Qu	Scheme		
1(a)	eg 60 people = 1.5 large squares/6 medium squares/150 small squares or		
	eg 1 person = 0.025 large squares/ 0.6 medium squares/ 2.5 small squares or		
	eg [1 small square =] 0.4 people/[1 medium square =] 10 people/[1 large square =] 40 people	B1	
	eg a correct f.d. eg $\frac{60}{(20-10)} = 6$]		
	eg a correct frequency, 100, 70, 20, 24 associated with the appropriate bar		
	eg $\frac{8}{10} \times 20$ or $\frac{15}{30} \times 24$ or 8×2 or 0.8×15 or $\frac{40}{2.5}$ or $\frac{30}{2.5}$ or $8 \times 5 \times 0.4$	M1	
	2×13×0.4 01 10 01 12 01 /0×0.4	A 1	
		A1 (3)	
(b)	5 5	(3)	
(0)	Median = $[5] + \frac{3}{70} \times 37$ or $[10] - \frac{3}{70} \times 33$	M1	
	= 7.642 awrt 7.64	A1	
		(2)	
(c)	$\sum \text{midpoint} \times \text{freq} = 2.5 \times 100 + 7.5 \times 70 + 15 \times 60 + 25 \times 20 + 45 \times 24 [= 3255]$	M1	
	Mean = $\frac{"3255"}{274}$	dM1	
	= 11.879 awrt 11.9	A1	
		(3)	
	Notes		
	Notes	Total 8	
(a)	NotesB1: for finding a ratio between people and area. Allow just the numbers for 1 person or for 1 sq0.025, 0.6, 2.5, 0.4, 1.66 or 40 orcalculating f.d. for any bar correctly, fd = 20, 14, 6, 2 or 0.8Information may be seen on diagram. Must be clear it is a fd either by correct use, seen on axesassociated with correct bar or stated as an fd. May be implied by M1M1: for a correct method to find the number of people between 22 and 30 km or 30 and 45 kmbetween 22 and 45 kmA1: 28NB An answer of 28 gains 3/3 unless from obvious incorrect working	Total 8 uare ie or	
(a)	NotesB1: for finding a ratio between people and area. Allow just the numbers for 1 person or for 1 sq0.025, 0.6, 2.5, 0.4, 1.66 or 40 orcalculating f.d. for any bar correctly, fd = 20, 14, 6, 2 or 0.8Information may be seen on diagram. Must be clear it is a fd either by correct use, seen on axesassociated with correct bar or stated as an fd. May be implied by M1M1: for a correct method to find the number of people between 22 and 30 km or 30 and 45 kmbetween 22 and 45 kmA1: 28NB An answer of 28 gains 3/3 unless from obvious incorrect workingM1: Allow equivalent for $n + \frac{5}{70} \times 37$ or $\frac{Q_2 - n}{5} = \frac{137 - 100}{170 - 100}$ or $n - \frac{33}{70} \times 5$ or $\frac{n - Q_2}{5} = \frac{170 - 13}{170 - 100}$ Allow alternative methods eg $\frac{Q_2 - 5}{10 - Q_2} = \frac{137 - 170}{170 - 137}$ Allow 37.5 for 37, 137.5 for 137, 32.5 for 33	$\begin{array}{ $	
(a)	NotesB1: for finding a ratio between people and area. Allow just the numbers for 1 person or for 1 sq0.025, 0.6, 2.5, 0.4, 1.66 or 40 orcalculating f.d. for any bar correctly, fd = 20, 14, 6, 2 or 0.8Information may be seen on diagram. Must be clear it is a fd either by correct use, seen on axesassociated with correct bar or stated as an fd. May be implied by M1M1: for a correct method to find the number of people between 22 and 30 km or 30 and 45 kmhetween 22 and 45 kmA1: 28NB An answer of 28 gains 3/3 unless from obvious incorrect workingM1: Allow equivalent for $n + \frac{5}{70} \times 37$ or $\frac{Q_2 - n}{5} = \frac{137 - 100}{170 - 100}$ or $n - \frac{33}{70} \times 5$ or $\frac{n - Q_2}{5} = \frac{170 - 13}{170 - 100}$ Allow alternative methods eg $\frac{Q_2 - 5}{10 - Q_2} = \frac{137 - 170}{170 - 137}$ Allow 37.5 for 37, 137.5 for 137, 32.5 for 33A1: awrt 7.64 or $\frac{107}{14}$ or allow awrt 7.68 or $\frac{215}{28}$ if using $n + 1$ Allow awrt 7640 m or 7680 m b	$\begin{array}{ $	
