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GCSE MATHS

Algebra

Edexcel 1MA1 | Subtopic collection Topic 22

Sequences and the nth term

Higher tier

Past paper question booklet

54	2003-2024	Higher
question groups	available papers	tier

Before you begin

1. Show working and use units where appropriate.
2. Use extra paper if you need more space.
3. Print at actual size (100%) for measurement questions.

Name _____ **Date** _____

Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

5. Here are the first 5 terms of an arithmetic sequence.

Leave blank

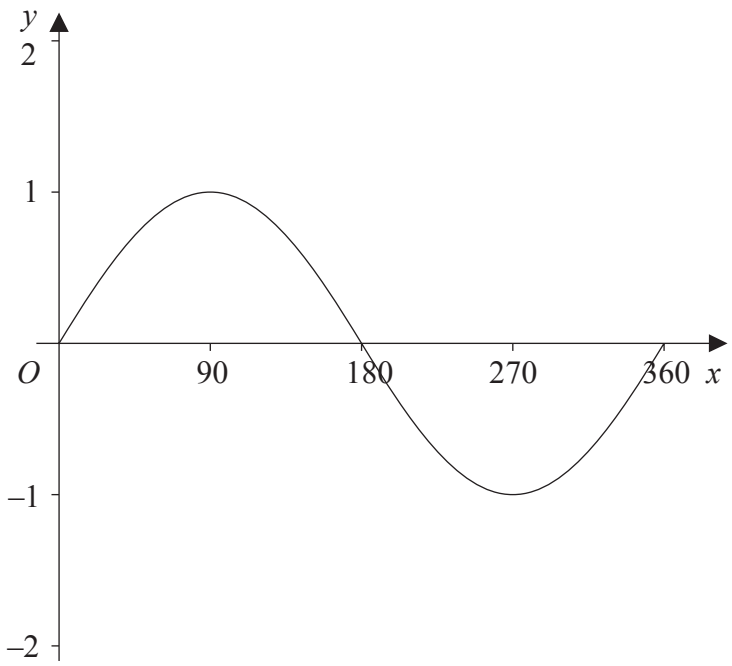
6, 11, 16, 21, 26

Find an expression, in terms of n, for the nth term of the sequence.

.....

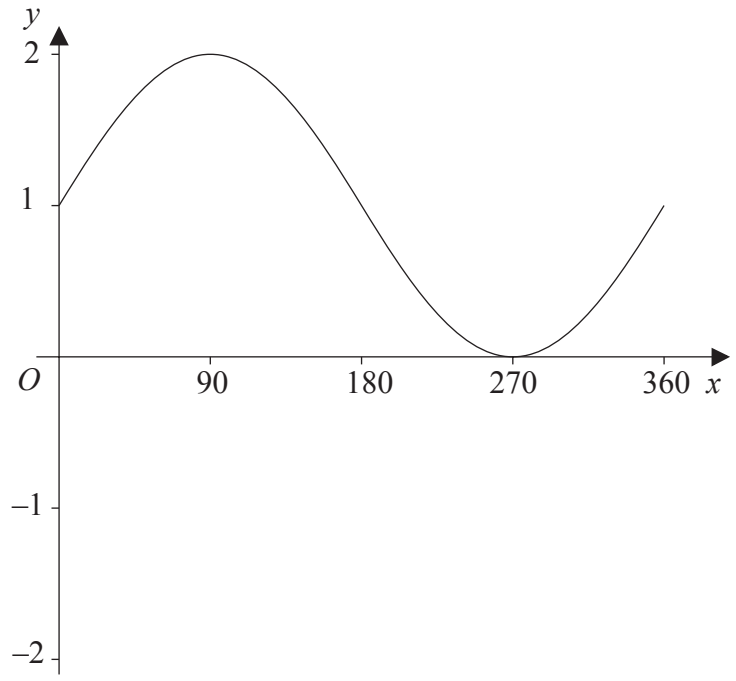
(2)

20. A sketch of the curve $y = \sin x°$ for $0 \leqslant x \leqslant 360$ is shown below.



(a) Using the sketch above, or otherwise, find the equation of each of the following two curves.

