AQA

AS
Mathematics

MS1B Statistics 1B
Mark scheme

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Version 1.0: Final Mark Scheme

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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.

General Notes for MS1B

GN1 There is no allowance for misreads (MR) or miscopies (MC) unless specifically stated in a question.

GN2 In general, a correct answer (to accuracy required) without working scores full marks but an incorrect answer (or an answer not to required accuracy) scores no marks.

GN3 In general, a correct answer (to accuracy required) without units scores full marks.

GN4 When applying AWFW, a slightly inaccurate numerical answer that is subsequently rounded to fall within the accepted range cannot be awarded full marks.

GN5 Where percentage equivalent answers are permitted in a question, then penalise by **one accuracy mark** at the first **correct** answer but only if no indication of percentage (eg %) is shown.

GN6 In questions involving probabilities, do **not** award **accuracy** marks for answers given in the form of a ratio or odds such as 13/47 given as 13:47 or 13:34 .

GN7 Accept decimal answers, providing that they have **at least two** leading zeros, in the form $c \times 10^{-n}$ (eg 0.00321 as 3.21×10^{-3}) .

GN8 **Where a candidate's response to a part of a question is simply to label the part (eg (d)(i)) with nothing else (ie no attempt at a solution), then this is still treated as a response and marked as 0 rather than NR. Also, deleted work, if not replaced, should be marked and not treated as NR.**

Specific Notes for MS1B

1. Question 2
Unless clearly identified assume that the order is 'measure of average' then 'measure of spread'.
Marks of B0 B0 in (b) have major implications as to the marks available in (c) using the SC.

2. Question 3
Despite the answers to (a)(v) and (b) not being exact, the final accuracy marks are CAO (3 dp) and CAO (3 sf) respectively.

3. Question 4
Take care not to miss the awarding of B1 for the SC in (b).

4. Question 5
In (a)(iii), the mark is either B2 or B0.
Take careful note of Notes 1, 2 and 3 after (c)(ii); the switching of answers is not unusual nor are confused answers. Thus, for example, 0.99 to 0.995 is seen in (i), and 0.84 or (0.99 to 0.995) followed by $(0.99 \text{ to } 0.995)^6$ is seen in (ii); the latter step is **not** ISW.

5. Question 6
In (a)(iii) and (a)(iv) the B1 for the value of p can be inferred from a probability. Thus, for example, in (a)(iii), the probability of 0.9405 scores B1 and 0.059 to 0.06 scores B1 M1.

6. Question 7
If B1* is not scored in (b)(i), then it can be scored in (b)(ii) for 166 to 167 or, by inference, from 17.5 or 20 (OE) or 7 or 8.
In (b)(i), statements of the form "€400 is £333.33. **It** lies within the CI in (a)." $\Rightarrow$ B1 BF0 Bdep0.
In (b)(i), having previously calculated (€)CI as (309, 453), then statements of the form "The claim that the mean is (€)400 is valid as **this** lies within the CI." $\Rightarrow$ B1 BF0 Bdep0.

Q	Solution	Marks	Total	Comments
1 (a)	$r =$ **0.959** $=$ **0.95 to 0.97** $=$ **0.9 to 0.99**	B3 (B2) (B1)		AWRT (0.95915) 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}	(M1)		1980 327726 1896 300598 & **313826** (all 5 attempted) 1026 1030 & **986** (all 3 attempted)
	Attempt at substitution into **correct** corresponding formula for r	(m1)		
	$r =$ **0.959**	(A1)	**3**	AWRT
(b)	(Very/extremely) **strong positive** (linear) **correlation**	Bdep1		Dependent on $\mathbf{0.9 \leq r \leq 0.99}$
Notes	**1** Statements **must** include the words "strong" **and** "positive" **together with** "correlation" **or** "association" **or** "relationship"; ignore additional comments unless clearly contradictory **2** The **only acceptable qualifiers** for "strong" are "very" **or** "extremely" **3** The use of: "highly/moderately/quite/fairly/relatively/reasonably/respectively strong" ⇒ Bdep0 **4** The use of: "high or big or good or some or moderate or medium or average" ⇒ Bdep0			
	between **Height(s)** and **arm span(s)** of **men** aged 21 to 40	B1	**2**	Context; providing $\mathbf{-1 < r < 1}$ Must contain at least the 4 emboldened words
Notes	**1** "As heights of men (aged 21 to 40) increase so do arm spans" (OE) Bdep0 B1 **2** "As heights/x increase so do arm spans/y" (OE) Bdep0 B0			
		Total	**5**	

