

A level Mathematics Practice Paper – Sequences and series – Mark scheme

Question	Scheme	Marks
1(a)	$(a_2 =) 2k$	B1
	$(a_3 =) \frac{k("2k"+1)}{"2k"}$	M1
	$(a_3 =) \frac{2k+1}{2}$	A1
		(3)
	Note that there are <u>no</u> marks in (b) for using an AP (or GP) sum formula unless their terms do form an AP (or GP).	
1(b)	$\sum_{r=1}^3 a_r = 10 \Rightarrow 1 + "2k" + "\frac{2k+1}{2}" = 10$	M1
	$\Rightarrow 2 + 4k + 2k + 1 = 20 \Rightarrow k = \dots$ or e.g. $\Rightarrow 6k^2 - 17k = 0 \Rightarrow k = \dots$	M1
	$(k =) \frac{17}{6}$	A1
		(3)
		(6 marks)
2(a)	$(a_2 =) 4k - 3$	B1
		(1)
2(b)	$a_3 = 4(4k - 3) - 3$	M1
	$\sum_{r=1}^3 a_r = k + 4k - 3 + 4(4k - 3) - 3 = ..k \pm \dots$	M1
	$21k - 18 = 66 \Rightarrow k = \dots$	dM1
	$k = 4$	A1
		(4)
		(5 marks)

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3(i)(a)	$U_3 = 4$	B1
		(1)
3(i)(b)	$\sum_{n=1}^{n=20} U_n = 4 + 4 + 4 \dots + 4$ or 20×4	M1
	$= 80$	A1
		(2)
3(ii)(a)	$V_3 = 3k, V_4 = 4k$	B1 B1
		(2)
3(ii)(b)	$\sum_{n=1}^{n=5} V_n = k + 2k + 3k + 4k + 5k = 165$ or $\frac{1}{2} \times 5(2 \times k + 4 \times k) = 165$ or $\frac{1}{2} \times 5(k + 5k) = 165$	M1
	$15k = 165 \Rightarrow k = ..$	M1
	$k = 11$	A1
	cao and cso	
		(3)
		(8 marks)
4(a)	$(x_2 =) a + 5$	B1
		(1)
4(b)	$(x_3) = a^2(a+5) + 5$	M1
	$= a^2 + 5a + 5$ (*)	A1 cso
		(2)
4(c)	$41 = a^2 + 5a + 5 \Rightarrow a^2 + 5a - 36 (= 0)$ or $36 = a^2 + 5a$	M1
	$(a + 9)(a - 4) = 0$	M1
	$a = 4$ or -9	A1
		(3)
		(6 marks)

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Question	Scheme	Marks
5(a)	$7 = 5a_1 - 3 \Rightarrow a_1 = ..$	M1
	$a_1 = 2$	A1
		(2)
5(b)	$a_3 = "32"$ and $a_4 = "157"$	M1
	$\sum_{r=1}^{r=4} a_r = a_1 + a_2 + a_3 + a_4$	
	$= "2" + "7" + "32" + "157"$	dM1
	$= 198$	A1
		(3)
		(5 marks)
6(a)	$a_1 = 3, a_{n+1} = 2a_n - c, n \geq 1, c$ is a constant	
	$\{a_2 =\} 2 \times 3 - c$ or $2(3) - c$ or $6 - c$	B1
		(1)
6(b)	$\{a_3 =\} 2 \times ("6 - c") - c$	M1
	$= 12 - 3c$ (*)	A1 cso
		(2)
6(c)	$a_4 = 2 \times ("12 - 3c") - c \quad \{= 24 - 7c\}$	M1
	$\left\{ \sum_{i=1}^4 a_i = \right\} 3 + (6 - c) + (12 - 3c) + (24 - 7c)$	M1
	$"45 - 11c" \geq 23$ or $"45 - 11c" = 23$	M1
	$c \leq 2$ or $2 \geq c$	A1 cso
		(4)
		(7 marks)

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Question	Scheme	Marks
7(a)	$(a_2 =) k(4+2) (= 6k)$	B1
		(1)
7(b)	$a_3 = k(\text{their } a_2 + 2) (= 6k^2 + 2k)$	M1
	$a_1 + a_2 + a_3 = 4 + (6k) + (6k^2 + 2k)$	M1
	$4 + (6k) + (6k^2 + 2k) = 2$	A1
	Solves $6k^2 + 8k + 2 = 0$ to obtain $k = (6k^2 + 8k + 2 = 2(3k + 1)(k + 1))$	M1
	$k = -1/3$	A1
	$k = -1$	B1
		(6)
		(7 marks)
8(a)	$a_2 = 5 - ka_1 = 5 - 4k$ $a_3 = 5 - ka_2 = 5 - k(5 - 4k)$	M1 A1
		(2)
8(b)	$\sum_{r=1}^3 (1) = 1 + 1 + 1$	B1
	$\sum_{r=1}^3 a_r = 4 + "5 - 4k" + "5 - 5k + 4k^2"$	M1
	$\sum_{r=1}^3 (1 + a_r) = 17 - 9k + 4k^2$	A1
		(3)
8(c)	500	B1
		(1)
		(6 marks)

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	Source paper	Question number	New spec references	Question description	New AOs
1	C1 2017	3	4.2 and 4.3	Iterative sequences	1.1b and 1.2
2	C1 June 2014R	3	4.2 and 4.3	Sequence defined by recurrence relation	1.1b
3	C1 2015	4	4.2, 4.3	Sequences and Series	1.1b
4	C1 Jan 2012	4	4.2 and 2.3	Sequences and series	1.1b
5	C1 2014	5	4.2 and 4.3	Sequences given by a formula	1.1b
6	C1 2012	5	4.2, 4.3, and 2.5	General sequences and series	1.1b. 3.1a
7	C1 2013	4	4.2 and 4.3	Sequences generated from simple relations	1.1b, 2.2a, 2.4