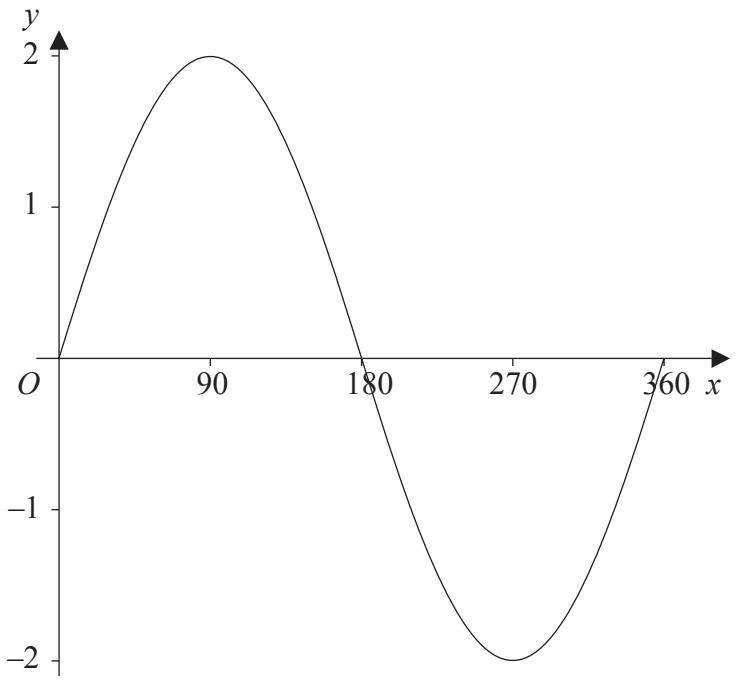
(i)



(i) Equation $y =$ .....

blank

(ii)



(ii) Equation $y =$ .....

(2)

(b) Describe fully the sequence of two transformations that maps the graph of $y = \sin x°$ onto the graph of $y = 3 \sin 2x°$.

.....

.....

.....

.....

(3)

blank

2. Here are the first five terms of a number sequence.

3 7 11 15 19

(a) Write down an expression, in terms of n, for the nth term of this sequence.

.....

(2)

Adeel says that 319 is a term in the number sequence.

(b) Is Adeel correct?
You must justify your answer.

.....

.....

(2)

Q2

(Total 4 marks)

blank

15. The table shows some rows of a number pattern.

Row 1	1^2	–	(0×2)
Row 2	2^2	–	(1×3)
Row 3	3^2	–	(2×4)
Row 4	4^2	–	(3×5)
Row *n*	.....		

(a) In the table, write down an expression, in terms of n, for Row n.

(1)

(b) Simplify fully your expression for Row n.
You must show your working.

.....

(2)

Q15

(Total 3 marks)

Blank

6. Here are the first four terms of a number sequence.

2 7 12 17

(a) Work out the 10th term of this number sequence.

.....

(2)

Here are the first five terms of another number sequence.

– 4 – 1 2 5 8

(b) (i) Find, in terms of n, an expression for the nth term of this number sequence.

.....

(ii) Find **two** numbers that are in both number sequences.

.....

(3) **Q6**

(Total 5 marks)

18. Here are the first 4 lines of a number pattern.

$1 + 2 + 3 + 4$	=	$(4 \times 3) - (2 \times 1)$
$2 + 3 + 4 + 5$	=	$(5 \times 4) - (3 \times 2)$
$3 + 4 + 5 + 6$	=	$(6 \times 5) - (4 \times 3)$
$4 + 5 + 6 + 7$	=	$(7 \times 6) - (5 \times 4)$

n is the first number in the nth line of the number pattern.

Show that the above number pattern is true for the four consecutive integers

n, $(n + 1)$, $(n + 2)$ and $(n + 3)$

Q18

(Total 4 marks)

3. The nth term of a number sequence is $n^2 + 1$

Write down the first three terms of the sequence.

.....

(Total 2 marks)

Q3

Blank

4. Here are the first five terms of an arithmetic sequence.

2 6 10 14 18

(a) Find, in terms of n, an expression for the nth term of this sequence.

.....

(2)

(b) An expression for the nth term of another sequence is $10 - n^2$

(i) Find the third term of this sequence.

.....

(ii) Find the fifth term of this sequence.