Q	Solution	Marks	Total	Comments
2 (a)(i)	Mode = **<u>26</u>**	B1	**1**	CAO
Notes	**1** "Mode is 26 (visitors) because largest frequency/number of days is 13" (OE) ⇒ B1 **2** "Modes are 13 and 26" (OE) ⇒ B0			
(ii)	x ≤20 21 22 23 24 25 26 27 28 29 ≥30 F: 1 3 6 12 20 30 43 50 52 53 55 Median = **<u>25</u>**	B1		CAO
	IQR = 26 – 24 = **<u>2</u>**	B1	**2**	CAO
Notes	**1** Median is at CF = 27 to 28, UQ is at CF = 41 to 42 and LQ is at CF = 13 to 14 **2** An answer of 25 or/and 2 with clearly shown incorrect method(s) ⇒ B1 B0 or B0 B1 or B0 B0			
(b)	**Mean**	B1		CAO; accept nothing else
	Range or **Standard deviation** or **Variance**	B1	**2**	CAO; accept naming of **only one** of these three measures; nothing else
Notes	**1** Unless **clearly** identified as to which is the 'measure of average' and which is the 'measure of spread', assume order is as requested in question (ie average then spread) so (eg simply "range and mean" ⇒ B0 B0 and so Bdep0 Bdep0 in (c) but the possibility, using **SC** below, of M1 M1 in (c)) **2** **Accept** "arithmetic mean" **3** **Do not accept** abbreviations such as "Sd / Var" **or** symbols such as "$\bar{x}$ / μ / w / s / σ / s^2 / σ^2"			
(c)	Mean = **<u>25.6</u>**	Bdep2		CAO $\sum fx = 1408$ Dependent on 1st B1 in (b)
	Mean = **<u>25 to 26</u>**	(B1dep)		AWFW
	Range = **<u>45</u>**	↑		CAO
	or	Bdep1		Dependent on 2nd B1 in (b)
	Sd(n) = **<u>5.26</u>** **or** Sd(n–1) = **<u>5.31</u>**	|		AWRT (5.26256 or 5.31106)
	or	|		$\sum fx^2 = 37568$
	Var(n) = **<u>27.7</u>** **or** Var(n–1) = **<u>28.2</u>**	↓	**3**	AWRT (27.6945 or 28.2074)
Notes	**1** Unless identified, by name, abbreviation or symbol, as to which is the 'measure of average' and which is the 'measure of spread', assume order is as requested in question (ie average then spread) so (eg simply "5.26 and 25.6" ⇒ Bdep0 Bdep0) **2** For the measure of average, the only valid answer is 25.6 (CAO) **or** 25 to 26 (AWFW) **3** For the measure of spread, award Bdep1 for any seen (CAO/AWRT) value that corresponds to the **one** measure of spread named **correctly** in (b) so (eg "Variance" named in (b) and "5.31 and 28.2" seen in (c) ⇒ Bdep1 but "Variance" named in (b) and "5.31 only" seen in (c) ⇒ Bdep0)			
SC	**1** If, and only if, Bdep0 Bdep0 scored, then, **ignoring labels**: award M1 for 25 to 26 (AWFW) and M1 for one of 45, 5.26, 5.31, 27.7 or 28.2 (AWRT)			
		Total	**8**	

