



8.5D The Nth Term of a Quadratic Sequence: Fluency and Exam Drill

EDEXCEL 1MA1 · Calculator allowed · about 50 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Write down the second difference for the sequence 4, 9, 16, 25, 36.

(Total for Question 1 is 1 mark)

- 2** The quadratic sequence begins 3, 8, 15, 24, 35. Find an expression for the n th term in the form $an^2 + bn + c$.

(Total for Question 2 is 3 marks)

- 3** Work out an expression for the n th term of the sequence 5, 12, 21, 32, 45.

(Total for Question 3 is 2 marks)

- 4** Write down the first four terms of the sequence defined by $T(n) = 2n^2 - n + 3$.

(Total for Question 4 is 2 marks)

- 5 The sequence 5, 11, 19, 29, 41,... is generated by a quadratic rule. Show that the n th term is $n^2 + 3n + 1$.

(Total for Question 5 is 3 marks)

- 6 The n th term of a sequence is $n^2 + 4n + 3$. Find the value of n for which the term is 63.

(Total for Question 6 is 3 marks)

- 7 A quadratic sequence has constant second difference 8. Its 3rd term is 24 and its 5th term is 60. Find an expression for the n th term.

(Total for Question 7 is 3 marks)

- 8 The sequence begins 10, 24, 44, 70, 102. (a) Find an expression for the n th term. (b) Hence find the value of n for which the term is 70.

(a) Find an expression for the n th term. (2)

(b) Hence find the value of n for which the term is 70. (2)

(Total for Question 8 is 4 marks)

9 Find all integer values of n for which $n^2 - 3n + 2 = 0$.

(Total for Question 9 is 2 marks)

10 The n th term of a sequence is $4n^2 - 7n + 2$. Find the smallest positive integer n for which the term is greater than 200.

(Total for Question 10 is 3 marks)

11 Find an expression for the n th term of the sequence 2, 9, 20, 35.

(Total for Question 11 is 2 marks)

12 Find the n th term of the sequence 8, 21, 40, 65.

(Total for Question 12 is 2 marks)

13 Work out an expression for the n th term of the sequence 1, 6, 15, 28.

(Total for Question 13 is 2 marks)

14 The 2nd term of a quadratic sequence is 30, the 4th term is 78 and the 6th term is 150. (a) Find an expression for the n th term. (b) Find the sum of the first 6 terms of the sequence.

(a) Find an expression for the n th term. (3)

(b) Find the sum of the first 6 terms. (2)

(Total for Question 14 is 5 marks)

Mark scheme · 8.5D The Nth Term of a Quadratic Sequence: Fluency and Exam Drill

Question 1

- **B1** second difference = 2 cao
- **Answer: 2**

Question 2

- **M1** second difference = 2 so $a = 1$ ($2a = 2$) oe
- **M1** use $n = 1$ and $n = 2$ to form linear equations and solve for b and c (eg $1 + b + c = 3$ and $4 + 2b + c = 8$) oe
- **A1** nth term = $n^2 + 2n$ cao
- **Answer: $n^2 + 2n$**

Question 3

- **M1** second difference = 2 so $a = 1$ ($2a = 2$) oe
- **A1** nth term = $n^2 + 4n$ cao
- **Answer: $n^2 + 4n$**

Question 4

- **M1** substitute $n = 1, 2, 3, 4$ into $2n^2 - n + 3$ oe
- **A1** 4, 9, 18, 31 cao
- **Answer: 4, 9, 18, 31**

Question 5

- **M1** second difference = 2 so $a = 1$ ($2a = 2$) oe
- **M1** use $n = 1$ and $n = 2$ to find b and c ($1 + b + c = 5$ and $4 + 2b + c = 11$) oe
- **A1** nth term = $n^2 + 3n + 1$ cao
- **Answer: $n^2 + 3n + 1$**

Question 6

- **M1** form equation $n^2 + 4n + 3 = 63$ oe
- **M1** rearrange and factorise to $(n + 10)(n - 6) = 0$ or equivalent method
- **A1** $n = 6$ cao (positive integer solution)
- **Answer: 6**

Question 7

- **M1** second difference = 8 so $a = 4$ ($2a = 8$) oe
- **M1** use T3 and T5 to form two linear equations and solve for b and c (eg $36 + 3b + c = 24$ and $100 + 5b + c = 60$) oe
- **A1** nth term = $4n^2 - 14n + 30$ cao
- **Answer: $4n^2 - 14n + 30$**

Question 8

- (a) **M1** second differences 14, 20, 26 so second difference = 6 and $a = 3$ ($2a = 6$) oe
- (a) **A1** nth term = $3n^2 + 5n + 2$ cao
- (a) **Answer: $3n^2 + 5n + 2$**
- (b) **M1** set $3n^2 + 5n + 2 = 70$ and rearrange to $3n^2 + 5n - 68 = 0$ oe
- (b) **A1** $n = 4$ cao
- (b) **Answer: 4**

Question 9

- **M1** factorise to $(n - 1)(n - 2) = 0$ or equivalent
- **A1** $n = 1$ or $n = 2$ cao
- **Answer: $n = 1$ or $n = 2$**

Question 10

- **M1** set inequality $4n^2 - 7n + 2 > 200$ and rearrange to $4n^2 - 7n - 198 > 0$ oe
- **M1** find positive root of $4n^2 - 7n - 198 = 0$ approximately (n approx 7.97) oe
- **A1** smallest integer $n = 8$ cao
- **Answer: 8**

Question 11

- **M1** second differences 7, 11, 15 so second difference = 4 and $a = 2$ ($2a = 4$) oe
- **A1** nth term = $2n^2 + n - 1$ cao
- **Answer: $2n^2 + n - 1$**

Question 12

- **M1** second differences 13, 19, 25 so second difference = 6 and $a = 3$ ($2a = 6$) oe
- **A1** nth term = $3n^2 + 4n + 1$ cao
- **Answer: $3n^2 + 4n + 1$**

Question 13

- **M1** second differences 5, 9, 13 so second difference = 4 and $a = 2$ ($2a = 4$) oe
- **A1** nth term = $2n^2 - n$ cao
- **Answer: $2n^2 - n$**

Question 14

- (a) **M1** form three equations $4a + 2b + c = 30$, $16a + 4b + c = 78$, $36a + 6b + c = 150$ and use second difference or elimination to find a
- (a) **M1** solve to find b after a is known (eg $a = 3$ then $b = 6$) oe
- (a) **A1** nth term = $3n^2 + 6n + 6$ cao
- **(a) Answer: $3n^2 + 6n + 6$**
- (b) **M1** use sum $S = \sum_{n=1..6} (3n^2 + 6n + 6) = 3 \sum n^2 + 6 \sum n + 6 \cdot 6$ oe
- (b) **A1** $S = 435$ cao
- **(b) Answer: 435**