Question			Answer	Marks	AO	Guidance
14	(a)		$\log_{10}200 - \log_{10}20 = \log_{10}\frac{200}{20} = 1$ $= \log_{10}10 = 1$	M1 A1	1.1a 1.1b	uses laws of logs AG $\log\frac{200}{20}$ or $\log_{10}10$ must be seen explicitly
			Alternative method $\log_{10}20 = \log_{10}2 + \log_{10}10$ $\log_{10}200 = \log_{10}2 + \log_{10}100$ So $\log_{10}200 - \log_{10}20 = 2 - 1 = 1$	M1 A1		Uses laws of logs Must see $\log_{10}100 = 2$ or $\log_{10}10 = 1$ explicitly
				[2]		
14	(b)		$\log_{10}2000 - \log_{10}200 = \log_{10}\frac{2000}{200} = 1$ same as the difference for the first two terms, so an arithmetic sequence	M1 A1	2.1 2.1	Attempts to establish a common difference of 1 argues from a common difference eg "increases by 1 each time". Must use exact values to establish the difference between the second and third terms.
			Alternative method $\log_{10}20 = \log_{10}10 + \log_{10}2 = 1 + \log_{10}2$ $\log_{10}200 = \log_{10}100 + \log_{10}2 = 2 + \log_{10}2$ $\log_{10}2000 = \log_{10}1000 + \log_{10}2 = 3 + \log_{10}2$ which is arithmetic with first term $\log_{10}20$ and common difference of 1	M1 A1		rewrites two more terms of the sequence and makes a comparison argues from a common difference eg "increases by 1 each time" Must use exact values to establish the difference between the second and third terms.
				[2]		
14	(c)		$S_{50} = 25(2a + (n-1)d)$ or $25(a + l)$ $S_{50} = 25\left(2\left(\log_{10}20\right) + 49 \times 1\right)$	M1 A1	1.1a 1.1b	Uses the formula with first term $\log_{10}20$ and common difference 1 Allow for fully correct expression not simplified. isw Correct forms include $50\log_{10}20 + 1225$, $25\log 400 + 1225$, $25(\log 400 + 49)$, $25(\log 4 + 51)$ etc
				[2]		