Q	Solution	Marks	Total	Comments
3(a)	**Accept the equivalent percentage answers with %-sign in parts (a)(i) to (a)(iv) but not in parts (a)(v) and (b) (see GN5)**			
(i)	$P(A_{41\text{-}65}) =$ **$\underline{176/500 = 88/250 = 44/125 = 0.352}$**	B1	**(1)**	CAO; any one of four listed answers
(ii)	$P(A_{\geq 66} \cap B_2) =$ **$\underline{68/500 = 34/250 = 17/125 = 0.136}$**	B1	**(1)**	CAO; any one of four listed answers
(iii)	$P(A_{19\text{-}40} \cap B_{\leq 1}) = \dfrac{17+62}{500} = \dfrac{79}{500}$ $= \underline{\mathbf{0.158}}$	M1 A1	**(2)**	Numerator CAO CAO
(iv)	$P(A_{\geq 41} \mid B_2) =$ $\dfrac{(35+68)/500}{130/500}$ **or** $\dfrac{(130-5-22)/500}{130/500}$ **or** $\dfrac{103}{130}$ $= \underline{\mathbf{0.792}}$	M1 A1	**(2)**	Fraction CAO AWRT (0.79231)
(v)	$P(B_{\geq 2} \mid A_{\leq 65}) =$ $\dfrac{5+(0)+22+3+35+31}{80+104+176}$ **or** $\dfrac{96}{360}$ $\dfrac{48}{180}$ **or** $\dfrac{24}{90}$ **or** $\dfrac{12}{45}$ **or** $\dfrac{4}{15}$ $= \underline{\mathbf{0.267}}$	M1 M1 (M2) A1	**(3)**	Numerator CAO (130 – 68 + 40 – 6) Denominator CAO (500 – 140) (Accept numerator and denominator each ÷ 500) **CAO (3 dp only)** (0.26667)
			9	
(b)	$P(A_{41\text{-}65} \cap B_{>0}) =$ $\dfrac{82+35+31}{500}$ **or** $\dfrac{176-28}{500}$ **or** $\dfrac{148}{500}$ (p_1)	B1		CAO; OE $\left(\dfrac{74}{250}, \dfrac{37}{125}, 0.296\right)$ Seen anywhere, even in an incorrect expression
	$P(A_{\geq 66} \cap B_{1 \text{ or } 2}) =$ $\dfrac{53+68}{500}$ **or** $\dfrac{140-13-6}{500}$ **or** $\dfrac{121}{500}$ (p_2)	B1		CAO; OE (0.242) Seen anywhere, even in an incorrect expression
	Prob $= (p_1)^2 \times (p_2)^2$ or $(p_1 \times p_2)^2$	M1		Providing $0 < p_1,\ p_2 < 1$ Must be equivalent to product of two squared probabilities with no extra terms
	$\times \binom{4}{2}$ or 6	m1		
	$= \underline{\mathbf{0.0308}}$	A1	**5**	**CAO (3 sf only)** (0.03078686)
SCs	**1** Answer of 0.00513 (AWRT) even without working $\Rightarrow$ B1 B1 M1 mo A0 **2** Answer of 0.0716 (AWRT) even without working $\Rightarrow$ B1 B1 M0 mo A0 **3** In each of the following (incorrect) expressions, $(\otimes \Rightarrow \times \text{ or } +)$ Ignore order of terms and/or value of n providing n is an integer ≥ 1 $\left(\frac{148}{500} \otimes p_3 \otimes \frac{121}{500} \otimes p_4\right) \times n \Rightarrow$ B1 B1 and $\left(\frac{148}{500} \otimes p_3 \otimes p_4 \otimes p_5\right) \times n$ or $\left(p_3 \otimes p_4 \otimes \frac{121}{500} \otimes p_5\right) \times n \Rightarrow$ B1 **4** Use of divisors of 504, 503, 502, and 501 $\Rightarrow$ max of M1 m1 but much more likely to be M0 mo **5** A final answer of 3.08×10^{-2} does score A1			
		Total	**14**	

