Mark scheme

Quadratic sequences

Mathematics 0580 · Questions from Paper 1, Paper 2 and Paper 4

Total marks

68

MARKS FOR EACH QUESTION

1	2	3	4	5	6	7	8	9	10	Total
2	2	4	4	5	5	10	14	12	10	**68**

Question 1 [2]

1	0 3 8	**2**	**B1** for 2 correct terms in correct position or **SC1** for −1 0 3

Question 2 [2]

2	$3n^2 + 5$ oe final answer	**2**	**M1** for correctly finding second differences or an answer that is a quadratic sequence

Question 3 [4]

3(a)	13, 16, 21	**2**	**B1** for 2 correct terms in correct position or **SC1** for 12, 13, 16
3(b)	Yes $n = 72$	**2**	**M1** for $n^2 + 12 = 5196$ or better or for a correct worded description for finding n or for 5184 is a square number

Question 4 [4]

4(a)	40 –275	**2**	**B1** for each
4(b)	24	**2**	**B1** for 324 or 289 or $\sqrt{300}$ or 17.3…

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Question 5 [5]

5	[a =] 2 [b =] − 1	**5**	**M2** for correct method to find two simultaneous equations e.g. two from $a \times 1^2 + b \times 1 - 4 = -3$ $a \times 2^2 + b \times 2 - 4 = 2$ $3a + b = 2 - - 3$ or **M1** for 1 correct equation **M1** for correctly eliminating one variable for *their* simultaneous equations **A1** for a = 2 **A1** for b = − 1

Question 6 [5]

6	**(a)**	$9a + 3b$	**1**	
	(b)	$36a + 6b = 96$ or $9a + 3b = 21$	**B1**	
		for correct method to eliminate one variable	**M1**	
		$a = 3$ $b = -2$	**A1** **A1**	If **M0 A0 A0** scored **SC1** for 2 values satisfying $36a+6b=96$ or $9a+3b=21$ or if no working shown, but 2 correct answers given

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Question 7 **[10]**

7(a)	40 54 26 34	**4**	**B1** for each
7(b)	$n^2 + 3n$ or $n(n+3)$ oe	**2**	**B1** for a quadratic expression or for 2nd common difference 2 (at least 2 shown) or for 2 correct equations seen or for subtracting n^2
7(c)	100	**2**	**M1** for *their* **(b)** = 10300 seen
7(d)	$[a =]\ \frac{1}{2}$ oe and $[b =]\ \frac{5}{2}$ oe	**2**	**B1** for each or **M1** for one correct equation or for 2nd difference = 1 soi (at least 2 shown)

Question 8 **[14]**

8	**(a)** 30 42 42 56 71 97	4	**B3** for 2 correct rows or **B2** for 1 correct row or **B1** for any term in column 5 correct
	(b) (i) 2550	1	
	(ii) 30	1	
	(c) $(n + 1)(n + 2)$ oe final ans	1	
	(d) (i) $2n^2 + pn + 1 = t$ Uses a value of n up to 6 and a matching t from the table e.g. puts $n = 3$ and $t = 31$ $2 \times 3^2 + 3p + 1 = 31$ **M1** **OR** Use $p = 4$ to get $2n^2 + 4n + 1 = 31$ and simplifies to 3 term eqn **M1** **OR** both $2 \times 9 + 4 \times 3 + 1\ (= 31)$ **M1** with one part evaluated **OR** $n(n + 1) + (n + 1)(n + 2) - 1$ or better **M1**	2	Correct solution shown with 1 intermediate step to $p = 4$ **E1** Solve correctly to get $n = 3$ **E1** Conclusion e.g. 31 = 31 **E1** Correct simplification to $2n^2 + 4n + 1$ **E1**
	(ii) 241	1	
	(iii) 12	3	**M1** for $2n^2 + 4n + 1 = 337$ and **M1** for $(n - 12)(n + 14)$ or correct expression for n using formula
	(e) $L = A + D - 1$ oe	1	

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Question 9 **[12]**

9 (a)	Pentagon Octagon 20	1 1, 1	
(b)(i)	35	1	
(ii)	54	1	
(c)(i)	$p = 2, q = 3$	3	**M1** for substituting a value of n e.g. $\frac{1}{p}4(4-q)=2 \quad n \geq 3$ **or M1** for number of diagonals from one vertex is $n-3$ (allow in words) **and B1** for one correct value. If 0, SC1 for $\frac{n}{2}(n-3)$ seen.
(ii)	4850 ft	1**ft**	**ft** their **(c)(i)** allow only if **ft** calculates to a positive integer.
(iii)	20 cao	2	**SC1** for answer of 17 or **M1** for their formula = 170
(d)	31 cao	1	

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Question 10 **[10]**

10	**(a)** **(i)**	16	**1**	
	(ii)	n^2	**1**	
	(b) **(i)**	43	**1**	
	(ii)	7	**1**	
	(c)	$a = \frac{5}{2}$ oe, $b = \frac{5}{6}$ oe with supporting working	**6**	**M1** for any correct substitution eg $\frac{2}{3}(2)^3 + 2^2a + 2b$ **A1** for **one** of eg $\frac{2}{3} + a + b = 4$ or better eg $\frac{16}{3} + 4a + 2b = 17$ or better eg $\frac{54}{3} + 9a + 3b = 43$ or better **A1** for **another** of eg $\frac{2}{3} + a + b = 4$ or better eg $\frac{16}{3} + 4a + 2b = 17$ or better eg $\frac{54}{3} + 9a + 3b = 43$ or better **M1** for correctly eliminating one variable from two of *their* equations in a and b **A1** for $a = \frac{5}{2}$ oe **A1** for $b = \frac{5}{6}$ oe After zero scored, **SC2** for 2 correct answers without supporting working or **SC1** for 2 of 17, 43, 86, 150, 239 seen

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