GCSE Mathematics (1MA1)

Themed papers – Quadratic Sequences

Compiled from student-friendly mark schemes

Please note that this mark scheme is not the one used by examiners for making scripts. It is intended more as a guide to good practice, indicating where marks are given for correct answers. As such, it doesn't show follow-through marks (marks that are awarded despite errors being made) or special cases.

It should also be noted that for many questions, there may be alternative methods of finding correct solutions that are not shown here – they will be covered in the formal mark scheme.

NOTES ON MARKING PRINCIPLES

Guidance on the use of codes within this mark scheme
M1 – method mark. This mark is generally given for an appropriate method in the context of the question. This mark is given for showing your working and may be awarded even if working is incorrect. P1 – process mark. This mark is generally given for setting up an appropriate process to find a solution in the context of the question. A1 – accuracy mark. This mark is generally given for a correct answer following correct working. B1 – working mark. This mark is usually given when working and the answer cannot easily be separated. C1 – communication mark. This mark is given for explaining your answer or giving a conclusion in context supported by your working. Some questions require all working to be shown; in such questions, no marks will be given for an answer with no working (even if it is a correct answer).

Question 1 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)(i)	6, 9	B1	This mark is given for the correct answer only
(a)(ii)	"Yes" and e.g "its the 11th term" or $11^2 + 5 = 126$	C1	This mark is given for the correct answer and supporting evidence
(b)	$-7n$ **or** $-7n + k$ (where $k \neq 33$)	M1	
	$-7n + 33$	A1	Thi mark is given for a correct answer or a correct equivalent

Question 2 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	3 6 11 18 27 38 51 3 5 7 9 11 13 2 2 2 2 2	M1	This mark is given for a method to find 2nd differences
	$n^2 + 2$	A1	This mark is given for the correct answer only
(b)	$50^2 + 2 = 2502$	B1	This mark is given for the correct answer only

Question 3 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	6 10 14 18 22 4 4 4 4	M1	This mark is given for a method to find the second differences
	$2n^2$	M1	This mark is given for a method to recognise that a second difference of 4 means a $2n^2$ term will be used
	$2n^2 - 3$	A1	This mark is given for the correct answer only

Question 4 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	4 11 22 37 56 7 11 15 19 4 4 4 2nd differences imply a term in $2n^2$	M1	This mark is given for a correct start to a method to find *n*th term
	$2n^2 + n$ gives 3, 10, 21, 36, 55…	M1	This mark is given for a method leading to $2n^2$ and either n or 1
	$2n^2 + n + 1$	A1	This mark is given for the correct answer only

Question 5 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	3 8 15 24 5 7 9 2 2 2nd difference of 2 implies $1n^2$ or $1^2 + \ldots$, $2^2 + \ldots$, $3^2 + \ldots$	M1	This mark is given for a correct deduction from differences
	$3 = 1^2 + 2$, $8 = 2^2 + 4$, $15 = 3^2 + 6$, $24 = 4^2 + 8$	M1	This mark is given for a method link 1^2, 2^2, 3^2 with 2, 4, 6,
	$n^2 + 2n$	A1	This mark is given for the correct answer only (or an equivalent expression)
(b)	31 is not a power of 2	C1	This mark is given for a correct explanation

Question 6 (Total 6 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$(a \times 2^2) + (b \times 2) = -2$ $(a \times 4^2) + (b \times 4) = -2$	P1	This mark is given for a process to find equations in a and b
	$4a + 2b = -2$ $16a + 4b = 12$	P1	This mark is given for a process to find a pair of simultaneous equations
	$a = 2$ and $b = -5$	A1	This mark is given for correctly solving two simultaneous equations to find values of a and b
	$(2 \times 6^2) + (-5 \times 6) = 72 - 30$ $= 42$	A1	This mark is given for a correct answer only
(b)	0 2 6 12 20 2 4 6 8 2 2 2	M1	This mark is given for using the method of differences; second difference of 2 implies n^2
	$n^2 - n$	A1	This mark is given for the correct answer only

Question 7 (Total 2 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	–1 0 3 8 15 1 3 5 7 2 2 2	B1	This mark is given for a correct deduction from differences: a second difference of 2 implies a term n^2
	$n^2 - 2n$	A1	This mark is given for a correct expression