(a) (b)	NotesB1: for finding a ratio between people and area. Allow just the numbers for 1 person or for 1 sq0.025, 0.6, 2.5, 0.4, 1.66 or 40 orcalculating f.d. for any bar correctly, fd = 20, 14, 6, 2 or 0.8Information may be seen on diagram. Must be clear it is a fd either by correct use, seen on axesassociated with correct bar or stated as an fd. May be implied by M1M1: for a correct method to find the number of people between 22 and 30 km or 30 and 45 kmbetween 22 and 45 kmA1: 28NB An answer of 28 gains 3/3 unless from obvious incorrect workingM1: Allow equivalent for $n + \frac{5}{70} \times 37$ or $\frac{Q_2 - n}{5} = \frac{137 - 100}{170 - 100}$ or $n - \frac{33}{70} \times 5$ or $\frac{n - Q_2}{5} = \frac{170 - 13}{170 - 100}$ Allow alternative methods eg $\frac{Q_2 - 5}{10 - Q_2} = \frac{137 - 170}{170 - 137}$ Allow 37.5 for 37, 137.5 for 137, 32.5 for 33Allow awrt 7.68 or $\frac{215}{28}$ if using $n + 1$ Allow awrt 7640 m or 7680 m bhave units.M1: Attempt at correct expression for \sum midpoint \times freq - at least 3 products with correct midpoint \times freq - at least 3 products with correct midpoint \times	$\frac{ \text{ Total 8} }{ \text{ uare ie} }$	
(a) (b)	NotesB1: for finding a ratio between people and area. Allow just the numbers for 1 person or for 1 sq0.025, 0.6, 2.5, 0.4, 1.66 or 40 orcalculating f.d. for any bar correctly, fd = 20, 14, 6, 2 or 0.8Information may be seen on diagram. Must be clear it is a fd either by correct use, seen on axesassociated with correct bar or stated as an fd. May be implied by M1M1: for a correct method to find the number of people between 22 and 30 km or 30 and 45 kmbetween 22 and 45 kmA1: 28NB An answer of 28 gains 3/3 unless from obvious incorrect workingM1: Allow equivalent for $n + \frac{5}{70} \times 37$ or $\frac{Q_2 - n}{5} = \frac{137 - 100}{170 - 100}$ or $n - \frac{33}{70} \times 5$ or $\frac{n - Q_2}{5} = \frac{170 - 13}{170 - 100}$ Allow alternative methods eg $\frac{Q_2 - 5}{10 - Q_2} = \frac{137 - 170}{170 - 137}$ Allow 37.5 for 37, 137.5 for 137, 32.5 for 33Allow awrt 7.68 or $\frac{215}{28}$ if using $n + 1$ Allow awrt 7640 m or 7680 m bhave units.M1: Attempt at correct expression for \sum midpoint \times freq - at least 3 products with correct mi	Total 8 uare ie or or $\frac{7}{90}$ oe out must dpoints	
(a) (b)	NotesB1: for finding a ratio between people and area. Allow just the numbers for 1 person or for 1 sq0.025, 0.6, 2.5, 0.4, 1.66 or 40 orcalculating f.d. for any bar correctly, fd = 20, 14, 6, 2 or 0.8Information may be seen on diagram. Must be clear it is a fd either by correct use, seen on axesassociated with correct bar or stated as an fd. May be implied by M1M1: for a correct method to find the number of people between 22 and 30 km or 30 and 45 kmbetween 22 and 45 kmA1: 28NB An answer of 28 gains 3/3 unless from obvious incorrect workingM1: Allow equivalent for $n + \frac{5}{70} \times 37$ or $\frac{Q_2 - n}{5} = \frac{137 - 100}{170 - 100}$ or $n - \frac{33}{70} \times 5$ or $\frac{n - Q_2}{5} = \frac{170 - 13}{170 - 100}$ Allow alternative methods eg $\frac{Q_2 - 5}{10 - Q_2} = \frac{137 - 170}{170 - 137}$ Allow 37.5 for 37, 137.5 for 137, 32.5 for 33Allow awrt 7.68 or $\frac{215}{28}$ if using $n + 1$ Allow awrt 7640 m or 7680 m bhave units.M1: Attempt at correct expression for \sum midpoint \times freq - at least 3 products with correct miadded with at least 1 of these products fully correct . Allow for 3255M1: dep on M1 being awarded for dividing "their sum" by 274	Total 8 uare ie or 0	
(a) (b)	NotesB1: for finding a ratio between people and area. Allow just the numbers for 1 person or for 1 sq0.025, 0.6, 2.5, 0.4, 1.66 or 40 orcalculating f.d. for any bar correctly, fd = 20, 14, 6, 2 or 0.8Information may be seen on diagram. Must be clear it is a fd either by correct use, seen on axesassociated with correct bar or stated as an fd. May be implied by M1M1: for a correct method to find the number of people between 22 and 30 km or 30 and 45 kmbetween 22 and 45 kmA1: 28NB An answer of 28 gains 3/3 unless from obvious incorrect workingM1: Allow equivalent for $n + \frac{5}{70} \times 37$ or $\frac{Q_2 - n}{5} = \frac{137 - 100}{170 - 100}$ or $n - \frac{33}{70} \times 5$ or $\frac{n - Q_2}{5} = \frac{170 - 13}{170 - 10}$ Allow alternative methods eg $\frac{Q_2 - 5}{10 - Q_2} = \frac{137 - 170}{170 - 137}$ Allow 37.5 for 37, 137.5 for 137, 32.5 for 33A1: awrt 7.64 or $\frac{107}{14}$ or allow awrt 7.68 or $\frac{215}{28}$ if using $n + 1$ Allow awrt 7640 m or 7680 m bhave units.M1: Attempt at correct expression for \sum midpoint × freq - at least 3 products with correct miadded with at least 1 of these products fully correct . Allow for 3255M1: awrt 11.9 or $\frac{3255}{274}$	Total 8 uare ie or 0	

Qu	Scheme	Marks
2(a)	$S_{tw} = 2304.53 - \frac{297.8 \times 114.8}{15}$ or $S_{ww} = 6089.12 - \frac{297.8^2}{15}$	M1
	$S_{tw} = 25.367$ awrt 25.4	A1
-	S _{ww} = 176.797 awrt 177	A1
		(3)
(b)	$r = \frac{"25.367"}{\sqrt{5.3173 \times "176.797"}}$	M1
	= 0.82735 awrt 0.827 or 0.828	A1
		(2)
(c)	$b = \frac{"25.367"}{5.3173} [= 4.77065]$	M1
	297.8 "25.367" 114.8 [16.658]	M1
	$a = \frac{15}{15} - \frac{5.3173}{5.3173} \times \frac{15}{15} [= -10.038]$	IVI 1
	$b = 4.771$ or better or $a = -16.66$ or better seen and $w = -16.7 + 4.77t^*$	A1*cso
		(3)
(d)	[On average,] for each cm/1 cm of tail length/t the weight/w increases by 4.77 g/grams	B1
(a)	167	(1)
(e)	$w = -16.7 + 4.77 \times 2[= -7.16]$ or $4.77 \times 2[= 9.54]$ or $[t =]\frac{10.7}{4.77}[= 3.5]$ or sd = awrt 0.6	M1
	[w=]-7.16 or 9.54 < 16.7 or 2 < 3.5 which is negative/weight cannot be negative	Δ1
	or for sd extrapolation since a 2 cm tail is (approx 9 sd)/(more than 3 sd) from the mean	
		(2)
(f)	0.827	Blft
(g)	2n+10 = -16.7 + 4.77(n+6) as	(1) D16
(5)	2y+10 = -10.7 + 4.77(x+0) 00	DIII (1)
	Notes	(1) Total 13
(a)	M1 for a correct expression for S or S	1014110
	A 1 over 25.4	
	A1 awrt 177	
(b)	M1 for a valid attempt at r with their S not equal to 2304 53 and S not equal to 6089 12	
	A1 (M2 on epen) swit 0.827 or swit 0.828	
