5**
	$= \underline{\mathbf{0.991 \text{ to } 0.992}}$	A1	**2**	AWFW (0.99180)
(c)	$P(104 < V < 108) = P(-a < Z < a) =$			
	$P(Z < a) - (1 - P(Z < a))$ **or** $2 \times P(Z < a) - 1$	M1		OE; $a = 0.8$ is **not** a requirement May be implied by **0.788 seen** **or** by a **correct** answer
	$= 0.788 - (1 - 0.788) = 0.788 - 0.212$ **or** $= 2 \times 0.788 - 1$	A1		AWRT (0.78814/0.21186) Condone 0.211 May be implied by a **correct** answer
	$= \underline{\mathbf{0.576}}$	A1	**3**	AWRT (0.57628)
(d)	$P(V \neq 106) = \underline{\mathbf{1 \text{ or one or unity or } 100\%}}$	B1	**1**	CAO; accept nothing else but ignore additional words providing they are not contradictory (eg certain so = 1)
		Total	**9**	

MS/SS1B (cont)

Q	Solution	Marks	Total	Comments
3				
(a)	$\underline{E \sim B(40, 0.30)}$	M1		Used anywhere in (a) even only by implication from a **correct** value
(i)	$P(E \leq 10) = \underline{\mathbf{0.308 \text{ to } 0.309}}$	A1	**(2)**	AWFW (0.3087)
SC	For calc^{n} of individual terms: award B2 for answer within above range; award B1 for answer within range 0.3 to 0.32			
(ii)	$P(E \geq 15) = \underline{\mathbf{1 - (0.8074 \text{ or } 0.8849)}}$	M1		Requires '1 –' Accept 3 dp rounding or truncation Can be implied by 0.192 to 0.193 but **not** by 0.115 to 0.116
	$= \underline{\mathbf{0.192 \text{ to } 0.193}}$	A1	**(2)**	AWFW (0.1926)
SC	For calc^{n} of individual terms: award B2 for answer within above range; award B1 for answer within range 0.18 to 0.2			
(iii)	$P(E \leq 12) = \mathbf{0.5772 - 0.4406}$ **or** $P(E \leq 12) = \binom{40}{12}0.3^{12}0.7^{28}$	M1		Accept 3 dp rounding or truncation Correct expression; may be implied by a **correct** answer
	$= \underline{\mathbf{0.136 \text{ to } 0.138}}$	A1	**(2)**	AWFW (0.1366)
			6	
(b)	Means = $\underline{\mathbf{3.2 \text{ and } 2}}$	B1		CAO both **values**; ignore notation *If not labelled, assume order in question*
	Variances = $\underline{\mathbf{2.56 \text{ and } 1.75}}$	B1 B1	**3**	CAO each **value**; ignore notation ISW all subsequent working
(c)(i)	Mean = $\underline{\mathbf{2}}$	B1		CAO **value**; ignore notation
	Variance = $\underline{\mathbf{2.54 \text{ to } 2.55 \text{ or } 2.33 \text{ to } 2.34}}$ (SD = 1.59 to 1.6 or 1.52 to 1.53)	B1	**2**	Any **value** within either range; ignore notation ISW all subsequent working
(ii)	$\underline{B(16, 0.20)}$ **or** $\underline{\text{eg "One dist}^{n}\text{"}}$ **Different/larger** mean **Similar/same** variance or standard deviation	Bdep1		Identification of distribution **not** required Both; dep on 3.2, 2.56 /1.6 & (c)(i)
	$\underline{B(16, 0.125)}$ **or** $\underline{\text{eg "Other dist}^{n}\text{"}}$ **Equal/same** mean D**ifferent/smaller** variance or standard deviation	Bdep1		Identification of distribution **not** required Both; dep on 2, 1.75/1.3 & (c)(i)
	Neither likely to provide satisfactory model	Bdep1	**3**	Dep on Bdep1 and on Bdep1
SC	Award Bdep1 Bdep0 Bdep0 for comparison of 3 correct means only **or** for comparison of 3 correct variances/SDs only Award up to Bdep1 Bdep1 Bdep1 for comparison of 3 correct means **and** for comparison of 3 correct variances/SDs			
		Total	**14**	

MS/SS1B (cont)

