Question Number	Answer	Marks
9		
(a)	$(1-x)^{-k} = 1+(-k)(-x)+\frac{(-k)(-k-1)}{2!}(-x)^2+\frac{(-k)(-k-1)(-k-2)}{3!}(-x)^3$	M1 (1 needed; 2 or 2!, 6 or 3!)
	$=1+kx+\frac{k(k+1)}{2}x^2+\frac{k(k+1)(k+2)}{6}x^3$ *	A2,1,0 (algebraic terms) (3)
(b)	$(1+kx)^{\frac{1}{2}} = 1+\frac{1}{2}kx+\frac{\frac{1}{2}\left(-\frac{1}{2}\right)}{2!}(kx)^2+\frac{\frac{1}{2}\left(-\frac{1}{2}\right)\left(-\frac{3}{2}\right)}{3!}(kx)^3$	M1
	$=1+\frac{1}{2}kx-\frac{1}{8}k^2x^2+\frac{1}{16}k^3x^3$	A2,1,0 (3)
(c)	$-\frac{1}{8}k^2=\frac{k(k+1)}{2}$	M1
	$5k^2+4k=0$	M1
	$k=-\frac{4}{5} \quad k\neq 0$	A1 (3)
(d)	$\sqrt{15}=\sqrt{\frac{3\times 25}{5}}=5\sqrt{\frac{3}{5}}$	M1A1 (2)
	Alt: $\sqrt{15}=\lambda\sqrt{\frac{3}{5}} \Rightarrow \sqrt{15\times\frac{5}{3}}=\lambda \quad \lambda=5$	
(e)	$x=\frac{1}{2}$	B1
	$\sqrt{\frac{3}{5}}=\left(1-\frac{1}{2}\times\frac{4}{5}\right)^{\frac{1}{2}}=1-\frac{2}{5}\times\frac{1}{2}-\frac{1}{8}\times\frac{16}{25}\times\frac{1}{4}-\frac{1}{16}\times\left(\frac{4}{5}\right)^3\times\frac{1}{8}$	M1A1
	$\sqrt{15}=5\sqrt{\frac{3}{5}}=3.88$	A1 (4)
		[15]

Notes

(a)

M1 for attempting a binomial expansion of $(1-x)^{-k}$. Must have the 1, 2 or 2! and 6 or 3!. It must be clear that $-x$ has been used in at least one term. This is a "show that" question, so simplifying all the terms immediately is insufficient method and gets M0

A1 for two correct algebraic terms

A1cso for all three algebraic terms correct. This is a given answer, so check working carefully.

(b)

M1 for attempting a binomial expansion of $(1+kx)^{\frac{1}{2}}$. Again must have the 1, 2 or 2! and 6 or 3!. It must be clear that kx has been used in at least one term.

A1 for two correct algebraic terms **must** be simplified.

A1cso for all three algebraic terms correct **must** be simplified.

(c)

M1 for equating *their* coefficients of x^2 to form an equation. Allow if x^2 is included in both terms.

M1 for reducing *their* equation to a two term quadratic or linear equation.

A1cso for $k=-\frac{4}{5}$ ($k \neq 0$ need not be seen)

(d)

M1 for manipulating either side of $\sqrt{15}=\lambda\sqrt{\frac{3}{5}}$ to obtain a value for λ

A1 for $\lambda=5$ need not be shown explicitly.

If $\lambda=5$ is seen w/o working, give M1A1

(e) B1 for identifying $x=\frac{1}{2}$ needed May only be seen in the expansion

M1 for substituting *their* values of x and k in their expansion from (b) to obtain a numerical expression for $\sqrt{\frac{3}{5}}$

A1 for an expansion which is fully correct, no need to evaluate here

A1cso for completing to $\sqrt{15}=5\sqrt{\frac{3}{5}}=3.88$