4.7 Sequences (Nth Term): Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A sequence begins 2, 5, ... and each term increases by the same amount. Work out the 3rd term of the sequence.

(Total for Question 1 is 1 mark)

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2 Here are the first four terms of a sequence.
2, 6, 10, 14

(a) Write down the next two terms of the sequence. **(1)**

.....

(b) Describe, in words, the term-to-term rule for the sequence. **(1)**

(Total for Question 2 is 2 marks)

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3 Three sequences are shown below.
Sequence A: 7, 11, 15, 19
Sequence B: 4, 12, 36, 108
Sequence C: 3, 6, 11, 18

(a) State whether Sequence A is arithmetic, geometric, or neither of these. Give a reason for your answer. **(1)**

(b) State whether Sequence B is arithmetic, geometric, or neither of these. Give a reason for your answer. **(1)**

(c) State whether Sequence C is arithmetic, geometric, or neither of these. Give a reason for your answer. **(1)**

(Total for Question 3 is 3 marks)

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4 This question has two parts.

(a) Find the nth term of the sequence 2, 7, 12, 17, ... **(2)**

(b) Work out the 6th term. **(1)**

(Total for Question 4 is 3 marks)

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5 The nth term of a sequence is 9n - 2.
Is 320 a term in this sequence? You must show your working.

(Total for Question 5 is 3 marks)

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6 Here are the first four terms of a sequence.
50, 44, 38, 32

(a) Write down the next term of the sequence. **(1)**

.....

(b) Find an expression, in terms of n, for the nth term of the sequence. **(2)**

.....

(c) Explain whether 0 is a term of the sequence. **(2)**

.....

.....

(Total for Question 6 is 5 marks)

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7 The nth term of a sequence is $n^2 + 3$.

(a) Work out the 4th term of the sequence. **(1)**

.....

(b) Work out the 10th term of the sequence. **(1)**

.....

(c) Explain why 20 is not a term in the sequence. **(2)**

.....

.....

(Total for Question 7 is 4 marks)

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8 Show that every term of the sequence with nth term 6n - 4 is an even number.

(Total for Question 8 is 2 marks)

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9 The nth term of a sequence is 7n - 3.

(a) Is 74 a term of the sequence? You must show working to justify your answer. **(3)**

(b) Is 101 a term of the sequence? You must show working to justify your answer. **(2)**

(Total for Question 9 is 5 marks)

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10 The nth term of a sequence is $4n^2 - 2n$.

(a) Work out the 1st and 2nd terms. **(2)**

(b) Show that the difference between consecutive terms is 8n + 2 when going from term n to term n+1. Give a short explanation. **(2)**

(Total for Question 10 is 4 marks)

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11 A sequence has nth term given by $T_n = 5n - 3$ for n odd, and $T_n = 5n + 1$ for n even.

(a) Work out T_5 and T_6. **(2)**

(b) Explain briefly whether this sequence is arithmetic overall. **(2)**

(Total for Question 11 is 4 marks)

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12 Here are the first four terms of a quadratic sequence.
23, 18, 11, 2

(a) Show that the second difference of the sequence is -2. **(1)**

(b) Find an expression, in terms of n, for the nth term of the sequence. **(3)**

.....

(c) Work out the 8th term of the sequence. **(2)**

.....

(Total for Question 12 is 6 marks)

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13 The nth term of a sequence is $n^2 + 3n$.
Prove algebraically that the difference between the (n + 1)th term and the nth term is always an even number.

(Total for Question 13 is 3 marks)

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Mark scheme · 4.7 Sequences (Nth Term): Test Pack

Question 1

8 cao **B1**

Answer: 8

Question 2

(a) 18 and 22 both correct oe **B1**

(a) Answer: 18, 22

(b) start at 2 and add 4 each time oe **B1**

(b) Answer: Start at 2 and add 4 each time (oe).

