3.	**(a)**	$29\times75+29\times83+....+46\times126=33\,856$	**33856**	B1cao (1)
	(b)	$\sum m=306$ and $\sum b=861$		B1
		$S_{bm}=\text{'33 856'}-\dfrac{\text{'861'}\times\text{'306'}}{8}=922.75$	**awrt 923**	M1 A1 (3)
	(c)	$r=\dfrac{\text{"922.75"}}{\sqrt{3083.875\times305.5}}=0.9506706....$	**awrt 0.951**	M1 A1 (2)
	(d)	As milk price increase, so does bread price.		B1 (1)
	(e)	Since bread price increases but milk price stays the same Therefore the correlation will decrease (or be weaker)		B1 dB1 (2) **(9 marks)**

Question Number		Scheme	Marks
3.	**(a)**	$[W\sim N(64,\,8^2)]$ $P(W<51)=P\left(Z<\dfrac{51-64}{8}\right)$ or $P(Z<-1.625)$	M1
		$=1-0.9484$ (calc. $1-0.9479187299\ldots$)	M1
		$=$ awrt **0.052**	A1 (3)
	(b)	Require: $P(W>49\mid W<51)$	M1
		$=\dfrac{P(49<W<51)}{P(W<51)}$ or $\dfrac{P(-1.875<Z<-1.625)}{P(Z<-1.625)}$	M1
		$=\dfrac{0.021684...}{\text{(a)}}$	A1ft
		$=0.4163\ldots$ awrt **0.42**	A1 (4)
	(c)	$\left[P(W>H)=0.10\Rightarrow\right]$ $\dfrac{H-64}{8}=1.2816$	M1B1
		$H=74.2528\ldots$ awrt **74.3**	A1 (3)
			[10 marks]

3. (a)	$[\bar{x} =]\frac{-1.2}{8}[=-0.15]$	M1
	$"-0.15" = \frac{\bar{b}-21}{2}$ oe $\quad \left[\sum b = 21\times 8+2\times(-1.2)\,[=165.6]\right]$ $\quad \left[\bar{b} =\right]\frac{165.6}{8}$	M1
	$= \underline{\mathbf{20.7}}$ (cm)	A1
		(3)
(b)	$\sigma_x = \sqrt{\frac{5.1}{8}-\left(\frac{-1.2}{8}\right)^2}\,[=\sqrt{0.615}=0.784...]$	M1
	$\sigma_b = 2\times '0.784...'$	M1
	= awrt $\underline{\mathbf{1.57}}$ (cm)	A1
		(3)
(c)(i)	$x_9 = 1.2 \rightarrow b_9 = 1.2\times 2+21$ oe **or** $9\times 21-8\times '20.7'[=354.6]$	M1
	$= \underline{\mathbf{23.4}}$ (cm)	A1
		(2)
(ii)	$\sum x^2 = 5.1+1.2^2\,[=6.54]$ $\quad \left[\Rightarrow \sigma_x = \sqrt{\frac{5.1+1.2^2}{9}-0^2}\right]$	M1
	= awrt $\underline{\mathbf{0.852}}$ (cm)	A1
		(2)

Question Number	Scheme	Marks
4. (a)	[W = weight of a package delivered to Susie $W \sim N(510, 45^2)$]	
	$P(W<450) = P\left(Z < \frac{450-510}{45}\right)$ or $P(Z < -1.3333)$	M1
	$= 1 - 0.9082$	M1
	$= 0.0918$ **[0.0912~0.0918]**	A1
		(3)
(b)	[$P(W > d) = 0.05$ implies] $\frac{d-510}{45} = 1.6449$	M1B1
	$d = 584.0205\ldots$ awrt **584**	A1
		(3)
(c)	$[P(W > 450 \mid W < \text{“584.02…”}) =] \frac{P(450 < W < "584.02...")}{P(W < "584.02...")}$	M1
	$= \frac{0.95-"0.0918"}{0.95}$ or $\frac{"0.9082"-0.05}{0.95}$	M1A1
	$= 0.903368\ldots$ awrt **0.904** or **0.903**	A1
		(4)
(d)	$\left(\frac{19}{20}\right)^4 \times \frac{1}{20} \times 5$	M1dM1
	$= 0.203626\ldots$ awrt **0.204**	A1
		(3)
		[13]

Question Number		Scheme	Marks
6.	(a)	$\left[\sum y = 16 \times 20.5 = 328\right]$ $S_{yy} = 8266 - \frac{328^2}{16}$	M1
		$= 1542$ (allow awrt 1540)	A1
		$[r =] \frac{-630.9}{\sqrt{368.16 \times "1542"}}$	M1
		$= -0.837336\ldots$ awrt **– 0.837**	A1
			(4)
	(b)	As the distance from the hospital increases the percentage of referrals decreases (o.e.) e.g. smaller % of patients attend from clinics further away	B1
			(1)
	(c)	e.g. Points close to a straight line (of negative gradient) so does support belief	B1
			(1)
	(d)	$b = \frac{-630.9}{368.16}$ $[= -1.7136\ldots]$	M1
		$a = 20.5 - "-1.7136..." \times 8.1$ $[= 34.3806\ldots]$	M1
		$y = 34.38\ldots - 1.7136\ldots x$ **$y = 34.4 - 1.71x$**	A1, A1
			(4)
	(e)	[On average] each km further from the hospital reduces the % attendance by 1.7%	B1
			(1)
	(f)	Correct line drawn on scatter diagram (use overlay within guidelines)	B1
			(1)
	(g)	Correct point circled (3.2,19) [Allow coords stated instead of point circled but if both, prioritise circled point]	B1
			(1)
			[13]