.....

(2)

Q4

(Total 4 marks)

Question 09

1 Here are the first four terms of an arithmetic sequence.

5 9 13 17

(a) What is the next term of this sequence?

.....

(1)

(b) Write down an expression, in terms of n, for the nth term of the sequence.

.....

(2)

(Total for Question 1 is 3 marks)

9. The nth term of a number sequence is given by $3n+1$

(a) Work out the first **two** terms of the number sequence.

.....

(1)

Here are the first four terms of another number sequence.

1 5 9 13

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

.....

(2)

(Total 3 marks)

Q9

10 Here are the first 5 terms of an arithmetic sequence.

6 10 14 18 22

(a) Write down an expression, in terms of n, for the nth term of this sequence.

.....

(2)

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

(b) Find the 3rd term of this sequence.

.....

(2)

(Total for Question 10 is 4 marks)

2. Here is a number pattern.

Line Number			
1	$1^2 + 3^2$	$2 \times 2^2 + 2$	10
2	$2^2 + 4^2$	$2 \times 3^2 + 2$	20
3	$3^2 + 5^2$	$2 \times 4^2 + 2$	34
4	.....	.....	52
10	.....	.....	.....

(a) Complete Line Number 4 of the pattern.

(1)

(b) Complete Line Number 10 of the pattern.

(2)

(c) Use the number pattern to find the answer to $999^2 + 1001^2$

.....

(2)

(Total 5 marks)

Q2

5 Here are the first four terms of an arithmetic sequence.

10 16 22 28

(a) Find the 10th term of this sequence.

.....

(1)

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

.....

(2)

(Total for Question 5 is 3 marks)

2 Here are the first five terms of an arithmetic sequence.

2 7 12 17 22

(a) Explain why the number 271 cannot be a term in this sequence.

.....

.....

(1)

(b) Write down an expression, in terms of n, for the nth term of the sequence.

.....

(2)

(Total for Question 2 is 3 marks)

Question 15

2 Here are the first four terms of a number sequence.

6 10 14 18

Write an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 2 is 2 marks)

18 The diagram shows part of a pattern made from tiles.

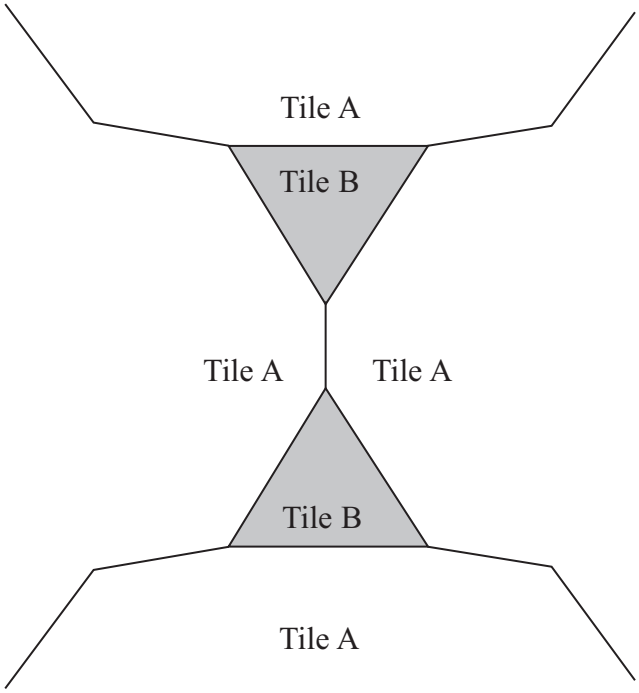


Diagram **NOT** accurately drawn

The pattern is made from two types of tiles, tile A and tile B.

Both tile A and tile B are regular polygons.

Work out the number of sides tile A has.

.....

(Total for Question 18 is 4 marks)

8 Here are the first five terms of an arithmetic sequence.

4 11 18 25 32

(a) Write down, in terms of n, an expression for the nth term of this sequence.

.....

(2)

An expression for the nth term of another sequence is $3n^2 - 1$

(b) Find the fourth term of this sequence.

.....

(2)

(Total for Question 8 is 4 marks)

5 Here are the first 5 terms of an arithmetic sequence.

3 9 15 21 27

(a) Find an expression, in terms of n, for the nth term of this sequence.

