Question Number	Scheme	Notes	Marks
4. (a) **Way 1**	$\sum_{r=1}^{3k}(4r+1)=4.\frac{1}{2}(3k)(3k+1)+3k$	Either $\sum_{r=1}^{3k}4r\rightarrow 4.\frac{1}{2}(3k)(3k+1)$ or $\sum_{r=1}^{3k}1\rightarrow 3k$	M1
		Correct expression, simplified or un-simplified	A1
	$=6k(3k+1)+3k=18k^2+9k$		
	$=\ 9k(2k+1)\quad\{p=9\}$	Obtains $9k(2k+1)$ with no errors	A1 **cso**
			(3)
(a) **Way 2**	$\sum_{r=1}^{k}(4r+1)=4.\frac{1}{2}(k)(k+1)+k$	**Both** $\sum_{r=1}^{k}4r\rightarrow 4.\frac{1}{2}(k)(k+1)$ **and** $\sum_{r=1}^{k}1\rightarrow k$	M1
	$=2k(k+1)+k=2k^2+3k$		
	$\sum_{r=1}^{3k}(4r+1)=2(3k)(3k+1)+3k=2(3k)^2+3(3k)$	Correct expression, simplified or un-simplified	A1
	$=18k^2+9k$		
	$=\ 9k(2k+1)\quad\{p=9\}$	Obtains $9k(2k+1)$ with no errors	A1 **cso**
			(3)
(b) **Way 1**	$\sum_{r=1}^{k}2r^2=\sum_{r=1}^{3k}(4r+1)$		
	$2.\frac{1}{6}k(k+1)(2k+1)=9k(2k+1)$	Sets $\lambda k(k+1)(2k+1)$ equal to "9"$k(2k+1)$ or their answer from part (a), $\lambda\neq 0$, to give an equation in k only	M1
	$\frac{1}{3}(k+1)=9\Rightarrow k=26$	**dependent on the previous M mark** Cancels out two terms or factorises out two terms and solves a linear equation in k to give $k=...$	dM1
		$k=26$ **only**	A1
			(3)
(b) **Way 2**	$2.\frac{1}{6}k(k+1)(2k+1)=9k(2k+1)$	Sets $\lambda k(k+1)(2k+1)$ equal to "9"$k(2k+1)$ or their answer from part (a), $\lambda\neq 0$, to give an equation in k only	M1
	$2k^3+3k^2+k=54k^2+27k$ $2k^3-51k^2-26k=0$ $k(2k^2-51k-26)=0$ $(2k+1)(k-26)=0\Rightarrow k=26$	**dependent on the previous M mark** Cancels out or factorises k and a correct method (e.g. factorising, applying the quadratic formula, completing the square or calculator) of solving a 3TQ to give $k=...$	dM1
		$k=26$ **only**	A1
			(3)
(b) **Way 3**	$2.\frac{1}{6}k(k+1)(2k+1)=9k(2k+1)$	Sets $\lambda k(k+1)(2k+1)$ equal to "9"$k(2k+1)$ or their answer from part (a), $\lambda\neq 0$, to give an equation in k only	M1
	$k(k+1)(2k+1)=27k(2k+1)$ $k(k+1)-27k=0\ \Rightarrow\ k^2-26k=0$ $k(k-26)\ \Rightarrow k=26$	**dependent on the previous M mark** Cancels out two terms or factorises out two terms and solves a linear equation in k to give $k=...$	dM1
		$k=26$ **only**	A1
			(3)
			6

	Question 4 Notes	
4. (a)	**Note**	Give M1A1 for $\sum_{r=1}^{3n}(4r+1)=4.\frac{1}{2}(3n)(3n+1)+3n$
	Note	Give M1A1A0 for $\sum_{r=1}^{3n}(4r+1)=4.\frac{1}{2}(3n)(3n+1)+3n=18n^2+9n=9n(2n+1)$ without reference to $\sum_{r=1}^{3k}(4r+1)=9k(2k+1)$
	Note	Give M1A1A1 for $\sum_{r=1}^{3n}(4r+1)=4.\frac{1}{2}(3n)(3n+1)+3n=18n^2+9n=9n(2n+1)\Rightarrow\sum_{r=1}^{3k}(4r+1)=9k(2k+1)$
	Note	**Way 2:** Give M1 for $\sum_{r=1}^{n}(4r+1)=4.\frac{1}{2}(n)(n+1)+n$
	Note	Give final A0 for cancelling down their final answer $9k(2k+1)$ in part (a) E.g. $\sum_{r=1}^{3k}(4r+1)=4.\frac{1}{2}(3k)(3k+1)+3k=18k^2+9k=9k(2k+1)=k(2k+1)$ gets M1 A1 A0
	Note	Give M0 A0 A0 for writing e.g. $k=1\Rightarrow\sum_{1}^{3(1)}(4r+1)=p(1)((2(1)+1))\Rightarrow 5+9+13=3p\Rightarrow p=9$ with no evidence of applying $\sum_{r=1}^{3k}4r\rightarrow 4.\frac{1}{2}(3k)(3k+1)$ or $\sum_{r=1}^{3k}1\rightarrow 3k$
	Note	You can give M1 1st A1 marks in part (a) for work recovered for $\sum_{r=1}^{3k}(4r+1)=4.\frac{1}{2}(3k)(3k+1)+3k$ in part (b)
(b)	**Note**	Condone giving 1st M1 for setting $\lambda k(k+1)(2k+1)$ equal to "9"$k(k+1)$ {slip}
	Note	Give A0 for giving more than one value of k as their final answer.
	Note	Where applicable, for A1, • $k=0$ and/or $k=-\frac{1}{2}$ needs to be rejected leaving $k=26$ as their final answer. • $k=26$ needs to be indicated as their final answer.
	Note	**Way 2:** Using fractions gives • $\frac{2}{3}k^3+k^2+\frac{1}{3}k=18k^2+9k\Rightarrow\frac{2}{3}k^3-17k^2-\frac{26}{3}k=0\Rightarrow\frac{2}{3}k^2-17k-\frac{26}{3}=0$ $\Rightarrow k=\frac{17\pm\sqrt{(-17)^2-4(\frac{2}{3})(-\frac{26}{3})}}{2(\frac{2}{3})}=\frac{17\pm\sqrt{\frac{2809}{9}}}{\frac{4}{3}}=\frac{17\pm\frac{53}{3}}{\frac{4}{3}}\Rightarrow k=26$
	Note	**Way 3:** E.g. Give dM0 for $k^2+k-27k=0$ leading directly to $k=\frac{-1\pm\sqrt{(1)^2-4(1)(-27)}}{2(1)}$