June 2306
4PM1 Paper 1
Mark Scheme

Question	Scheme	Marks
1(a)	$d=3$ and $a=5$	B1
	$\sum_{r=1}^{n}(3r+2)=\frac{n}{2}(2\times5+(n-1)3)=\frac{n}{2}(3n+7)$ *	M1A1 cso [3]
	ALT	
	$\sum_{r=1}^{n}(3r+2)=3\sum_{r=1}^{n}r+2\sum_{r=1}^{n}1$	[B1
	$\sum_{r=1}^{n}(3r+2)=\frac{3}{2}n(n+1)+2n=\frac{3n^2+3n}{2}+\frac{4n}{2}=\frac{3n^2+7n}{2}=\frac{n}{2}(3n+7)$	M1A1]
(b)	$\sum_{r=10}^{40}(3r+2)=\frac{40}{2}(3\times40+7)-\frac{9}{2}(3\times9+7)=[2540-153]=2387$	M1A1 [2]
		Total 5 marks

Note: Part (b) can be answered simply by entering the expression in the question into a permissible calculator. A solution seen with no working is M0.

Part	Mark	Notes
(a)	**B1**	For the correct value of a and d
	M1	For using the correct summation formula with their values of a and d
	A1	For achieving $\sum_{r=1}^{n}(3r+2)=\frac{n}{2}(3n+7)$ with no errors
	ALT 1 – Uses first plus last formula	
	B1	For the correct value of $a = 5$ and the final value $l = 3n+2$
	M1	For the correct use of the first plus last summation formula $\sum_{r=1}^{n}(3r+2)=\frac{n}{2}(5+[3n+2])=\frac{n}{2}(3n+7)$
	A1	For achieving $\sum_{r=1}^{n}(3r+2)=\frac{n}{2}(3n+7)$ with no errors
	ALT 2 – Uses standard results	
	B1	For stating $\sum_{r=1}^{n}(3r+2)=3\sum_{r=1}^{n}r+2\sum_{r=1}^{n}1$
	M1	For using the standard expressions $\sum_{r=1}^{n}(3r+2)=\frac{3}{2}n(n+1)+2n$
	A1	For simplifying to the required form. $\sum_{r=1}^{n}(3r+2)=\frac{3n^2+3n}{2}+\frac{4n}{2}=\frac{3n^2+7n}{2}=\frac{n}{2}(3n+7)$ *
(b)	**M1**	Uses the given formula with n = 40 and with n = 9 (allow n = 10 for this mark) [Note: use of n = 10 will give a value of 2355] Allow alternative correct methods
	A1	For the correct sum of 2387
	ALT 1 – Uses first + last summation formula	
	M1	$U_{10}=32,\quad U_{40}=122,\quad n=31\ $ (allow 30 for this mark) $\sum_{r=10}^{40}(3r+2)=\frac{31}{2}(32+122)=\ldots$ [Note: Use of n = 30 will give a value of 2310]
	A1	For the correct sum of 2387
	ALT 2 – Finds new first term and uses the summation formula	
	M1	$U_{10}=32\quad n=31\ $ (allow 30 for this mark) $\sum_{r=10}^{40}(3r+2)=\frac{31}{2}(2\times32+(31-1)3)=\ldots$ [Note: Use of n = 30 will give a value of 2265]
	A1	For the correct sum of 2387