.....

(2)

Ben says that 150 is in the sequence.

(b) Is Ben right?
You must explain your answer.

.....

.....

.....

(1)

(Total for Question 5 is 3 marks)

7 The first five terms of an arithmetic sequence are

2 6 10 14 18

(a) Write down an expression, in terms of n, for the nth term of this sequence.

.....

(2)

An expression for the nth term of a different sequence is $20 - 5n$

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

.....

(2)

(Total for Question 7 is 4 marks)

4 Here are the first five terms of an arithmetic sequence.

1 5 9 13 17

(a) Write down an expression, in terms of n, for the nth term of this sequence.

.....

(2)

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

(b) Find the 10th term of this sequence.

.....

(2)

(Total for Question 4 is 4 marks)

8 Here are the first four terms of an arithmetic sequence.

3 10 17 24

(a) Find, in terms of n, an expression for the nth term of this arithmetic sequence.

.....

(2)

(b) Is 150 a term of this sequence?

You must explain how you get your answer.

.....

.....

.....

.....

.....

(2)

(Total for Question 8 is 4 marks)

9 The diagram shows a pattern using four identical rhombuses.

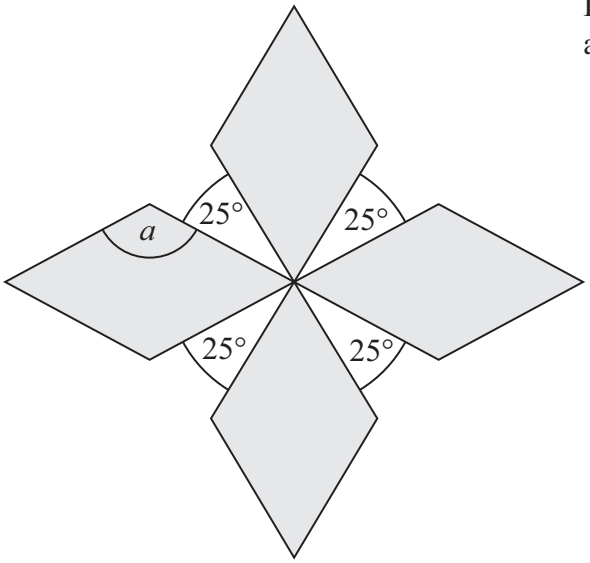


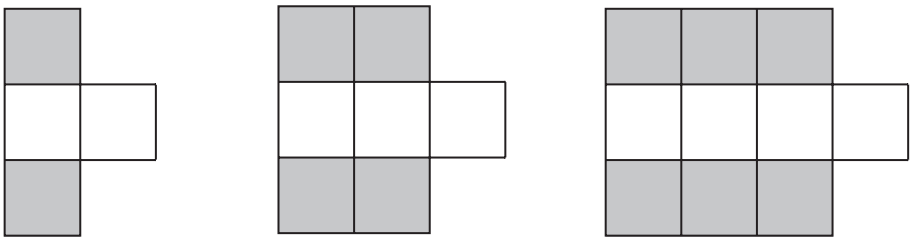
Diagram **NOT** accurately drawn

Work out the size of the angle marked a.
You must show your working.

.....°

(Total for Question 9 is 4 marks)

1 Here are some patterns made from white centimetre squares and grey centimetre squares.



Pattern 1 Pattern 2 Pattern 3

A Pattern has 20 grey squares.

(a) Work out how many white squares there are in this Pattern.

.....

(2)

(b) Find an expression, in terms of n, for the total number of centimetre squares in Pattern n.

.....

(2)

(Total for Question 1 is 4 marks)

12 Here are the first five terms of an arithmetic sequence.

4 9 14 19 24

(a) Find, in terms of n, an expression for the nth term of this sequence.

.....

(2)

Here are the first five terms of a different sequence.

2 2 0 –4 –10

An expression for the nth term of this sequence is $3n - n^2$

(b) Write down, in terms of n, an expression for the nth term of a sequence whose first five terms are

4 4 0 –8 –20

.....

