Question	Scheme	Marks
3(a)	Width = 1.25 [cm]	B1
	18.75 cm^2 for freq of 20 so $\frac{18.75}{20}\times 16 = 15$ cm^2 for a frequency of 16 or $w\times h = 15$ or fd = 5	M1
	[$h = 15\div 1.25$ or $h = 8\div 5\times 7.5$ =] 12 (cm)	A1
		(3)
(b)	$Q_2 = [32+]\frac{7}{20}\times 4$ or using $n+1$ gives $Q_2 = [32+]\frac{7.5}{20}\times 4$	M1
	=33.4 ($n+1$ gives 33.5)	A1
		(2)
(c)	$\bar{y} = \frac{104}{50}[=2.08]$ | $\sum(w-20) = 10\times 104[=1040]$ or $\sum w = 10\times 104 + 50\times 20[=2040]$	M1
	$\bar{w} = 10\times$"2.08"$+20$ = 40.8* | $\frac{"1040"}{50}+20 = 40.8$ or $\frac{"2040"}{50} = 40.8$	A1*
		(2)
(d)	$[\text{Variance of } y =]\frac{233.54}{50} - ("2.08")^2 \left[=\frac{861}{2500} = 0.3444\right]$ or 10 × sd of y = sd of w or $100\times 233.54 = \sum(w^2) - 40\times"2040" + 50\times 400 \left[\Rightarrow \sum(w^2) = 84954\right]$ oe	M1
	$[\text{Variance of } w =]"0.3444"\times 100$ or $\frac{"84954"}{50} - 40.8^2 \left[=\frac{861}{25} = 34.44\right]$ or sd of $y = \sqrt{"0.3444"}\left[=\frac{\sqrt{861}}{50} = 0.5868...\right]$	M1
	sd of w = $\sqrt{"0.3444"\times 100}$ or $\sqrt{"34.44"}$ or $10\times"\frac{\sqrt{861}}{50}"$	M1
	= 5.868… awrt 5.87	A1
(e)(i)	The mean would not change (as 40.8 is the mean)	B1
(ii)	The standard deviation would decrease (as 40.8 is in the middle so data closer together)	B1
	Both correct with a correct reason for why the standard deviation decreases	ddB1
		(3)
	Notes	**Total 14**

(a)	**B1**	for width = 1.25 no need for units
	M1	for sight of 15 or "their w"×"their h"$=15$ or fd = 5 May be implied by h = 12
	A1	for height = 12 no need for units
(b)	**M1**	for $\frac{7}{20}\times 4$ or $\frac{13}{20}\times 4$ or $\frac{m-32}{25-18} = \frac{4}{20}$ oe or $\frac{36-m}{38-25} = \frac{4}{20}$ oe (allow 25.5 rather than 25)
	A1	33.4 or if using $(n+1)$ 33.5
(c)	**M1**	for a correct method to find the mean of y or $\sum(w-20)$ or $\sum w$ ($10\times 104 + k$ where $k \neq 20\times 50$ is M0)
	A1*	for a correct method to find mean of w which leads to 40.8
(d)	**M1**	for a correct method to find the Variance of y or writing/using 10 ×sd of y = sd of w or a correct equation to find $\sum w^2$
	M1	for a correct method to find the Variance of w or sd of y ft their Var(y)
	M1	for a correct method to find the sd of w ft their Var(w)
	A1	awrt 5.87 **NB** an exact answer $\frac{\sqrt{861}}{5}$ scores A0
(e)(i)	**B1**	for no change (No reason needed) Allow mean = 40.8 to imply no change
(ii)	**B1**	for sd decreases/be smaller/go down (condone Var decreases) (No reason needed)
	ddB1	Both previous B1 awarded. For a correct reason for the sd decreasing Allow $(x-\bar{x}) = 0$ Allow $\sum(x-\bar{x})^2$ doesn't change and n increases. Allow the values would be more concentrated about the mean