Question Number	Scheme	Marks
6(a)	$\left[\mathrm{P}\left(Y<\frac{1}{4}k \mid Y<k\right)=\right]\dfrac{\mathrm{F}\left(\frac{1}{4}k\right)}{\mathrm{F}(k)}=\dfrac{\frac{1}{21}\left(\frac{k}{4}\right)^2}{\frac{1}{21}k^2}=\dfrac{1}{16}$ oe	M1 A1
		(2)
(b)	$\dfrac{1}{21}k^2=-\dfrac{1}{15}k^2+\dfrac{4}{5}k-\dfrac{7}{5}$ $\quad\dfrac{\mathrm{d}}{\mathrm{d}y}\left(\dfrac{1}{21}y^2\right)=\dfrac{2}{21}y$ or $\dfrac{\mathrm{d}}{\mathrm{d}y}\left(\dfrac{2}{15}\left(6y-\dfrac{y^2}{2}\right)-\dfrac{7}{5}\right)=\dfrac{2}{15}(6-y)$	M1
	$\Rightarrow 4k^2-28k+49=0$ oe $\quad\dfrac{\mathrm{d}}{\mathrm{d}y}\left(\dfrac{1}{21}y^2\right)=\dfrac{2}{21}y$ & $\dfrac{\mathrm{d}}{\mathrm{d}y}\left(\dfrac{2}{15}\left(6y-\dfrac{y^2}{2}\right)-\dfrac{7}{5}\right)=\dfrac{2}{15}(6-y)$	A1
	$\Rightarrow (2k-7)^2=0$ $\quad\dfrac{2}{21}k=\dfrac{2}{15}(6-k)$	M1
	$k=\dfrac{7}{2}$ oe	A1
		(4)
(c)	$\mathrm{f}(y)=\begin{cases}\frac{2}{21}y & 0\leqslant y\leqslant '3.5'\\ \frac{2}{15}(6-y) & '3.5'<y\leqslant 6\\ [0] & [\text{otherwise}]\end{cases}$	M1 M1
	$\mathrm{E}(Y)=\dfrac{2}{21}\int_0^{'3.5'}y^2\mathrm{d}y+\dfrac{2}{15}\int_{'3.5'}^{6}\left(6y-y^2\right)\mathrm{d}y \quad\Rightarrow\quad \dfrac{2}{21}\left[\dfrac{y^3}{3}\right]_0^{'3.5'}+\dfrac{2}{15}\left[3y^2-\dfrac{y^3}{3}\right]_{'3.5'}^{6}$	M1 M1
	$\dfrac{2}{21}\left(\dfrac{343}{24}\right)+\dfrac{2}{15}\left(\dfrac{325}{24}\right)=\dfrac{19}{6}=3.166...$ awrt 3.17	dM1 dA1
		(6)
		Total 12

(a)	**M1**	For a correct probability statement or a correct ratio of probabilities
	A1	For $=\dfrac{1}{16}$ oe or 0.0625
(b)	**M1**	For setting the two lines of the cdf = to each other or $\frac{2}{21}y$ or $\frac{2}{15}(6-y)$ (Implied by a correct 3TQ)
	A1	For a correct 3TQ or $\frac{2}{21}y$ and $\frac{2}{15}(6-y)$
	M1	For solving their 3TQ. If the 3TQ is not correct, then a correct method must be shown or setting their 2 lines of the pdf = to each other
	A1	$k = 3.5$ oe **NB** $k = 3.5$ with no incorrect working scores 4/4
(c)	**M1**	Attempting to differentiate 1 of the functions. May be seen in part (b) or in an attempt to find E(Y)
	M1	Attempting to differentiate both with one correct. May be seen in part (b) or in an attempt to find E(Y)
	M1	For writing or using $\mathrm{E}(Y)=\int_0^{3.5}y\ \mathrm{f}(y)\ \mathrm{d}y+\int_{3.5}^{6}y\ \mathrm{f}(y)\ \mathrm{d}y$ Ignore limits
	M1	For attempting to integrate
	dM1	Dependent on previous M1. For substitution of limits, must be 0 or 6 and ft their 3.5. May be implied by $\frac{49}{36}$ oe or $\frac{65}{36}$ oe or $\frac{19}{6}$ oe. If the integral is not correct, then we must see evidence of substitution.
	dA1	Dependent on previous M1. For $\frac{19}{6}$ or awrt 3.17