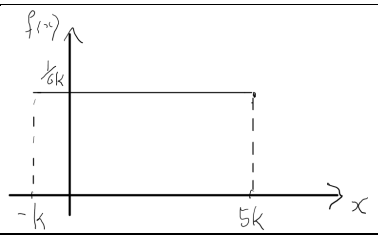
Question Number	Scheme	Marks
3(a)	$\begin{cases} \frac{1}{6k} & -k \leqslant x \leqslant 5k \\ 0 & \text{otherwise} \end{cases}$	B1 B1
		(2)
(b)		B1 B1ft
		(2)
(c)	$\mathrm{E}(X) = \frac{-k+5k}{2} = 2k$	B1
		(1)
(d)	$\mathrm{F}(X) = \int_{(-k)}^{(x)} "\frac{1}{6k}" \,(\mathrm{d}a)$	M1
	$= \left[\frac{a}{6k}\right]_{a=-k}^{a=x} \Rightarrow \mathrm{F}(x) = \frac{x}{6k} + \frac{1}{6}$ oe Alt: $\mathrm{F}(x) = \frac{x}{6k} + c$ Use of $\mathrm{F}(-k) = 0$ or $\mathrm{F}(5k) = 1$ giving $c = \frac{1}{6}$	A1
	$\begin{cases} 0 & x < -k \\ \frac{x}{6k} + \frac{1}{6} & -k \leqslant x \leqslant 5k \\ 1 & x > 5k \end{cases}$	B1 A1
		(4)
(e)	$\mathrm{Var}(X) = \frac{1}{12}(5k - -k)^2 = 3k^2$ Alt: $\mathrm{E}(X^2) = \int_{(-k)}^{(5k)} "\frac{x^2}{6k}" (\mathrm{d}x)$	M1
	$\mathrm{E}(Y) = \mathrm{E}(X^2) = \mathrm{Var}(X) + (\mathrm{E}(X))^2 = 3k^2 + "(2k)"^2$ $= "\frac{1}{6k}\left[\frac{x^3}{3}\right]_{-k}^{5k}"$	dM1
	$= 7k^2$ $\frac{125k^3 + k^3}{18k} = 7k^2$	A1
		(3)
(f)	$\left(\mathrm{P}(Y < 2k^2) = \mathrm{P}(X^2 < 2k^2) =\right) \ \mathrm{P}(-\sqrt{2}k < X < \sqrt{2}k)$	M1
	$= \mathrm{P}(-k < X < \sqrt{2}k)$	M1
	$\left(= \frac{\sqrt{2}k - -k}{6k}\right) = \frac{\sqrt{2}+1}{6}$ or exact equivalent	A1
		(3)
		Total 15

	Notes	
(a)	**B1**	correct pdf. Condone $\frac{1}{5k+k}$ but not $\frac{1}{5k--k}$. Must be seen in (a).
	B1	all correct, allow use of < instead of $\leqslant$. B0B1 is not possible.
(b)	**B1**	correct horizontal line / rectangle drawn which must be both sides of the *y*-axis. Ignore the presence or absence of vertical lines at -*k* and 5*k*
	B1ft	labels correct, -*k*, 5*k* and $"\frac{1}{6k}"$ ft on their f(*x*), provided f(*x*) is a constant.
(c)	**B1**	cao (condone $2\times k$)
(d)	**M1**	a correct integral expression for their pdf from (a). Ignore/condone missing limits. May be implied by their integrated expression. Alternatively, attempts the equation of the line between $(-k,0)$ and $(5k,1)$
	A1	$\frac{x}{6k}+\frac{1}{6}$ oe A correct expression for $-k$ „ x „ $5k$ e.g. $\frac{x+k}{6k}$ will imply M1A1
	B1	1st and 3rd lines of cdf correct, allow use of 'otherwise' for one of these lines
	A1	for correct 2nd line of cdf correct: $\frac{x}{6k}+\frac{1}{6}$ oe e.g. $\frac{x+k}{6k}$ **and** $-k$ „ x „ $5k$ (oe), allow use of < instead of $\leqslant$
(e)	**M1**	correct calculation to find Var(X), does not need to be simplified. **Alt** correct integral for their pdf in (a) (not just the general expression). Condone missing limits.
	dM1	dep on previous M1 for a correct calculation to find E(Y) using their part (c). **Alt** attempt integration (not wrt *k*) for their pdf in (a), which must be **a constant** i.e. $\frac{x^2}{"6k"}\rightarrow ...x^3$, and correct limits shown or used
	A1	cao
(f)	**M1**	for an attempt to find the range of possible values for X (inside region) involving $\sqrt{2}k$ or $\sqrt{2}k^2$ or $\sqrt{2k}$. May be implied by further work. May attempt 1 – outside region. You do not need to see P(…)
	M1	$-k < X < "\sqrt{2}k"$ seen or implied. e.g. F($"\sqrt{2}k"$), P($X<"\sqrt{2}k"$) May attempt $1-\text{P}("\sqrt{2}k<X<5k)$ do not be concerned with strict or inclusive inequality signs used.
	A1	cao or exact equivalent e.g. $\frac{\sqrt{2}}{6}+\frac{1}{6}$ or $\frac{\sqrt{2}k+k}{6k}$ (note decimal answer awrt 0.402 is M1M1A0) isw after correct answer seen