Question 8 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	The terms of $2n^2 - 1$ are 1, 7, 17, 31, 49…	M1	This mark is given for a method to generate at least three terms of the first sequence
	The terms of $40 - n^2$ are 39, 36, 31, 24, 15…	M1	This mark is given for a method to generate at least three terms of the second sequence
	31	A1	This mark is given for a correctly identifying the only number in both sequence

Question 9 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\sqrt{x} + 1 = k \times 1$	1	This mark is given for expressing the common ratio algebraically
	$\frac{1}{\sqrt{x} - 1} = \frac{\sqrt{x} + 1}{1}$	1	This mark is given for setting up an appropriate equation in x
	$(\sqrt{x} - 1) \times (\sqrt{x} + 1) = 1$ $x - 1 = 1$ $x = 2$	1	This mark is given for the correct answer only
(b)	$(\sqrt{2} + 1) \times (\sqrt{2} + 1)^2$	1	This mark s given for showing that the 5th term = 3rd term × (common ratio)^2
	$= 2\sqrt{2} + 4 + \sqrt{2} + 2 + 2\sqrt{2} + 1$ $= 7 + 5\sqrt{2}$	1	This mark is given for a correct conclusion supported by working

Question 10 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	1.5 3 5.5 9 13.5 1.5 2.5 3.5 4.5 1 1 1	P1	This process mark is given for process to find common second differences
	$\frac{1}{2}n^2$	P1	This process mark is given for $\frac{1}{2}n^2$ as part of an algebraic expression
	$\frac{1}{2}n^2 + 1$	A1	This accuracy mark is given for the correct answer only (or an equivalent expression)

Question 11 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	1 3 7 13 21 2 4 6 8 2 2 2	M1	This mark is given for a correct deduction from differences: a second difference of 2 implies a term n^2
	$1^2, 2^2, 3^2$, .. linked with 1, 2, 3, ...	M1	
	$n^2 - n + 1$	A1	This mark is given for a correct answer or a correct equivalent

Mark scheme for 1MA1 Higher themed papers: Quadratic Sequences

Performance data:

Q	Taken from			Total Marks available	TOPIC	Spec Ref	AO	% Mean marks	Edexcel mean averages Marks of candidates who achieved grade:										
	Q	Series	Paper						ALL	9	8	7	6	5	4	3	2	1	U
1a	2a	Mock Set 4	3H	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1b	2b	Mock Set 4	3H	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2a	7a	Mock Set 2	1H	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2b	7b	Mock Set 2	1H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	16	June 2019	3H	3	Algebra	A25	1	67	2.02	2.93	2.76	2.48	2.06	1.56	1.10	0.74	-	-	0.44
4	22	June 2017	2H	3	Algebra	A24, A25	2	50	1.51	2.88	2.58	2.09	1.52	0.95	0.49	0.18	-	-	0.07
5a	12a	Mock Set 1	2H	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5b	12b	Mock Set 1	2H	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6a	16a	June 2018	3H	4	Algebra	A16	2	25	0.99	3.52	2.56	1.44	0.62	0.21	0.05	0.02	-	-	0.00
6b	16b	June 2018	3H	2	Algebra	A19	2	56	1.12	1.95	1.83	1.59	1.21	0.75	0.38	0.18	-	-	0.08
7	20	Nov 2019	3H	2	Algebra	A25	1	23	0.45	1.67	1.54	1.41	0.94	0.53	0.20	0.07	-	-	0.00
8	6	Nov 2019	2H	3	Algebra	A23, A24	2	20	0.60	1.00	0.49	0.75	0.73	0.76	0.67	0.33	-	-	0.06
9a	23a	Nov 2017	2H	3	Algebra	A24	2	1	0.03	2	0.85	0.2	0.08	0	0	0	-	-	0
9b	23b	Nov 2017	2H	2	Algebra	A24 N8	2	1	0.01	1.12	0.47	0.09	0	0	0	0	-	-	0
10	18	Mock Set 1	1H	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	17	Spec Set 1	2H	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				32			**14**	**243**	**6.73**	**17.07**	**13.08**	**10.05**	**7.16**	**4.76**	**2.89**	**1.52**	**-**	**-**	**0.65**