Q	Solution	Marks	Total	Comments
4 **(a)**	b (gradient/slope) = **3(.00) to 3.01** b (gradient/slope) = **2.95 to 3.05**	B2 (B1)		AWFW (3.00420) AWFW
	a (intercept) = **181 to 182** a (intercept) = **179 to 183**	B2 (B1)		AWFW (181.30070) AWFW
	Attempt at $\sum x$ $\sum x^2$ $\sum y$ & $\sum xy$ **or** Attempt at S_{xx} & S_{xy}	(M1)		570 30650 3888 & **195420** (all 4 attempted) $\left(\sum y^2 = 1292224\right)$ 3575 & **10740** (both attempted) (S_{yy} = 32512)
	Attempt at substitution into correct corresponding formula for b	(m1)		
	b = **3(.00) to 3.01** a = **181 to 182**	(A1 A1)	**4**	AWFW $\left(\bar{x} = 47.5 \text{ & } \bar{y} = 324\right)$
Notes	**1** Written form of equation is **not** required **2** Award 4 marks for y = (181 to 182) + (3 to 3.01)x **or** for (181 to 182) + (3 to 3.01)x **3** Values of a and b interchanged and equation $y = ax + b$ **stated or used in (c)** ⇒ max of 4 marks **4** Values of a and b interchanged and equation $y = a + bx$ **stated or used in (c)** ⇒ 0 marks **5** Values of a and b are **not** identified (eg y = (181 to 182) + (3 to 3.01) **or** (181 to 182) + (3 to 3.01)) ⇒ 0 marks **6** Answers as fractions $\left(3\frac{3}{715} \text{ and } 181\frac{43}{143}\right)$ can score at most B1 B1 or M1 m1 **7** Some/all of marks can be scored in (b), (c) & (d), even if some/all of marks are lost in (a), but marks lost in (a) **cannot** be recouped by subsequent working in (b) or (c) but see **Note 3**			
(b)	**Each/every/one degree rise** in water temperature results in or **increase per degree** is	B1		
	(on average) ***b* grams**	BF1	**2**	F on b providing **$2.95 \le b \le 3.05$** Accept, for example, 5°C and 5b grams for B1 BF1
Notes	**1** To score any marks, an explanation must indicate change in x affecting change in y, **not** change in y affecting change in x **2** Reference **only** to correlation ⇒ B0 BF0			
SC	**1** As x/temperature increases (by k) then y/mass increases by b (OE; value of b ($2.95 \le b \le 3.05$) must be stated but context and/or units are **not** required) ⇒ B1			
(c)	$y(68)$ = **385 to 386**	B1	**1**	AWFW (385.5860)
Notes	**1** Ignore method used **2** If linear interpolation from data is used, then $y(68)$ = 384 ⇒ B0 **3** If a and b are interchanged, then $y(68)$ = 12150 to 12450 ⇒ B0			
(d)	Residuals are **relatively small/less than 10%** **or** **Percentage** residuals are **small** **or** Residuals are **small relative/compared to *y*-values/estimate** in (c)	B1		Accept any value within 3% to 10%
	Estimate is (likely to be) (relatively) **accurate**	Bdep1	**2**	Dependent on B1
Notes	**1** **Accept the use of**: "moderately/quite/fairly/reasonably" "accurate" **2** "Residuals are small" **or** "Residuals are small relative to x-values" ⇒ B0 Bdep0 **3** Residuals show points are "close to the line" or "not far from the line" (OE) ⇒ B0 Bdep0 **4** Conflicting reasons justifying both "accurate" and "not accurate" ⇒ B0 Bdep0			
		Total	**9**	