Q	Solution	Marks	Total	Comments
4(a) (i)	r = **–0.326 to –0.325** r = **–0.33 to –0.32** r = **–0.4 to –0.2** r = **0.2 to 0.4**	B3 (B2) (B1) (B1)		AWFW (–0.32569) AWFW AWFW AWFW
	Attempt at $\sum x$ $\sum x^2$ $\sum y$ $\sum y^2$ & $\sum xy$ **or** Attempt at S_{xx} S_{yy} & S_{xy} Attempt at substitution into **correct** corresponding formula for r r = **–0.326 to –0.325**	(M1) (m1) (A1)	**3**	756 50004 738 48200 & **45652** (all 5 attempted) 2376 2813 & **–842** (all 3 attempted) AWFW
(ii)	**Some/little/slight/(fairly/quite) weak/ (fairly/quite) moderate** **negative** (linear) **correlation**/relationship/ association/link (*but not 'trend'*) between **marks/percentages** in the two examination papers	Bdep1 B1	**2**	Dependent on **–0.4 ≤ *r* ≤ –0.2** OE; must **qualify strength** and **state negative** Ignore extra words unless contradict Bdep0 for 'low', 'small', 'poor', 'unlikely', 'medium', 'average', or adjective 'very' Context; providing **–1 < *r* < 1**
(b)(i)	Identifying linear patterns/non-linear patterns/ multiple patterns/no pattern (*allow 'trend'*) Identifying outliers/anomalies Estimating/gives idea of value of *r*/sign of *r*	 B2,1 	**2**	 OE; only one mark from each set B0 for reference to **checking** calculated value
(ii)	**Graph** (**6** labelled points correct) (**5 or 4** labelled points correct)	B2 (B1)	**2**	Correct ⇒ within a circle of radius equal to distance between 2 grid lines Deduct 1 mark for any unlabelled or incorrectly labelled point
(iii)	**Two** separate correlations/relationships/lines/ associations/links/sets of data (*but not 'trends'*)	B1	**1**	OE; eg A to F and G to L
(c)	A to F: **(+)0.7 to (+)0.99** G to L: **–0.9 to –0.5**	B1 B1	**2**	AWFW; allow calculation (0.937) *If not labelled, assume order A to F then G to L* AWFW; allow calculation (–0.757)
		Total	**12**	

MS/SS1B (cont)

Q	Solution	Marks	Total	Comments
5				**Ratios (eg 3:10) are only penalised by 1 accuracy mark at first correct answer**
(a)(i)	P(F & C) = **0.3 or 3/10 or 30%**	B1	**(1)**	CAO (0.3)
(ii)	P(G or S) = **0.45 or 45/100 or 45%**	B1	**(1)**	CAO (0.45)
(iii)	$P(C \mid F) = \frac{0.3 \text{ or } (i)}{0.55} =$	M1		
	30/55 or 6/11	A1		CAO (6/11)
	or			
	(0.54 to 0.55) or (54% to 55%)		**(2)**	AWFW (0.54545)
(iv)	$P(R' \mid D) = \frac{0.25 \text{ or } (0.30-0.05)}{0.30}$	M1 M1		Correct numerator Correct denominator
	25/30 or 5/6	A1		CAO (5/6)
	or			
	(0.83 to 0.834) or (83% to 83.4%)		**(3)**	AWFW (0.83333)
(v)	$P(F \mid C') = \frac{0.25 \text{ or } (0.60-0.35)}{0.60}$	M1		Correct expression
	25/60 or 5/12	A1		CAO (5/12)
	or			
	(0.416 to 0.42) or (41.6% to 42%)		**(2, 3)**	AWRT (0.41667)
			9	
(b)	$P = [P(F \& C)]^2 + [P(F \& G)]^2$	M1		Attempt at **sum of at least 2 squared terms; 0 < term < 1**; not $(a+b)^2$ May be implied by a **correct** expression or a **correct** answer
	$0.30^2 + 0.25^2$ **or** $0.09 + 0.0625 =$	A1		OE Ignore additional terms or integer multipliers May be implied by a **correct** answer
	1525/10000 or 305/2000 or 61/400	A1		CAO (0.1525)
	or			
	(0.152 to 0.153) or (15.2% to 15.3%)		**3**	AWFW
		Total	**12**	

MS/SS1B (cont)

Q	Solution	Marks	Total	Comments
6 (a)	$L \sim N(1005, 15^2)$			
	V(pack) = **$15^2/12$ or 225/12 or 75/4**	B1		CAO
	or **18.7 to 18.8**			AWFW (18.75)
	OR SD (pack) = **$15/\sqrt{12}$ or $15/2\sqrt{3}$ or $5\sqrt{3}/2$**			CAO; OE
	or **4.3 to 4.4**			AWFW (4.33013)
	$P(L < 1000) = P\left(\frac{1000-1005}{15/\sqrt{12}}\right) =$	M1		Standardising 1000 using 1005 and **$15/\sqrt{12}$ OE**; allow (1005 – 1000)
	$P(Z < -1.1547) = 1 - P(Z < 1.1547) =$	m1		**Correct** area change May be implied by a correct answer **or** an answer **< 0.5**
	1 – (0.87698 to 0.87493) = **0.123 to 0.126**	A1	**4**	AWFW (0.12411) (1 – answer) ⇒ B1 M1 max
(b)(i)	99% (0.99) ⇒ z = **2.57 to 2.58**	B1		AWFW (2.5758)
	CI for μ is $\bar{x} \pm z \times \frac{\sigma}{\sqrt{n}}$	M1		Used with z (2.05 to 2.58), $\bar{x}$ (4.65) & σ (0.15) and $\div\sqrt{n}$ with $n > 1$
	Thus $4.65 \pm 2.5758 \times \frac{0.15}{\sqrt{24}}$	A1		z (2.05 to 2.06 or 2.32 to 2.33 or 2.57 to 2.58), $\bar{x}$ (4.65) & σ (0.15) and $\div\sqrt{24 \text{ or } 23 \text{ or } 12 \text{ or } 11}$
	Hence **4.65 ± 0.08**			CAO/AWRT
	OR	A1		
	(4.57, 4.73)		**4**	AWRT
(b)(ii)	**Clear correct comparison** of **4.5** with **LCL or CI** (eg 4.5 < LCL or its value or 4.5 < CI or its limits	BF1		F on CI only providing LCL > 4.5 (ie whole of CI > 4.5) Quoting values for LCL or for CI is **not** required BF0 for '4.5 is outside CI'; OE
	so **Agree** with manufacturer's specification	Bdep1	**2**	OE; dependent on previous BF1
		Total	**10**	