(c)	1 st M1 for a correct method to find the value of <i>b</i>	
	2 nd M1 ft their <i>b</i> . For a correct method to find <i>a</i> . Minimum shown	
	$a = awrt 19.9 - "their b" \times awrt 7.65 = -16.658$	
	A1* Both method marks must be awarded, equation stated (no fractions) and sight of (4.771 of	or better)
	or (-16.66 or better)	<i>,</i>
(d)	B1 For a suitable contextual comment that implies that as length increases by 1 cm weight inc	reases by
	4.7/g. Allow multiples eg each 10 cm increase in tail length weight increases by 47.7g Allow	ın terms
(0)	Of t and W M1 for a correct method to calculate the value of w (condone if written as a fraction) or	
	$4.77 \times 2[=9.54]$ or correct method to find tail length when $w = 0$ or sd = awrt 0.6	
	A 1 Mathed mark must be everydad. Ear, $7.16 \approx 0.54 \times 16.7 \approx 0.225$ such a subsection of the	ation
	AT we not mark must be awarded. For -1.10 or $9.34 \le 10.1$ or $2 \le 3.5$ with a relevant explant stating that weight is negative. If sd = awrt 0.6 is given allow extrapolation since a 2 cm tail is	ation (approx
	9 sd)/(more than 3 sd) from the mean.	, (approx
(f)	B1ft follow through their answer to (b)	
(g)	B1 ISW no need to be simplified. Allow equivalent eg $y = \frac{-16.7 + 4.77(x+6)}{2} - 5$ The correct	
	simplified equation is $y = 2.285 r + 0.06$ allow evert 2.20 and 0.06 -0.08	

Qu	S	cheme	Marks
3(a)	$\left[\overline{x} = \right] \frac{3711}{81} \left[= 45.814 \right]$	$\left[\sum l = \right] 3711 + 81 \times 600 \left[= 52311\right]$	M1
	$\left[\overline{l}\right]$ "45.814"+600	$\left[\overline{l} = \right] \frac{"52311"}{81}$	M1
	$\left[\overline{l}\right]$ =]645.81	awrt 646	A1
			(3)
(b)	$\left[\sigma_{x}^{2}=\right]\frac{475181}{81}-\left(\frac{3711}{81}\right)^{2}\left[=3767\right]$	$\left[\operatorname{Var}(L) = \right] \frac{34088381}{81} - \left(\frac{"52311"}{81}\right)^2$	M1
	$=3767.43\Rightarrow \sigma_l^2 = 3767.43$	= 3767.43 awrt 3770	A1
			(2)
(c)	40		Blcao
(d)	IOR = 5400 - 3800 [= 1600]		(1) M1
(u)	$5400 + 1.5 \times 1600$ [= 7800] or 3800 -	1.5×"1600" [= 1400]	M1
	7800 > 7700 and $1400 < 1600$ therefore the	here are no outliers	Al
			(3)
	-	Notes	Total 9
(a)	M1 for a correct method to find \overline{x} or $\sum x$	Allow 45.8 or better. Ignore labels	
	M1 for a correct method to find \overline{l} ft their \overline{x} if it is clearly labelled or it comes from $\frac{3711}{81}$ or ft their $\sum l$ if it is clearly labelled or comes from $3711+81\times600$		- or ft
	A1 awrt 646 or $\frac{17437}{27}$ or $\frac{52311}{81}$ oe		
(b)	M1 correct method to find Var (X) implied by awrt 3770 or a correct method to find Var (L) ft their		L) ft their
	$\sum l$ or Allow calculation of sd $[\sigma_x]$ = awrt 61.4 Ignore labels		
	A1 awrt 3770 labelled clearly as $Var(L)$ of	r Var $(L) = Var(X)$ or $\sigma_l = \sigma_x$ stated or variance	is not
	changed by coding is stated or they have gained the answer from $\frac{34088381}{81} - \left(\frac{"52311"}{81}\right)^2$		
(c)	Bl cao	45 4 4 4 5	
(d)	M1 correct method to find IQR. May be implied by a correct limit. NB $1.5 \times (5400 - 3800) = 2400$		
	M1 for a correct method to find the upper or the lower outlier boundary.		