Q	Solution	Marks	Total	Comments
5(a)	**Accept the equivalent percentage answers with %-sign (see GN5)**			
(i)	$P(X < 1540) = P\left(Z < \frac{1540-1525}{9.6}\right)$	M1		Standardising 1540 with 1525 and 9.6 but allow (1525 – 1540)
	$= P(Z < 1.56(25)) =$ **0.94 to 0.942**	A1	**(2)**	AWFW (0.94091)
(ii)	$P(X > 1535) =$ $P(Z > 1.04(17)) = 1 - P(Z < 1.04)$	M1		Area change; can be implied by **any final answer < 0.5**
	$= 1 - 0.85122 =$ **0.148 to 0.15**	A1	**(2)**	AWFW (0.14878)
(iii)	$P(1515 < X < 1540) = P(-1.04 < Z < 1.56)$ $= 0.94091 - (1 - 0.85122)$			
	$=$ **0.79 to 0.793**	B2	**(2)**	AWFW (0.79213)
(iv)	$P(X \neq 1500) =$ **1 or one or unity or 100%**	B1	**(1)**	CAO; accept nothing else but ignore zeros after decimal point (eg 1.00) Ignore additional words providing that they are not contradictory (eg certain so = 1)
			7	
(b)	$10\%\ (0.1) \Rightarrow z =$ **1.28**	B1		AWRT (1.2816) Seen; ignore sign
	$\frac{\pm(1535-(\mu \text{ or } \bar{x} \text{ or } x))}{9.6} = \pm(1.28 \text{ to } 1.29)$	M1		Standardising 1535 with $\mu / \bar{x}$ and 9.6; allow $((\mu \text{or} \bar{x}) - 1535)$ **and** equating to ±(1.28 to 1.29)
	$\mu =$ **1522 to 1523**	A1		AWFW (1522.697)
	Reduction = 1525 – 1522.7 = **2.3**	Adep1	**4**	**CAO (1 dp only)**; dependent on A1
Note	**1** Award max of B1 M1 A0 A0 if the signs are not consistent throughout (answer for μ is likely to be 1547.3)			
	Parts (a) & (b)	**Total**	**11**	

Q	Solution	Marks	Total	Comments
5	**Continued**			
	Parts (a) & (b)	**Total**	**11**	
(c)	Each **pack** contains a **random sample** of bottles **or** **Packs** contain **random samples** of bottles	B1	**(1)**	Must contain at least the 3 emboldened words **and** clearly infer that 'bottles in a pack are a random sample' **This mark can be scored anywhere in (c)**
Note	**1** "Samples (of bottles) are random" (OE) or "Each bottle is randomly selected" (OE) ⇒ B0 **2** "Packs are selected at random" (OE) or "Each pack is selected at random" (OE) ⇒ B0 (Stated in question!) **3** "Packs/bottles are selected independently" (OE) or "Packs/bottles are normally distributed" (OE) ⇒ B0			
(i)	$p = \text{P(bottle} > 505) = \text{P}\left(Z > \dfrac{505-508.5}{3.5}\right) =$ $\text{P}(Z > -1) = \text{P}(Z < 1) =$ **<u>0.84</u>**	B1		AWRT (0.84134) Can be implied by a **correct** answer
	$\text{P(6 bottles} > 505) = p^6$	M1		Providing $0 < p < 1$
	$=$ **<u>0.35 to 0.356</u>**	A1	**(3)**	AWFW (0.35469)
Notes	**1** Calculation of $(1 - 0.84134) = 0.15866$ ⇒ B0 **2** Calculation of $(1 - 0.84134)^6$ ⇒ B0 M1 A0			
(ii)	$\text{V}\left(\bar{B}\right) = \dfrac{3.5^2}{6}$ **or** $\dfrac{12.25}{6}$ **or** **<u>2.04</u>**			CAO/AWRT (2.04167)
	or	B1		Can be implied by what follows
	$\text{Sd}\left(\bar{B}\right) = \dfrac{3.5}{\sqrt{6}}$ **or** **<u>1.43</u>**			CAO/AWRT (1.42887)
	$\text{P}\left(\bar{B} > 505\right) = \text{P}\left(Z > \dfrac{505-508.5}{3.5/\sqrt{6}}\right)$	M1		Standardising 505 with 508.5 and $3.5/\sqrt{6}$ **(OE)**; allow $(508.5 - 505)$
	$= \text{P}(Z > -\sqrt{6}) = \text{P}(Z > -2.45) =$ **<u>0.99 to 0.995</u>**	A1	**(3)**	AWFW (0.99285)
			7	
Notes	**1** Do **not** give BOD for unclear/dubious/questionable identifications of (i) & (ii) **2** If answers to (i) & (ii) are not identified, then mark as (i) followed by (ii) **3** If answers to (i) & (ii) are switched, then the **only mark available** is the B1 for stating the 'necessary assumption' **4** In (ii), award of B0 ⇒ 0/3 marks			
SC	**1** Use of distribution of total in (ii): **B1** for Sd = $3.5\sqrt{6}$ (OE); **M1** for $\text{P}(Z > (3030 - 3051)/(3.5\sqrt{6}))$ or $\text{P}(Z > -\sqrt{6})$ or $\text{P}(Z > -2.45)$ **A1** for 0.99 to 0.995 (AWFW); award of B0 ⇒ 0/3 marks			
		Total	**18**	

