| Question Number | Scheme | Notes | Marks |
|---|---|---|---|
| **1(a)** | $\dfrac{1}{(3n-1)(3n+5)} \equiv \dfrac{A}{3n-1}+\dfrac{B}{3n+5}$<br>$\Rightarrow A=\ldots \ \left\{\dfrac{1}{6}\right\}, B=\ldots \ \left\{-\dfrac{1}{6}\right\}$ | Uses correct partial fractions and finds values for both $A$ and $B$ | **M1** |
| | $\equiv \dfrac{1}{6(3n-1)}-\dfrac{1}{6(3n+5)}$ | Correct **partial fractions** in any form e.g., $\dfrac{1}{18n-6}-\dfrac{1}{18n+30}$, $\dfrac{\frac{1}{6}}{3n-1}-\dfrac{\frac{1}{6}}{3n+5}$, $\dfrac{1}{6}\left(\dfrac{1}{3n-1}+\dfrac{-1}{3n+5}\right)$ | **A1** |
| | | | **(2)** |
| **(b)** | Allow the M marks if $r$ is used for $n$<br>Ignore errors with terms that are cancelled | | |
| | $\dfrac{20}{6}\sum_{r=1}^{n}\left(\dfrac{1}{3n-1}-\dfrac{1}{3n+5}\right)=$<br>$\dfrac{20}{6}\left(\dfrac{1}{2}-\dfrac{1}{8}+\dfrac{1}{5}-\dfrac{1}{11}+\dfrac{1}{8}-\dfrac{1}{14}+\ldots+\dfrac{1}{3n-7}-\dfrac{1}{3n-1}+\dfrac{1}{3n-4}-\dfrac{1}{3n+2}+\dfrac{1}{3n-1}-\dfrac{1}{3n+5}\right)$<br>Uses the method of differences for at least the first and last rows. Must attempt to put their rows together. Allow with their partial fractions provided there are two which form a difference and have different 2 term linear denominators in $n$ and numeric numerators.<br>Ignore errors/omission with the 20 or the "$\dfrac{1}{6}$". Allow this mark to be implied if their 4 terms in the correct positions are the only ones that result. | | **M1** |
| | $=\dfrac{20}{6}\left(\dfrac{1}{2}+\dfrac{1}{5}-\dfrac{1}{3n+2}-\dfrac{1}{3n+5}\right)$ | Any correct expression for the required sum. The "20" may appear later - allow this mark if a correct sum without the 20 was seen but is then misprocessed before the 20 is reapplied. | **A1** |
| | $=\dfrac{20}{6}\left(\dfrac{7(3n+2)(3n+5)-10(6n+7)}{10(3n+2)(3n+5)}\right)$ | Achieves a consistent single fraction expression. Must come from adding 4 fractions - 2 numeric and 2 with different two term linear denominators and numeric numerators. Ignore omission/error with the 20 and/or the "$\dfrac{1}{6}$". | **dM1** |
| | $=\dfrac{1}{3}\left(\dfrac{63n^2+87n}{(3n+2)(3n+5)}\right)=\dfrac{n(21n+29)}{(3n+2)(3n+5)}$ | Correct expression in the correct form. Not just values for the constants unless form is seen | **A1** |
| | | | **(4)** |
| | | | **Total 6** |