Question Number	Scheme	Notes	Marks
7(a)	$\sum_{r=1}^{n}(12r^2+2r-3)=12\sum_{r=1}^{n}r^2+2\sum_{r=1}^{n}r-3\sum_{r=1}^{n}1$ $=12\times\frac{n}{6}(n+1)(2n+1)+2\times\frac{n}{2}(n+1)-3n$ $\left[=2n(n+1)(2n+1)+n(n+1)-3n\right]$	M1: Expands summation to at least 2 separate sums with one correct (could be implied), uses $\sum_{r=1}^{n}r^2=\frac{n}{6}(n+1)(2n+1)$ (allowing one of the following slips within the formula above: One of the 2 + signs seen as – or a missing first n) **and** replaces $\sum_{r=1}^{n}r$ with $\frac{n}{2}(n+1)$ **or** $\sum_{r=1}^{n}1$ with n Condone r used for n for the first three marks only. Allow $\sum$ for $\sum_{r=1}^{n}$ A1: Fully correct unsimplified expression	**M1** **A1**
	$\sum_{r=1}^{n}(12r^2+2r-3)=4n^3+6n^2+2n+n^2+n-3n=...$	Expands to a **cubic** and collects terms. Allow slips. **Requires previous M mark.**	**dM1**
	$4n^3+7n^2$	Correct expression from correct work Allow $A=4,\ B=7$ following $"=An^3+Bn^2"$	**A1**
			(4)
(b)	Full marks in (b) does not require full marks in (a)		
	$\sum_{r=1}^{2n}r^3=\frac{(2n)^2}{4}(2n+1)^2$	Attempts to use the sum of cubes formula with $2n$ Allow **one** of the following two slips: $2n^2$ for $(2n)^2$ Only one of the n's in the formula replaced by $2n$	**M1**
	$\sum_{r=1}^{2n}r^3-\sum_{r=1}^{n}(12r^2+2r-3)=$ $4n^4+4n^3+n^2-"4"n^3-"7"n^2\left[=270\right]$ $\left[\Rightarrow 4n^4-6n^2=270\right]$	Correct expanded quartic expression for $\sum_{r=1}^{2n}r^3-\sum_{r=1}^{n}(12r^2+2r-3)$ (ft their An^3+Bn^2) No requirement to collect terms but must be correct for their A and B if expression only seen with terms collected. If this is only seen as an equation it must be correct.	**A1ft**
	$4n^4-6n^2-270=0\Rightarrow$ $2n^4-3n^2-135=(2n^2+15)(n^2-9)=0$ $\Rightarrow n^2=...$	Solves their 3TQ in n^2 (usual rules and allow for one correct root if no working). May change variable e.g., $n^2\to x$ Ignore the labelling of roots (e.g. "n = ...") Allow for solving as a quartic if one root correct but requires $pn^4+qn^2+r=0$ oe, $p,q,r\neq 0$ **Requires previous M mark.**	**dM1**
	$n^2=9\Rightarrow n=3$	n = 3 and no other unrejected solutions. $n=\pm 3$ is A0 Must follow a correct equation.	**A1**
			(4)
			Total 8