Question Number	Scheme	Notes	Marks
3. (a)	$\sum_{r=1}^{n}(2r+5)^2 = 4\sum_{r=1}^{n}r^2 + 20\sum_{r=1}^{n}r + \sum_{r=1}^{n}25$		
	$= 4\left(\frac{1}{6}n(n+1)(2n+1)\right) + 20\left(\frac{1}{2}n(n+1)\right) + 25n$	Attempts to expand $(2r+5)^2$ and attempts to substitute at least one formula for either $\sum_{r=1}^{n}r^2$ or $\sum_{r=1}^{n}r$ into their resulting expression	M1 (B1 on ePEN)
		$4\left(\frac{1}{6}n(n+1)(2n+1)\right) + 20\left(\frac{1}{2}n(n+1)\right)$ which can be simplified or un-simplified	A1 (M1 on ePEN)
		Use of $\sum_{r=1}^{n}1 = n$	B1
	$= \frac{1}{3}n\left(2(n+1)(2n+1)+30(n+1)+75\right)$	Obtains an expression of the form $\alpha n(n+1)(2n+1)+\beta n(n+1)+\lambda n;\ \alpha,\beta,\lambda \neq 0$ and attempts to factorise out at least n	M1
	$= \frac{1}{3}n(4n^2+6n+2+30n+30+75)$		
	$= \frac{n}{3}(4n^2+36n+107)$		
	$= \frac{n}{3}\left[(2n+9)^2+26\right] \quad \left\{\text{or } \frac{n}{3}\left[(-2n-9)^2+26\right]\right\}$	Correct completion **Note:** $a=2,\ b=9$ and $c=26$ or $a=-2,\ b=-9$ and $c=26$	A1
			(5)
(b)	$\left\{\sum_{r=0}^{100}(2r+5)^2 =\right\}$ $= \frac{100}{3}\left[(2(100)+9)^2+26\right]+(5)^2$	Substitutes $n=100$ into their expression for $\sum_{r=1}^{n}(2r+5)^2$ which is in terms of n, and adds $(5)^2$ or 25 or $(2(0)+5)^2$ o.e. to the result	M1
	$\left\{= \frac{100}{3}(43707)+25\right\} = 1456925$	Obtains 1456925	A1
			(2)
			7

Question 3 Notes

3. (a)	**Note**	Applying e.g. $n=1$, $n=2$ and $n=3$ to the printed equation without applying the standard formulae to give $a=2$, $b=9$ and $c=26$ is M0 A0 B0 M0 A0
	Alt 1	**Alt Method 1 (Award the first three marks using the main scheme)**
		Using $\frac{4}{3}n^3+12n^2+\frac{107}{3}n \equiv \frac{a^2}{3}n^3+\frac{2ab}{3}n^2+\frac{b^2+c}{3}n$ o.e.
	M1	Equating coefficients to find at least two of $a=...$, $b=...$ or $c=...$ and at least one of **either** $a=2$, $b=9$ or $c=26$ **or** $a=-2$, $b=-9$ and $c=26$
	A1	Finds $a=2$, $b=9$ and $c=26$ or $a=-2$, $b=-9$ and $c=26$
	Note	Allow final M1A1 for $\frac{4}{3}n^3+12n^2+\frac{107}{3}n \rightarrow \frac{n}{3}\left[(2n+9)^2+26\right]$ with no incorrect working.
	Note	A correct proof of $\sum_{r=1}^{n}(2r+5)^2 = \frac{n}{3}\left[(2n+9)^2+26\right]$ followed by stating an incorrect e.g. $a=9$, $b=2$ and $c=26$ is M1 A1 B1 M1 A1 (ignore subsequent working)

	Question 3 Notes Continued	
3. (b)	**Note**	Allow M1 for $\frac{100}{3}(4(100)^2+36(100)+107)+(5)^2$ and A1 for obtaining 1456925
	Note	Allow M1 for $4\left(\frac{1}{6}(100)(101)(201)\right)+20\left(\frac{1}{2}(100)(101)\right)+25(100)+(5)^2$ $\{=1353400+101000+2500+25\}$ and A1 for obtaining 1456925
	Note	**dependent on obtaining 1st M1, 1st A1 and B1 in part (a)** Allow M1 A1 for $1456900+25=1456925$
	Note	Give M0 A0 for writing down 1456925 by itself with no supporting working
	Note	Give M0 A0 for listing individual terms i.e $\sum_{r=0}^{100}(2r+5)^2=5^2+7^2+9^2+11^2+...+205^2=1456925$, by itself is M0 A0
	Note	Give M0 A0 for applying $\frac{100}{3}\left[(2(100)+9)^2+26\right]+\frac{(-1)}{3}\left[(2((-1))+9)^2+26\right]=1456900--25=1456925$