Question Number		Scheme	Marks
2.(a)		$[E(X) =]$ $(-2 \times 0.15) + (-1 \times a) + 0 + (1 \times a) + (3 \times 0.4)$ or $-0.3 - a + a + 1.2$	M1
		$= \mathbf{0.9}$	A1
			(2)
	(b)	$[E(X^2) =] \{(-2)^2 \times 0.15\} + \{(-1)^2 \times a\} + \{1^2 \times a\} + \{3^2 \times 0.4\}$	M1
		or $0.6 + 2a + 3.6$	
		So $4.2 + 2a = 4.54$	dM1
		$a = \mathbf{0.17}$	A1
		Use of sum of probabilities = 1 e.g. $0.15 + "0.34" + 0.4 + b = 1$	M1
		$b = \mathbf{0.11}$	A1
			(5)
	(c)	$[\text{Var}(X) =]$ $4.54 - (\text{their } 0.9)^2$ $[= 3.73]$	M1
		$\text{Var}(Y) = (-2)^2 \text{Var}(X)$	M1
		$= \mathbf{14.92}$ (accept 14.9)	A1
			(3)
			[10 marks]

5.	**(a)**	Resting heart rate, h, is being measured (you can't control it) So it is the response variable	B1 dB1 (2)
	(b)	For every additional minute of exercise, heart rate decreases by 0.43 (bpm)	B1 (1)
	(c)	$[\bar{t} =]50 \quad [\bar{h} =]72$	B1 B1 (2)
	(d)	$h = 93.5 - 0.43\,(50)$ so $h = 72$ or Allow: $72 = 93.5 - 0.43 \times 50$	B1 cso (1)
	(e)	$[h = 93.5 - 0.43\,(60)]$ $h =$ **67.7** (allow 68 if a correct expression is seen)	B1 (1)
	(f)	Since 1 hour (60 minutes) is within the range (of the t-values), The estimate is reliable	B1 dB1 (2)
	(g)	$\frac{a-73}{8} = -1.96$ or $\frac{b-73}{8} = 1.96$ $73 \pm 1.96 \times 8$ (57.32, 88.68) **awrt 57.3 and 88.7**	M1 B1 dM1 A1 (4) **(13 marks)**

Question	Scheme	
4 (a)	$0.2 = \frac{P(C \cap D)}{0.45}$	M1
	$[P(C \cap D) =]\ 0.09$	A1
		(2)
(b)	$0.59 = P(C) + 0.45 - "0.09" \quad [\rightarrow P(C) = 0.59 - 0.45 + "0.09"]$	M1
	$= 0.23$	A1
		(2)
	Notes	**Total 4**
	Mark (a) and (b) together	
(a)	M1 for substitution of 0.2 and 0.45 into a correct equation for $P(C \cap D)$ (allow any rearrangement)	
	A1 oe correct answer scores 2 out of 2 Must be clearly identified as the answer to part (a). A correct Venn diagram on its own is not sufficient.	
(b)	M1 for correct substitution of 0.59, 0.45 and "their a" into $P(C \cup D) = P(C) + P(D) - P(C \cap D)$ Implied by "their (b)" – "their(a)" = 0.14 $0.59 = P(C) + 0.45$ is M0 Only ft $0 <$ "their (a)" < 1 If "their (a)" is outside this range, then M0	
	A1 oe correct answer scores 2 out of 2	

Question Number	Scheme	Marks
3(a)	Width = 3 cm	B1
	1cm^2 represents 2 cars or 0.5cm^2 represents 1 car or their $h \times w = 6$ or area = 6	M1
	Height = $\frac{6}{3} = 2$ cm	A1
		(3)
(b)	Median = $(2) + \frac{30-28}{15} \times 2$ or $(2) + \frac{30.5-28}{15} \times 2$ (o.e.)	M1
	= 2.266… (or 2.33…)	A1
		(2)
(c)	$\left[\bar{t} =\right] \frac{182}{60} = 3.03...$	B1
	$\left[\sigma_t =\right] \sqrt{\frac{883}{60} - \bar{t}^{\,2}} = \sqrt{5.5155...}$	M1
	= 2.3485… (s = 2.3683…)	A1
		(3)
(d)	Mean > median	B1ft
	Positive skew	dB1
		(2)
(e)	[75 mins = 1.25 hours]	
	(> 75 mins) = $5+12+15+\frac{3}{4}\times 18 = 45.5$ or (< 75) = $10+\frac{1}{4}\times 18$ or $28-\frac{3}{4}\times 18$	M1
	$P(T > 1.25) = \frac{45.5}{60}$ or e.g. $1-\frac{14.5}{60}$	M1
	0.7583… awrt **0.758**	A1
		(3)
	Notes	**Total 13**