Question number	Scheme	Marks
9 (a)	$a = 5\times1-1=4$ $d = 5$ $S_n = \frac{n}{2}\left(2\times4+[n-1]5\right) = \frac{n}{2}(3+5n)$* cso **ALT** $a = 4$ $l = 5n-1$ $S_n = \frac{n}{2}(a+l) = \frac{n}{2}(4+5n-1) = \frac{n}{2}(3+5n)*$ cso	B1 M1A1 [3] [B1 M1A1]
(b)	$\sum_{r=10}^{20}(5r-1) = \sum_{r=1}^{20}(5r-1) - \sum_{r=1}^{9}(5r-1)$ $\sum_{r=10}^{20}(5r-1) = \frac{20}{2}(3+5\times20) - \frac{9}{2}(3+5\times9)$ $= 1030-216 = 814$ **ALT** $a = 4+9\times5 = 49,\ l = 4+20\times5 = 99,\ n = 20-10+1 = 11$ $\sum_{r=10}^{20}(5r-1) = \frac{11}{2}(49+99) = 814$ **ALT** $a = 5\times10-1 = 49$ $d = 5$ $n = 11$ $S_n = \frac{11}{2}(2\times49+(11-1)\times5) = 814$	B1 M1 A1 [3] [B1 M1A1] [B1 M1A1]
(c)	$\frac{n}{2}(3+5n) = 12(4+5n)+52 \Rightarrow 5n^2-117n-200 = 0$ $\Rightarrow (n-25)(5n+8) = 0 \Rightarrow n = 25,\ \left(n \neq -\frac{8}{5}\right)$	M1M1A1 M1A1 [5]
		Total 11 marks

Part	Mark	Notes
(a)	**B1**	For finding the first term and common difference. $a = 5\times1-1=4$ $d = 5$ May be implied by correct values seen in summation formula.
	M1	Uses a **correct** form of the summation formula for an arithmetic series with their a and their d provided their a and their d are stated. $S_n = \frac{n}{2}(2\times'4'+[n-1]\times'5')$
	A1 **cso**	For obtaining the given answer in full with no errors. $\sum_{r=1}^{n}(5r-1) = \frac{n}{2}(3+5n)$
Alternative method		
	B1	For finding the first term and an expression for the last term. $a = 4$ $l = 5n-1$

		May be implied by correct values seen in summation formula.
	M1	Uses a **correct** form of the summation formula for an arithmetic series with their *a* and their *l* provided their *a* and their *l* are stated. $S_n = \frac{n}{2}(a+l) = \frac{n}{2}('4' + '5n - 1')$
	A1 **cso**	For obtaining the given answer in full with no errors. $\sum_{r=1}^{n}(5r-1) = \frac{n}{2}(3+5n)$
Note: If standard summation results are correctly used award B1M1A1, if not fully correct send to review.		
(b)	**B1**	For correctly giving the required summation as the difference between two summations starting at $r = 1$. $\sum_{r=10}^{20}(5r-1) = \sum_{r=1}^{20}(5r-1) - \sum_{r=1}^{9}(5r-1)$
	M1	For substitution of $n = 20$ and $n = '9'$ into the result from part (a) and subtracting. $\frac{20}{2}(3+5\times 20) - \frac{'9'}{2}(3+5\times' 9')$ Allow for use of 9 or 10.
	A1	For the correct summation 814
Alternative method		
	B1	For finding the first term, last term and number of terms for the arithmetic sequence. $a = 49,\ l = 99,\ n = 11$
	M1	Uses a **correct** summation formula for an arithmetic series with their *a*, their *l*and their *n* provided these are stated. $\frac{'11'}{2}('49'+'99')$
	A1	For the correct summation 814
Alternative method – considering this as a series starting at the 10th term of the original series		
	B1	For finding the first term, common difference and number of terms. $a = 5\times 10 - 1 = 49$ $d = 5$ $n = 11$
	M1	Uses a **correct** form of the summation formula for an arithmetic series with their *a*, *their d*, and *their n* provided their *a* and their *d* and their *n* are stated and their $n \neq 20$ $S_n = \frac{'11'}{2}(2\times'49' + ('11'-1)\times'5')$
	A1	For the correct summation 814
(c)	**M1**	Uses $5r-1$ with $n+1$ to find an expression for u_{n+1} in terms of *n*. $5r-1 = 5(n+1)-1 = 5n+4$
	M1	Forms a correct equation for *n* using the result given in part (a) and their expression for $5r-1$ in terms of *n*. $\frac{n}{2}(3+5n) = 12('4+5n') + 52$
	A1	Obtains a correct 3TQ $5n^2 - 117n - 200 = 0$ oe
	M1	For an attempt to solve their 3TQ. See General Guidance for the definition of an attempt. $(n-25)(5n+8) = 0 \ \Rightarrow\ n = 25, \left(n = -\frac{8}{5}\right)$
	A1	For correct value: $n = 25$ If $n = -\frac{8}{5}$ is seen it must be rejected.