Q	Solution	Marks	Total	Comments
6(a)	**Accept 3 dp rounding of probabilities from tables**	**Accept the equivalent percentage answers with %-sign (see GN5)**		
(i)	$P(\text{Red} = 4) = \binom{50}{4}(0.18)^4(0.82)^{46}$	M1		Correct expression Can be implied by a **correct** answer Ignore additional expressions
	$= 230300 \times 0.00104976 \times 0.000108502$			
	$= \underline{\mathbf{0.026 \text{ to } 0.027}}$	A1	**2**	AWFW (0.02623)
(ii)	$P(\text{Yellow} \leq 10) = \underline{\mathbf{0.88}}$	B1	**1**	AWRT (0.8801)
(iii)	$P(\text{Blue or Green}) = \underline{\mathbf{0.5}}$	B1		CAO; indicated as a value of p or implied by any one of the probabilities opposite
	$P(\text{Blue or Green} \geq 30)$			
	$= 1 - 0.8987$	M1		
	$= \underline{\mathbf{0.101 \text{ to } 0.102}}$	A1		AWFW (0.1013)
	$= 1 - 0.9405$ **or** 0.059 to 0.06	(M1)	**3**	
Note	**1** For calculation of individual terms or no method: award **B3** for 0.101 to 0.102 (AWFW); **B2** for 0.059 to 0.06 (AWFW)			
(iv)	Using $p = \underline{\mathbf{0.2}}$ gives Using $p = \underline{\mathbf{0.8}}$ gives	B1		Either CAO; indicated as a value of p or implied by any one of the probabilities opposite
	0.9393 or 0.9692 (p_1) **0.9520 or 0.9815**	M1		One of either pair
	MINUS **MINUS**			
	0.0480 or 0.0185 (p_2) **0.0607 or 0.0308**	M1		One of matching pair from above
	$= \underline{\mathbf{0.89 \text{ to } 0.892}}$	A1	**4**	AWFW (0.8913)
Notes	**1** For calculation of individual terms or no method: award **B4** for 0.89 to 0.892 (AWFW); **B3** for 0.92 to 0.922 (AWFW); **B3** for 0.95 to 0.952 (AWFW) **2** Answers involving $(1 - p_2) - (1 - p_1) \Rightarrow$ (B1) M1 M1 A1 or (B1) M1 M1 or (B1) M1 **3** Answers involving $1 - (p_1 - p_2)$ even after $(p_1 - p_2)$ (eg $1 - (0.9393 - 0.0480) = 0.1087$) $\Rightarrow$ max of B1			
(b)	Mean $= 300 \times 0.18 = \underline{\mathbf{54}}$	B1		CAO
	Variance $= 300 \times 0.18 \times 0.82$			
	$= \underline{\mathbf{44.2 \text{ to } 44.3}}$	B1	**2**	AWFW (44.28)
Notes	**1** Ignore any subsequent work following correct statement of variance (eg "So Sd = 6.6 to 6.7") **2** The statement "44.2 to 44.3" followed by "Variance = 6.6 to 6.7" or "Variance = 1960 to 1961" $\Rightarrow$ B0			
		Total	**12**	

