HIGHER

8.5 The Nth Term of a Quadratic Sequence: 30-minute Pack

Total Marks

EDEXCEL 1MA1 · Calculator allowed · about 30 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Find the nth term of the sequence 8, 21, 40, 65.

(Total for Question 1 is 2 marks)

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2 The nth term of a sequence is given by $2n^2 + 1$.

(a) Work out the first three terms of the sequence. **(2)**

.....

(b) Write down whether the sequence is increasing or decreasing. **(1)**

.....

(Total for Question 2 is 3 marks)

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3 The nth term of Sequence A is $n^2 + 3n$. The nth term of Sequence B is $2n + 9$. Find an expression for the nth term of the sequence formed by adding the corresponding terms of Sequence A and Sequence B.

(Total for Question 3 is 2 marks)

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4 A tile pattern is built so that Pattern 1 uses 4 tiles, Pattern 2 uses 11 tiles, Pattern 3 uses 22 tiles and Pattern 4 uses 37 tiles. The number of tiles in Pattern n follows a quadratic sequence.

(a) Show that the number of tiles in Pattern n is $2n^2 + n + 1$. **(3)**

(b) Find the number of tiles used in Pattern 10. **(2)**

.....

(c) A pattern in this sequence uses 301 tiles. Work out the pattern number. **(3)**

.....

(Total for Question 4 is 8 marks)

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5 The nth term of a sequence is $3n^2 + n - 9$. Is 145 a term of this sequence? You must show your working.

(Total for Question 5 is 3 marks)

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6 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 nth term. **(3)**

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

(Total for Question 6 is 5 marks)

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Mark scheme · 8.5 The Nth Term of a Quadratic Sequence: 30-minute Pack

A correct answer earns full marks unless the question asks for working, a method, proof or explanation.

Question 1

second differences 13, 19, 25 so second difference = 6 and a = 3 (2a = 6) oe **M1**

nth term = $3n^2 + 4n + 1$ cao **A1**

Answer: $3n^2 + 4n + 1$

Question 2

(a) at least two of 3, 9, 19 correct **B1**

(a) all of 3, 9, 19 correct (dep on previous B1) **B1**

(a) Answer: 3, 9, 19

(b) increasing (cao) **B1**

(b) Answer: Increasing

Question 3

$n^2 + 3n + 2n + 9$ seen (adding corresponding terms) **M1**

$n^2 + 5n + 9$ oe, fully simplified **A1**

Answer: $n^2 + 5n + 9$

Question 4

(a) finding the second difference (4) of 4, 11, 22, 37 and halving it to get a=2 **M1**

(a) comparing the sequence to $2n^2$ (2, 8, 18, 32) to find the linear remainder n+1 **M1**

(a) cso: $2n^2 + n + 1$ shown to fit all four given values **A1**

(a) Answer: $2n^2 + n + 1$

(b) substituting n=10 into $2n^2+n+1$ **M1**

(b) 211 cao **A1**

(b) Answer: 211

(c) forming the equation $2n^2 + n - 300 = 0$ **M1**

(c) solving using the quadratic formula (or factorisation) **M1**

(c) 12 cao (rejecting the negative solution) **A1**

(c) Answer: 12

Question 5

$3n^2 + n - 9 = 145$ **M1**

tests values of n or solves the quadratic **M1**

Yes, term number 7 with supporting working **A1**

Answer: Yes, term number 7

Question 6

(a) form three equations 4a + 2b + c = 30, 16a + 4b + c = 78, 36a + 6b + c = 150 and use second difference or elimination to find a **M1**

(a) solve to find b after a is known (eg a = 3 then b = 6) oe **M1**

(a) nth term = $3n^2 + 6n + 6$ cao **A1**

(a) Answer: $3n^2 + 6n + 6$

(b) use sum S = $\sum_{n=1..6}(3n^2 + 6n + 6) = 3$ sum $n^2 + 6$ sum n + 6*6 oe **M1**

(b) S = 435 cao **A1**

(b) Answer: 435

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