Qu	Scheme	Marks
5(a)	$\begin{array}{\|c\|c\|c\|c\|c\|c\|c\|}\hline P(Y=y) & 2k & k & k & 8k & 17k & k \\ \hline \end{array}$	M1
	$2k+k+k+8k+17k+k=1$ or $30k=1$ $\left[\Rightarrow k=\frac{1}{30}\right]$*	A1*
		(2)
(b)	$k+k+8k$ or $1-(2k+17k+k)$	M1
	$=\frac{1}{3}$ **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)	$P(Y\geqslant 15-2Y)$ or [X =] 13 11 9 7 5 3 only or [Y =] 5 or 6 only	M1
	$[P(Y\geqslant 5) = P(Y=5)+P(Y=6)] = \frac{"17"}{30}+\frac{"1"}{30}$	M1
	$=\frac{3}{5}$ oe	A1ft
		(3)
(e)	Var (X) = 4Var(Y)	M1
	$[E(Y^2)=](1\times 2k)+(2^2\times k)+(3^2\times k)+(4^2\times 8k)+(5^2\times 17k)+(6^2\times k)\left[=\frac{302}{15}\text{ or awrt } 20.1\right]$	M1
	$[\text{Var}(Y)=]"\frac{302}{15}"-\left("\frac{13}{3}"\right)^2\left[=\frac{61}{45}\text{ or awrt } 1.36\right]$	M1d
	$[\text{Var}(X)=]$ $\frac{244}{45}$ oe **awrt 5.42**	A1
	ALT for 1st 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
	$[E(X^2)=](13^2\times 2k)+(11^2\times k)+(9^2\times k)+(7^2\times 8k)+(5^2\times 17k)+(3^2\times k)\left[=\frac{683}{15}\text{ or awrt } 45.5\right]$	M1
	$[\text{Var}(X)=]"\frac{683}{15}"-\left("\frac{190}{30}"\right)^2$	M1d
	Notes	**Total 13**
(a)	M1 for finding the probabilities in terms of k. The individual probabilities must be seen either in a table or in the calculation (but do not need to be simplified)	
	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 $\sum xP(x)$ At least 3 terms given Allow with $k=1/30$ subst or ft their probabilities.	
	A1 awrt 4.33	
(d)	M1 forming correct inequality in Y **or** 13,11,9,7,5,3 seen anywhere **or** for 5 and 6 only. Implied by 2nd M1	
	M1 finding their $P(Y=5)$ + their $P(Y=6)$ or $P(X=5)+P(X=3)$ eg $17k + k$	
	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) allow 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 labels	
	M1d dep on the 2nd 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 2nd M1 the 1st M1 must be awarded. Condone incorrect labelling	
	A1 awrt 5.42	