Q	Solution	Marks	Total	Comments
7 (a)	99% (0.99) $\Rightarrow$ z = **2.57 to 2.58** CI for μ is $317.5 \pm \begin{pmatrix} 2.57 \text{ to } 2.58 \\ 2.32 \text{ to } 2.33 \\ 2.70 \text{ to } 2.71 \\ 2.42 \text{ to } 2.43 \end{pmatrix} \times \frac{(146.3 \text{ or } 148.1 \text{ to } 148.2)}{\sqrt{40 \text{ or } 39}}$ Hence **317.50 ± (58.50 to 60.50)** **or** **(257.00 to 259.00, 376.00 to 378.00)**	B1 M2,1 (–1 ee) Adep1 **4**		AWFW (2.5758) Ignore any notation M0 if CI is not of the form: $317.5 \pm (z \text{ or } t) \times \left((s \text{ or } s^2) / \sqrt{40 \text{ or } 39} \right)$ Allow any combination in last term NB: $146.3 \times \sqrt{40/39} = 148.16377$ CAO/AWFW; **1 or 2 dp only** Dependent on award of M2 AWFW; **1 or 2 dp only**
Notes	**1** If award of M0 is followed by a numerically correct CI $\Rightarrow$ 2 solutions **2** Use same rules as above for t = 2.7 to 2.71 (AWFW) $\Rightarrow$ 317.50 ± (62.00 to 63.00) or (254.50 to 255.50, 379.50 to 380.50)			
(b) (i)	€400 equates to (£) **333 to 334** **or** CI (€): **381 ± (70 to 73)** **or** **(308 to 311, 451 to 454)** **Clear correct comparison** of **(333 to 334)** with **CI in (a)** {eg 333.33 is within CI in (a)} **or** (Must be clear that comparing like with like) **Clear correct comparison** of **(400)** with **CI in (b)(i)** {eg 400 is within CI in (b)(i)} **Agree with or accept** claim Claim is (likely to be) **true/correct/right/valid/accurate**	B1* BF1 Bdep1 **(3)**		AWFW (£333.33) *** This mark may be scored in (b)(ii) *** CAO/AWFW (2 dp **not** required) AWFW (2 dp **not** required) Statement must include reference to 333 to 334 F on CI providing it is **includes** 333 to 334 Must have found an **interval** in (a) but quoting values for CI or CLs is **not** required Statement must include reference to 400 F on CI providing it is **includes** 400 Must have found an **interval** in (b)(i) but quoting values for CI or CLs is **not** required OE; dependent on BF1
Notes	**1** Statement must **clearly** indicate that "(333 to 334 or 400) is **within** the **corresponding** CI" OE **2** Statements of the form "It/this/mean/value/etc is within the (corresponding) CI" $\Rightarrow$ BF0 **3** Statements of the form "(333 to 334 or 400) is within 99% of the data/values/pounds/euros" $\Rightarrow$ BF0 **4** Statements such as "Claim is likely to be reasonable/supported/correct/true/possible/valid" $\Rightarrow$ Bdep1 providing BF1			
(ii)	€200 equates to (£) **166 to 167** Per cent < €200/£166.67 $\frac{7 \text{ or } 8}{40} \times 100$ = **17.5 or 20** seen with **25** **or** **7 or 8** seen with **10** **or** (€)**200** seen with (€)**225** **or** (£)**166 to 167** seen with (£)**187.5(0)** **Agree with or accept** claim Claim is (likely to be) **true/correct/right/valid/accurate**	B1 Bdep1 **(2)**		AWFW (£166.67) *** Award B1 if 1st B1 not scored in (b)(i) *** Can be implied by 17.5 or 20 (OE) or 7 or 8 Requires **both correct** numbers (OE) from any of these pairs eg 17.5 & 25, 0.2 & 0.25, 8 & 10 $\Rightarrow$ B1 7 & 25 only $\Rightarrow$ B0 OE; dependent on B1
			5	
		Total	**9**	