	A1 both 7800 and 1400 correct and 7700 stating no outliers	and 1600 (as the minimum not IQR) seen and e	xplicitly

Qu	Scheme	Marks
4(a)	Bag Colour	
	0.02 Red	
	0.3 0.98 Not Red	
	0.04 Red	
	0.45 B	B1B1
	Not Red	
	0.25	
	0.06 Red	
	0.94 Not Red	
		(2)
(b)	0.3×"0.98"	M1
	= 0.294	Al
		(2)
(c)	$(0.3 \times 0.02) + ("0.45" \times "0.04") + ("0.25" \times "0.06")$	M1
	= 0.039	A 1
	0.005	(2)
(d)	□ (¬ (¬ ¬ ¬) "0.25"×"0.06" [0.015]	
	$P(C Red) = \frac{1}{0.039} = \frac{1}{0.039} = \frac{1}{0.039}$	M1,M1
	5	
	$= 0.3846 \text{ or } \frac{5}{12}$	A1
	13	(2)
	Notos	(3) Total 9
(a)	B1 for 0.45 0.25 and 0.98 Allow fractions	10tal)
(4)	B1 0.04 0.96 and 0.06 0.94 Allow fractions	
(h)	M1 may ft their tree diagram if method shown $0.3 \times$ " their 0.98"	
(~)	A1 0.294 oe	
(c)	M1 may ft their tree diagram if method shown	
	A1 0.039 oe	
(d)	M1 allow p or p where $0 \le n \le 1$ and $n \le$ denominator and their (a) is a	
	"their part (c)" of $\frac{1}{0.039}$ where $0 and p < denominator and their (c) is a$	
	probability or	
	allow $\frac{"0.25"\times"0.06"}{a}$ or $\frac{0.015}{a}$ where $0 \le a \le 1$ and $a \ge$ numerator	
	q q	
	M1 6 "0.25"×"0.06" 6 4 5 5 1 2 5 1 2 5	•
	"0.039" It their tree diagram and their part(c) if all 3 figures shown	111
	working. We will condone num > denom	
	A1 awrt 0.385	
	NB if correct ft on numerator and denominator leads to "num" > "denom" then max score	
	is M0M1A0	

Qu	Scheme		
5(a)	P(Y=y) 2k k k 8k 17k k		
	$2k + k + k + 8k + 17k + k = 1$ or $30k = 1$ $\left[\implies k = \frac{1}{30} \right]^*$		
(b)	k+k+8k or $1-(2k+17k+k)$		
	$=\frac{1}{3}$ oe awrt 0.333	A1	
		(2)	
(c)	$(1 \times 2k) + (2 \times k) + (3 \times k) + (4 \times 8k) + (5 \times 17k) + (6 \times k) =$	M1	
	$\frac{13}{3}$ oe awrt 4.33	A1	
		(2)	
(d)	$P(Y \ge 15 - 2Y)$ or $[X=]$ 13 11 9 7 5 3 only or $[Y=]$ 5 or 6 only	M1	
	$[P(Y \ge 5) = P(Y = 5) + P(Y = 6)] = \frac{"17"}{20} + \frac{"1"}{20}$	M1	
	$-\frac{3}{2}$ or $-\frac{3}{2}$ or $-\frac{3}{2}$	A 1 G	
	$-\frac{5}{5}$ be	AIII	
(0)	$V_{ar}(Y) = AV_{ar}(Y)$	(3) M1	
(0)	$[F(Y^2) = [(1 \times 2k) + (2^2 \times k) + (3^2 \times k) + (4^2 \times 8k) + (5^2 \times 17k) + (6^2 \times k) = \frac{302}{2} \text{ or awrt } 201]$	M1	
	$\left[2(1)^{2} + (2 + k)^{2} + (3 + k)^{2} + $	1011	
	$\left[\operatorname{Var}(Y) = \right]^{"} \frac{302}{15}^{"} - \left(^{"} \frac{13}{3}^{"}\right)^{"} \left[= \frac{61}{45} \text{ or awrt } 1.36 \right]$	M1d	
	$\left[\text{Var}(X) = \right] \frac{244}{45}$ oe awrt 5.42	A1	
	ALT for 1 st 3 marks	(4)	
	$[E(X) =] (13 \times 2k) + (11 \times k) + (9 \times k) + (7 \times 8k) + (5 \times 17k) + (3 \times k) \left[= \frac{19}{3} \text{ or awrt } 6.33 \right]$	M1	
	$[\mathrm{E}(X^2) =](13^2 \times 2k) + (11^2 \times k) + (9^2 \times k) + (7^2 \times 8k) + (5^2 \times 17k) + (3^2 \times k) \left[= \frac{683}{15} \text{ or awrt } 45.5 \right]$	M1	