(1)

(Total for Question 12 is 3 marks)

9 Here are the first five terms of an arithmetic sequence.

3 5 7 9 11

Write down, in terms of n, an expression for the nth term of the sequence.

.....

(Total for Question 9 is 2 marks)

7 Here are the first five terms of an arithmetic sequence.

2 6 10 14 18

(a) Write down an expression, in terms of n, for the nth term of this sequence.

.....

(2)

*(b) Is 86 a term in the sequence?
You must give a reason for your answer.

(1)

(Total for Question 7 is 3 marks)

1 Here are the first five terms of an arithmetic sequence.

5 12 19 26 33

(a) Write down an expression, in terms of n, for the nth term of the sequence.

.....

(2)

The expression $4n^2 - 5$ is the nth term of a different sequence.

(b) Find the 3rd term of this sequence.

.....

(2)

(Total for Question 1 is 4 marks)

Question 28

4 The nth term of a number sequence is $2n + 1$

Write down the first 3 terms of the number sequence.

.....

(Total for Question 4 is 2 marks)

3 Here are the first four terms of an arithmetic sequence.

11 17 23 29

(a) Find, in terms of n, an expression for the nth term of this arithmetic sequence.

.....

(2)

(b) Is 121 a term of this arithmetic sequence?
You must explain your answer.

.....

.....

.....

(2)

(Total for Question 3 is 4 marks)

2 Here is an equilateral triangle.

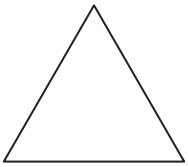
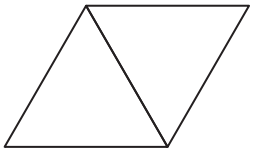


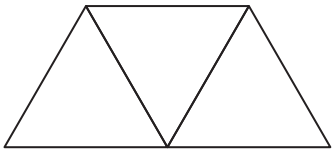
Diagram **NOT** accurately drawn

The equilateral triangle has a perimeter of 24 cm.

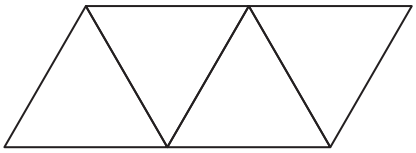
Some of these equilateral triangles are used to make this sequence of quadrilaterals.



quadrilateral 1



quadrilateral 2



quadrilateral 3

Find an expression for the perimeter, in centimetres, of quadrilateral n.

.....

(Total for Question 2 is 3 marks)

***6** The *n*th term of sequence A is $3n - 2$
The *n*th term of sequence B is $10 - 2n$

Sally says there is only one number that is in both sequence A and sequence B.

Is Sally right?
You must explain your answer.

(Total for Question 6 is 2 marks)

1 Here are the first 5 terms of an arithmetic sequence.

3 10 17 24 31

(a) Find an expression, in terms of n, for the nth term of this sequence.

.....

(2)

The nth term of a different sequence is $3n^2 + 5$

(b) Find the 4th term of this sequence.

.....

(2)

(Total for Question 1 is 4 marks)

10 Here are the first five terms of an arithmetic sequence.

2 5 8 11 14

(a) Write down an expression, in terms of n, for the nth term of this sequence.

.....

(2)

(b) Is 299 a term of this sequence?
You must give a reason for your answer.

.....

.....

(2)

(c) Write down an expression, in terms of n, for the $(n + 1)$th term of this sequence.

.....

(1)

(Total for Question 10 is 5 marks)

22 Here are the first five terms of a sequence.

4 11 22 37 56

Find an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 22 is 3 marks)

23 S is a geometric sequence.

(a) Given that $(\sqrt{x} - 1)$, 1 and $(\sqrt{x} + 1)$ are the first three terms of S, find the value of x.
You must show all your working.

.....

