Question Number	Scheme		Marks
4 (a)(i)(ii)	$a=\frac{1}{2}$		B1
(ii)	$d=1$		B1
(iii)	$a+3b=1\Rightarrow '\frac{1}{2}'+3b=1\Rightarrow b=\frac{1}{6}$		M1A1
(iv)	$a+2b=c\Rightarrow '\frac{1}{2}'+2\times '\frac{1}{6}'=c$ or $d-b=c\Rightarrow '1'-'\frac{1}{6}'=c$ So $c=\frac{5}{6}$		M1A1
			(6)
(b) (i)	$\mathrm{E}(X)=\left[0\times '\frac{1}{2}'+2\times '\frac{1}{3}'+3\times '\frac{1}{6}'\left[=\frac{7}{6}\right]\right]$	4, 28 and 40 seen	M1
	$\mathrm{E}(12X+4)=12\mathrm{E}(X)+4=12\times '\frac{7}{6}'+4=18$	$4\times '\frac{1}{2}'+28\times '\frac{1}{3}'+40\times '\frac{1}{6}'=18$	M1 A1
			(3)
(ii)	$\mathrm{E}(X^2)=\left[0^2\times '\frac{1}{2}'+2^2\times '\frac{1}{3}'+3^2\times '\frac{1}{6}'\left[=\frac{17}{6}\right]\right]$	16, 784 and 1600 seen oe	M1
	$\mathrm{Var}(X)='\frac{17}{6}'-'\frac{7}{6}'^2\left[=\frac{53}{36}\right]$	$4^2\times '\frac{1}{2}'+28^2\times '\frac{1}{3}'+40^2\times '\frac{1}{6}'[=536]$	M1
	$\mathrm{Var}(12X+4)=12^2\mathrm{Var}(X)=144\times '\frac{53}{36}'=212$	$536-18^2=212$	M1 A1
			(4)

	Notes	Total 13
(a) (i)	**B1**	Cao
(ii)	**B1**	Cao
(iii)	**M1**	For writing or using of $a+3b=1$ ft their a provided $0<a<1$ May be implied by $b=\frac{1}{6}$
	A1	Allow awrt 0.167
(iv)	**M1**	For writing or using of $a+2b=c$ ft their a and their b provided $0<a<1$ and $0<b<1$ or $d-b=c$ ft their d and their b provided $0<d<1$ and $0<b<1$ May be implied by $c=\frac{5}{6}$
	A1	Allow awrt 0.833
(b) (i)	**M1**	For use of $\sum x\mathrm{P}(X=x)$ ft their a and their b provided $0<b<1$ (We do not need to see 0×0.5) Allow $\sum x\mathrm{P}(X=x)=7b$ or writing/using 4, 28 and 40
	M1	For use of $12\mathrm{E}(X)+4$ ft their E(X) Allow E($12X+4$) = $84b+4$ or use of $\sum x\mathrm{P}(X=x)$ if using 4, 28 and 40 ft their a and their b provided $0<a<1$ and $0<b<1$ Allow $\sum x\mathrm{P}(X=x)=4a+96b$
	A1	Cao
(ii)	**M1**	For use of $\sum x^2\mathrm{P}(X=x)$ ft their a and their b, provided $0<b<1$ (We do not need to see $0^2\times 0.5$). Allow $\sum x^2\mathrm{P}(X=x)=17b$ or writing/using 16, 784 and 1600 May be implied by the 2nd M mark
	M1	For use of $\mathrm{Var}(X)=\mathrm{E}(X^2)-\mathrm{E}(X)^2$ ft their $\mathrm{E}(X^2)$ and their $\mathrm{E}(X)$ Allow $\mathrm{Var}(X)=17b-49b^2$ or use of $\sum x^2\mathrm{P}(X=x)$ if using 16, 784 and 1600 ft their a and their b provided $0<a<1$ and $0<b<1$ Allow $\sum x^2\mathrm{P}(X=x)=16a-3168b$
	M1	For use of $12^2\mathrm{Var}(X)$ ft their Var(X) Allow $2448b-7056b^2$ or $\mathrm{Var}(X)=\mathrm{E}(X^2)-\mathrm{E}(X)^2$ if using 16, 784 and 1600 Allow $16a-3168b-(4a+96b)^2$
	A1	Cao