	$\left[\operatorname{Var}(X) = \right]'' \frac{683}{15}'' - \left('' \frac{190}{30}''\right)^2$	M1d	
	Notes	Total 13	
(a)	M1 for finding the probabilities in terms of k. The individual probabilities must be seen either in or in the calculation (but do not need to be simplified)	n a table	
	A1* Method mark must be awarded. For a correct equation which would lead to $k = 1/30$ *		
	NB Verification - $2\left(\frac{1}{30}\right) + \left(\frac{1}{30}\right) + \left(\frac{1}{30}\right) + 8\left(\frac{1}{30}\right) + 17\left(\frac{1}{30}\right) + \left(\frac{1}{30}\right) = 1$ gains M1 A0		
(b)	M1 for using $P(Y = 2) + P(Y = 3) + P(Y = 4)$ or $1 - P(Y = 1) + P(Y = 5) + P(Y = 6)$ Allow in terms of k or		
	with $k = 1/30$ subst or with their probabilities. Do not allow in terms of y		
	A1 awrt 0.333		
(c)	M1 for using $\sum x P(x)$ At least 3 terms given Allow with $k = 1/30$ subst or ft their probabilities.		
(d)	Al awrt 4.33 M1 forming correct inequality in V or 13 11 0 7 5 3 seen anywhere or for 5 and 6 only. Implied	by 2nd M1	
(u)	M1 finding their $P(Y = 5)$ + their $P(Y = 6)$ or $P(X = 5) + P(X = 3)$ eg $17k + k$	Uy 2 WII	
	A1ft ft their probabilities		
(e)	M1 written or used $4Var(Y)$ (may come at the end of the calculation) or written or used $E(X)$ all	ow awrt	
	6.33 NB condone -2^2 Var(Y) if used 4Var(Y)		
	M1 Correct method, at least 3 products correct, to find $E(Y^2)$ or $E(X^2)$ condone incorrect label	ls	
	M1d dep on the 2^{nd} M mark being awarded. For correct use of $E(Y^2) - [E(Y)]^2$ or $E(X^2) - [E(X)]^2$ For		
	the ALT In addition to the 2 nd M1 the 1 st M1 must be awarded. Condone incorrect labelling		
L			

Qu	Scheme	Marks	
6(a)	0.6	B1	
		(1)	
(b)	$[P(A \cap B) =]0.1 \times 0.3 \text{ or } 0.3 = \frac{P(A \cap B)}{0.1}$	M1	
	$0.25 = 0.1 + P(B) - "0.03"$ or $0.25 = 0.1 + P(B) - P(A \cap B)$	M1	
	P(B) - 0.15		
	$0.25 = 0.1 + P(B) - 0.03 \text{ or } 0.3 = \frac{1}{0.1} \therefore P(B) = 0.18*$	Al*	
		(3)	
	$\begin{bmatrix} A & B & C \\ 0.07 & 0.03 & 0.09 & 0.41 \\ 0.07 & 0.34 \end{bmatrix} \begin{bmatrix} A & B & B \\ 0.07 & 0.03 & 0.06 \\ 0 & 0.09 & 0.41 \\ 0.41 & 0.34 \end{bmatrix}$	M1 M1 B1ft B1ft A1	
		(5)	
	Notes	Total 9	
(a)	B1cao		
(b)	M1 for use of $P(B A) = \frac{P(A \cap B)}{P(A)}$ with 0.1 and 0.3 substituted. Allow for 0.1×0.3 seen		
	M1 0.25 = 0.1 + P(B) - p where $0 or p = P(A \cap B) or p = P(B) (allowed by p = P(B)) (a$		
	any letter for P(B))		
	A1* $P(B) = 0.18$ depends on both previous M marks for a fully correct equation in terms of $P(B)$ (allow any letter for $P(B)$) followed by $P(B) = 0.18$		
	NB 0.03 used/stated with no working could get M0M1A0		
	Using $P(A \cap B) = 0.1 \times P(B)$ then they get M0M0A0		
	Varification could get M1M1A0		
	M1 for 0.1×0.3		
	0.18-0.15		