MS/SS1B (cont)

Q	Solution	Marks	Total	Comments
7 (a)	$\sigma \approx \frac{10}{a}$ **or** $\frac{20}{b}$ **or** $\frac{\text{range}}{b}$ **or** $10c$ **or** $20d$	M1		OE; with $2 \le a \le 4$ $4 \le b \le 8$ **or** with c or d in equiv percentages **Cannot** be implied from a **correct** answer (justification required)
	2.5 or 3.3(OE) or 5	A1	**2**	
SC	Award B1 for only **2.5 or 3.3(OE) or 5** with no justification Award B0 for any other answer with no justification or with incorrect justification (eg $\sqrt{10} = 3.16$)			
(b)	**Valid statement** involving: 391 and 405 **OR** 401 and 415 **OR** 24 and 10 **OR** 391 and 415 and 10/24 with linking statement	B1		Allow 'set weight' to imply 415 and/or 'mean' to imply 391 B0 for 10 linked to σ
	95.5 > (**value** of σ of **2.5 or 3.3(OE) or 5**)	B1		Accept $\neq$ rather than > **Clear correct numerical** comparison
	Neither (likely to be) **correct**	Bdep1	**3**	Dependent on B1 B1
(c)	Mean **or** $\bar{y} = \frac{8210.0}{10} =$ **821** **OR** $\sum y =$ **8200**	B1		CAO;
	Variance $\frac{110.00}{9} =$ **12.2** **or** $\frac{110.00}{10} =$ **11** **OR** SD **3.5 or 3.3**	B1		AWRT CAO Award on **value**; ignore notation AWRT
	821 **is similar to/within 10 of** 820 **OR** 8210 **is within 100 of** 8200	B1		OE; **clear correct numerical** comparison of **821** with **820** Allow 'set weight' to imply 820 **Or** OE; **clear correct numerical** comparison of **8210** with **8200** but do **not** accept 'within 10' here
	3.5 **or** 3.3 is **similar to** **a value** of σ of **3.3(OE) or 2.5**	B1	**4**	**Clear correct numerical** comparison
		Total	**9**	
	TOTAL		**75**	

Scaled mark unit grade boundaries - January 2013 exams

A-level

Code	Title	Maximum Scaled Mark	Scaled Mark Grade Boundaries and A* Conversion Points					
			A*	A	B	C	D	E
LAW03	LAW UNIT 3	80	66	60	54	48	43	38
MD01	MATHEMATICS UNIT MD01	75	-	63	57	52	47	42
MD02	MATHEMATICS UNIT MD02	75	68	62	55	49	43	37
MFP1	MATHEMATICS UNIT MFP1	75	-	69	61	54	47	40
MFP2	MATHEMATICS UNIT MFP2	75	67	60	53	47	41	35
MFP3	MATHEMATICS UNIT MFP3	75	68	62	55	48	41	34
MFP4	MATHEMATICS UNIT MFP4	75	68	61	53	45	37	30
MM1B	MATHEMATICS UNIT MM1B	75	-	58	52	46	40	35
MM2B	MATHEMATICS UNIT MM2B	75	66	59	52	46	40	34
MPC1	MATHEMATICS UNIT MPC1	75	-	64	58	52	46	40
MPC2	MATHEMATICS UNIT MPC2	75	-	62	55	48	41	35
MPC3	MATHEMATICS UNIT MPC3	75	69	63	56	49	42	36
MPC4	MATHEMATICS UNIT MPC4	75	58	53	48	43	38	34
MS1A	MATHEMATICS UNIT MS1A	100	-	78	69	60	52	44
MS/SS1A/W	*MATHEMATICS UNIT S1A - WRITTEN*	*75*		*58*				*34*
MS/SS1A/C	*MATHEMATICS UNIT S1A - COURSEWORK*	*25*		*20*				*10*
MS1B	MATHEMATICS UNIT MS1B	75	-	60	54	48	42	36
MS2B	MATHEMATICS UNIT MS2B	75	70	66	58	50	42	35
MEST1	MEDIA STUDIES UNIT 1	80	-	54	47	40	33	26
MEST2	MEDIA STUDIES UNIT 2	80	-	63	54	45	36	28
MEST3	MEDIA STUDIES UNIT 3	80	68	58	48	38	28	18
MEST4	MEDIA STUDIES UNIT 4	80	74	68	56	45	34	23