Question 3

(a) arithmetic, since the terms have a common difference of 4 oe **B1**

(a) Answer: Arithmetic (common difference of 4)

(b) geometric, since the terms have a common ratio of 3 oe **B1**

(b) Answer: Geometric (common ratio of 3)

(c) neither, since the differences (3, 5, 7) are not constant and the ratios are not constant oe **B1**

(c) Answer: Neither (it is a quadratic sequence)

Question 4

(a) identify add 5 pattern or form 5n - 3 oe **M1**

(a) 5n - 3 cao **A1**

(a) Answer: 5n - 3

(b) 27 cao **B1**

(b) Answer: 27

Question 5

9n - 2 = 320 **M1**

n = 322/9 **M1**

No **A1**

Answer: No

Question 6

(a) 26 cao **B1**

(a) Answer: 26

(b) common difference of -6 used correctly, e.g. -6n + c oe **M1**

(b) 56 - 6n oe cao **A1**

(b) Answer: 56 - 6n

(c) 56 - 6n = 0 oe, or 56 / 6 evaluated **M1**

(c) correct conclusion: no, since n = 9.33... (28/3) is not a positive integer oe **A1**

(c) Answer: No, 0 is not a term (n would be 9.33..., not a whole number)

Question 7

(a) 19 cao **B1**

(a) Answer: 19

(b) 103 cao **B1**

(b) Answer: 103

(c) $n^2 + 3 = 20$ rearranged to $n^2 = 17$ oe **M1**

(c) correct conclusion: 17 is not a square number, so there is no integer value of n oe **A1**

(c) Answer: 20 is not a term, since $n^2 = 17$ has no integer solution (17 is not a square number)

Question 8

show algebraic factorisation 6n - 4 = 2(3n - 2) or equivalent **M1**

conclude every term is even because it is 2 times an integer cso **A1**

Answer: 6n - 4 = 2(3n - 2), so every term is even because it is 2 times an integer.

Question 9

(a) 7n - 3 = 74 oe, or 7n = 77 **M1**

(a) n = 11 **A1**

(a) correct conclusion: yes, since n = 11 is a positive integer, 74 is the 11th term ft **B1**

(a) Answer: Yes, 74 is a term (the 11th term)

(b) 7n - 3 = 101 oe, or 7n = 104 **M1**

(b) correct conclusion: no, since n = 14.86... (104/7) is not a whole number ft **A1**

(b) Answer: No, 101 is not a term

Question 10

(a) substitute n = 1 and n = 2 into $4n^2 - 2n$ **M1**

(a) 2 and 12 cao **A1**

(a) Answer: 1st term = 2, 2nd term = 12

(b) compute $T(n+1) - T(n) = [4(n+1)^2 - 2(n+1)] - [4n^2 - 2n]$ **M1**

(b) 8n + 2 cao with brief simplification shown **A1**

(b) Answer: 8n + 2

Question 11

(a) substitute n = 5 and n = 6 into correct formula depending on parity **M1**

(a) 22 and 31 cao **A1**

(a) Answer: $T_5 = 22$, $T_6 = 31$

(b) compare differences between consecutive terms and note they are not constant **M1**

(b) statement: not arithmetic because differences are not constant (example given) **A1**

(b) Answer: Not arithmetic, because consecutive differences are not constant (they alternate).

Question 12

(a) first differences -5, -7, -9 shown, giving a second difference of -2 cso **B1**

(a) Answer: -2 (shown)

(b) coefficient of n^2 = half the second difference = -1 identified **M1**

(b) forms and solves simultaneous equations (or equivalent) for the remaining terms **M1**

(b) $-n^2 - 2n + 26$ oe cao **A1**

(b) Answer: $-n^2 - 2n + 26$

(c) substitutes n=8 into their expression, e.g. $-(8)^2 - 2(8) + 26$ **M1**

(c) -54 cao ft **A1**

(c) Answer: -54

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Question 13

correctly expands $(n+1)^2 + 3(n+1) = n^2 + 5n + 4$ oe	**M1**
correctly simplifies the difference to $2n + 4$ oe	**M1**
factorises as $2(n + 2)$ and concludes this is always even, since $n + 2$ is an integer cso	**A1**

Answer: Proven: the difference is 2(n + 2), which is always even.

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