	M1 for $0.25 - 0.18 - 0.1 = -0.03$ or $0.3 = \frac{0.13 - 0.15}{0.1}$ or $0.25 = 0.1 + 0.18 - P(A \cap B)$		
(c)	M1 for 3 circles as per either diagram. If using Diagram 2 we must see exactly 2 zeros in one of the intersections (as shaded). (Do Not accept blank or dash instead of 0) Condone missing rectangle. Ignore labels		
	M1 for 0.09 and 0.41 marked correctly in diagram – condone incorrect/no label but must b	be in the	
	left or right hand circles in 1 st diagram or must have zeros (condone blank or dash) in the 2 other		
	regions of the circle if in 2 nd diagram		
	B1ft their "0.03" in correct place on diagram. Correct label required		
	B1ft for 0.34 or ft 0.75 – "their 0.41" where their 0.41 \neq 0.5 No other ft accepted. Do not allow 0.75		
	A1 fully correct Venn diagram including the rectangle and all 3 labels		
	SC no labels could get M1M1B0B1A0 if using 3 intersecting circles must have blanks or 0 for the		
	2 nd M1		

Qu	Scheme	Marks
7(a)(i)	$P(J > 510) = P(Z > \frac{510 - 500}{25}) \text{ or } P(Z > 0.4)$	M1
	$= 1 - 0.6554 \implies 0.3446 *$	A1*
		(2)
(ii)	$\frac{d-500}{25} = -1.4 (\text{calc} - 1.3997)$	M1B1
	d = 465 (calc 465.007)	dA1
		(3)
(b)	$(1-0.3446)^5$	M1
	-0.1200 owrt 0.121	Δ1
	- 0.1209 awit 0.121	(2)
(c)	$\frac{r-520}{k} = -1.0364$	M1A1
	$\frac{3r - 800 - 520}{k} = 2.5758$	M1A1
	$-240 = (3 \times -"1.0364k") - "2.5758"k \text{ or } \frac{r - 520}{"-1.0364"} = \frac{3r - 1320}{"2.5758"} \text{ oe}$	ddM1
	<i>k</i> = 42.216 awrt 42	A1
	<i>r</i> = 476.246 awrt 476	dA1
		(7)
	Notes	Total 14
(a)(i)	M1 for standardising using 500 and 25. Allow for 0.4	
(**)	A1* M1 must be awarded. For $1 - 0.6554 = 0.3446$ or using calc $0.34457 = 0.3446$ or bet	ter
(11)	M1 correct standardisation using 500 and 25 equated to a z value where $1 < z < 2$	
	B1 correct expression with compatible signs eg $\frac{500-d}{25} = 1.4$ (calc 1.3997) or allow incompatible	
	signs with 500 – ("535"–500)	
	SC $\frac{510-d}{25} = 1.4$ (calc 1.3997) can get M0B1A0	
	dA1 dependent on M1 awarded for 465 or 465.007	
(b)	M1 for $(p)^5$ where 0	
	A1 awrt 0.121	
(c)	M1 $\frac{r-520}{k} = z$ value where $ z > 1$	
	$1^{\text{st}} \text{A1} \ \frac{r-520}{k} = \text{awrt} \ -1.0364 \text{ (calc } 1.036433) \text{ (signs must be compatible)}$	
	$2^{nd} M1 \frac{3r - 800 - 520}{k} = z$ value where $ z > 2$	
	$2^{nd} A1 \frac{3r - 800 - 520}{k} = awrt 2.5758 (calc 2.5758293) (signs must be compatible)$	
	3^{rd} M1 (dep on both Ms) for forming a correct equation in k or r only using their z values. ISW once $3(-1.0364k + 520) - 800 - 520$	
	correct equation seen eg $-5.685k = -240$ or $k = 2.5758$ Implied by r	
	and k correct	
ļ	3 rd A1 for awrt 42	
	4 th A1 for awrt 476 Must come from equations with compatible signs	
	NB awrt 476 and awrt 42 does not mean full marks. They could get M1A0M1A0 M1A1A1 if they do	
	not have accurate 2 values	