| Question Number | Scheme | Marks |
|---|---|---|
| **8(a)** | $\sum_{r=1}^{n}(2r-1)^2 = 4\sum_{r=1}^{n}r^2 - 4\sum_{r=1}^{n}r + \sum_{r=1}^{n}1$ | M1 |
| | $= 4\times\frac{n}{6}(n+1)(2n+1) - 4\times\frac{n}{2}(n+1) + n$ | M1 A1 |
| | $= n\left(\frac{2}{3}(n+1)(2n+1) - 2(n+1) + 1\right)$ or $\frac{n}{3}\left(4n^2+6n+2-6n-6+3\right)$ | M1 |
| | $= \frac{n}{3}\left(4n^2-1\right)$ | A1 |
| | | **(5)** |
| **(b)** | smallest = $25^2$ = 13th term or largest = $95^2$ = 48th term | B1 |
| | $\frac{48}{3}\left(4\times48^2-1\right) - \frac{12}{3}\left(4\times12^2-1\right)$ | M1 |
| | 145 140 | A1 |
| | | **(3)** |
| | | **Total 8** |

**Notes**

**(a)**

M1: Expands and splits summation to obtain two correct terms. (Limits need not be shown.)

M1: Uses any two of $\sum_{r=1}^{n}r^2 = \frac{n}{6}(n+1)(2n+1)$ or $\sum_{r=1}^{n}r = \frac{n}{2}(n+1)$ or $\sum_{r=1}^{n}1 = n$

A1: Fully correct expression.

M1: Extracts a common factor of $\frac{n}{3}$ or $n$ from **all three terms** in their expression ($n$ must be a factor), allow one slip on one term. Do not accept attempts to solve the cubic via a calculator and "build up" the solution.

A1: Achieve the correct expression following the award of all the previous marks.

**(b)**

B1: Identifies either $25^2$ as $u_{13}$ or $95^2$ as $u_{48}$

M1: Attempts f($a$) – f($b$) with their f and $a$ = 48 or 47 & $b$ = 12 or 13. Substitution must be seen

A1: 145 140 only