(3)

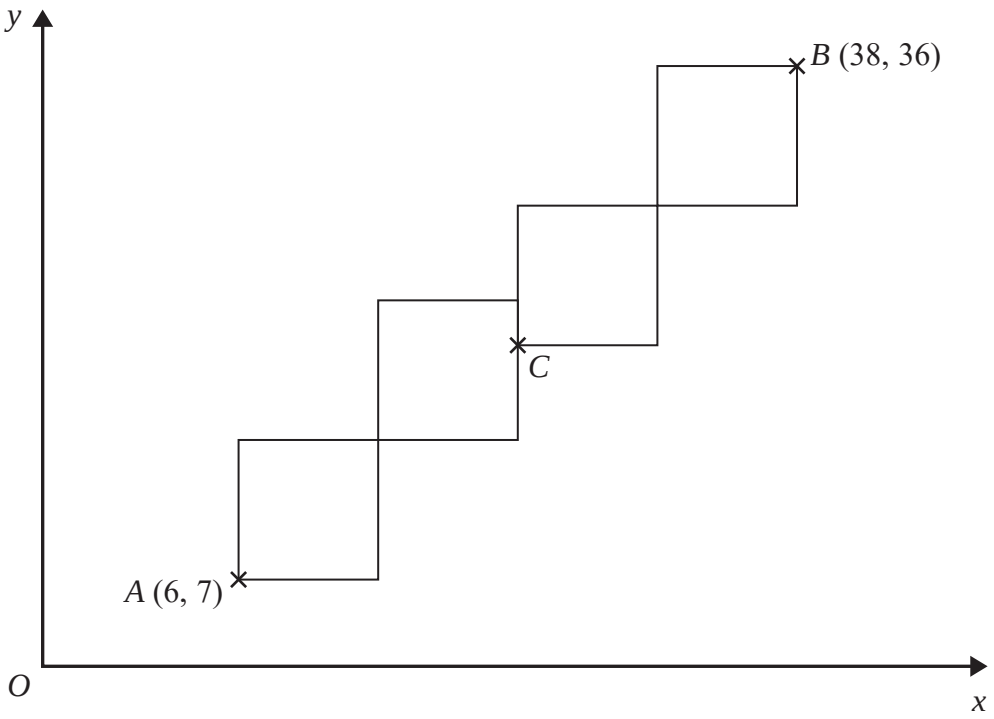
(b) Show that the 5th term of S is $7 + 5\sqrt{2}$

(2)

(Total for Question 23 is 5 marks)

6 A pattern is made from four identical squares.

The sides of the squares are parallel to the axes.



Point A has coordinates (6, 7)
Point B has coordinates (38, 36)
Point C is marked on the diagram.

Work out the coordinates of C.

(..... , ...)

(Total for Question 6 is 5 marks)

16 The nth term of a sequence is given by $an^2 + bn$ where a and b are integers.

The 2nd term of the sequence is –2
The 4th term of the sequence is 12

(a) Find the 6th term of the sequence.

.....

(4)

Here are the first five terms of a different quadratic sequence.

0 2 6 12 20

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

.....

(2)

(Total for Question 16 is 6 marks)

16 Here are the first six terms of a quadratic sequence.

−1 5 15 29 47 69

Find an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 16 is 3 marks)

6 The nth term of a sequence is $2n^2 - 1$

The nth term of a different sequence is $40 - n^2$

Show that there is only one number that is in both of these sequences.

(Total for Question 6 is 3 marks)

20 Here are the first five terms of a sequence.

$$-1 \qquad 0 \qquad 3 \qquad 8 \qquad 15$$

Find an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 20 is 2 marks)

Question 41

November 2020 | 1MA1/1H | Original Q1

1 The first five terms of an arithmetic sequence are

1 4 7 10 13

Write down an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 1 is 2 marks)

16 Here are the first five terms of a quadratic sequence.

10 21 38 61 90

Find an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 16 is 3 marks)

5 The first four terms of a Fibonacci sequence are

$$a \qquad 2a \qquad 3a \qquad 5a$$

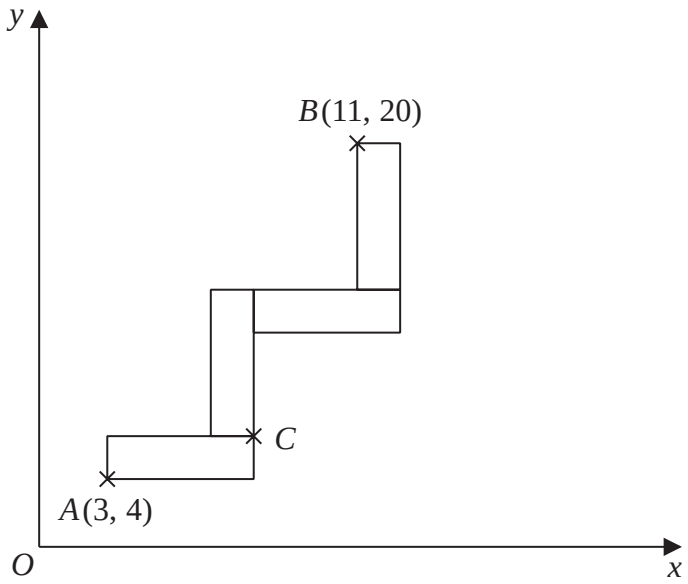
The sum of the first five terms of this sequence is 228

Work out the value of a.

.....

(Total for Question 5 is 3 marks)

13 A pattern is made from four identical rectangles.
The sides of the rectangles are parallel to the axes.



Point A has coordinates (3, 4)
Point B has coordinates (11, 20)
Point C is marked on the diagram.

Work out the coordinates of C.
You must show all your working.

(..... , ...)

(Total for Question 13 is 5 marks)

23 Here are the first five terms of a geometric sequence.

$$\sqrt{5} \qquad 10 \qquad 20\sqrt{5} \qquad 200 \qquad 400\sqrt{5}$$

(a) Work out the next term of the sequence.

.....

(2)

The 4th term of a different geometric sequence is $\frac{5\sqrt{2}}{4}$

The 6th term of this sequence is $\frac{5\sqrt{2}}{8}$

Given that the terms of this sequence are all positive,

(b) work out the first term of this sequence.
You must show all your working.

.....

(3)

(Total for Question 23 is 5 marks)

3 Here are the first five terms of an arithmetic sequence.

7 13 19 25 31

(a) Find an expression, in terms of n, for the nth term of this sequence.

.....

(2)

The nth term of a different sequence is $8 - 6n$

(b) Is -58 a term of this sequence?
You must show how you get your answer.

(2)

(Total for Question 3 is 4 marks)

Question 47

June 2023 | 1MA1/2H | Original Q15

15 Here are the first four terms of a quadratic sequence.

3 9 17 27

Find an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 15 is 3 marks)

13 An expression for the nth term of the sequence of triangular numbers is $\frac{n(n+1)}{2}$

Prove that the sum of any two consecutive triangular numbers is a square number.

(Total for Question 13 is 3 marks)

22 The 2nd term of a geometric sequence is $3 + 2\sqrt{2}$
The 3rd term of the sequence is $13 + 9\sqrt{2}$

Find the value of the common ratio of the sequence.
Give your answer in the form $a + \sqrt{b}$ where a and b are integers.
You must show all your working.

.....

(Total for Question 22 is 4 marks)

14 Here are the first six terms of a quadratic sequence.

5 11 21 35 53 75

Find an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 14 is 2 marks)

Question 51

1 Here are the first four terms of an arithmetic sequence.

1 5 9 13

Find an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 1 is 2 marks)

Question 52

17 A ball is thrown upwards and reaches a maximum height.
The ball then falls and bounces repeatedly.

After the nth bounce, the ball reaches a height of h_n
After the next bounce, the ball reaches a height given by $h_{n+1} = 0.55h_n$

After the 1st bounce, the ball reaches a height of 8 metres.

What height does the ball reach after the 4th bounce?

..... metres

(Total for Question 17 is 3 marks)

20 $x - 4$, $x + 2$ and $3x + 1$ are three consecutive terms of an arithmetic sequence.

(a) Find the value of x.

$x =$ .....

(2)

$y - 4$, $y + 2$ and $3y + 1$ are three consecutive terms of a geometric sequence.

(b) Find the possible values of y.

.....

(5)

(Total for Question 20 is 7 marks)

15 Here are the first five terms of a quadratic sequence.

3 20 47 84 131

(a) Find an expression, in terms of n, for the nth term of this sequence.

.....

(3)

The terms of a different sequence are given by the rule $u_{n+1} = ku_n + k$ where k is a constant.

Given that $u_1 = 9$ and $u_2 = 4$

(b) find the value of u_4

u_4 = ...

(3)

(Total for Question 15 is 6 marks)