Name	ANSWERS	Class	

⬛ MATHS TEACHER HUB

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Sequences
(9 – 1) Topic booklet
Foundation

These questions have been collated from previous years GCSE Mathematics papers.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.

Total Marks

Instructions
- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need*.
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out**.
- If the question is a **1F** question you are not allowed to use a calculator.
- If the question is a **2F** or a **3F** question, you may use a calculator to help you answer.

Information
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question*.

Advice
- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions
Write your answers in the space provided.
You must write down all the stages in your working.

4   Here are the first 4 terms of a sequence.

2   9   16   23
+7   +7   +7

(a) (i) Write down the next term in the sequence.

30

(1)

(ii) Explain how you got your answer.

Add 7 to the previous number

(1)

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

2 9 16 23 30 37 44 51 58 65

65

(1)

May 2018 – Paper 3F   **(Total for Question 4 is 3 marks)**

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

2   5   11   23

The rule to continue this sequence is

multiply the previous term by 2 and then add 1

Work out the 5th term of this sequence.

46 +1

47

November 2017 – Paper 1F   **(Total for Question 5 is 1 mark)**

2

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

<div align="center">97   91   85   79</div>

-6   -6   -6

(a) Explain how to work out the next number of the sequence.

Subtract 6 from the previous number

(1)

(b) Work out the difference between the 5th term and the 7th term of the sequence.

5th 6th 7th
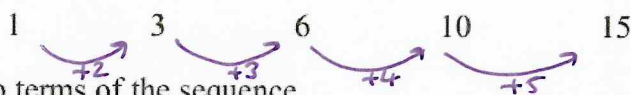
73   67   61

73 - 61 = 12

12

(2)

(c) Explain why 52 is **not** a number in this sequence.

All values in this sequence are odd.

(1)

(Total for Question 8 is 4 marks)

8 Here are the first five terms of a sequence.

1   3   6   10   15

+2   +3   +4   +5

Write down the next two terms of the sequence.

21 , 28

(Total for Question 8 is 2 marks)

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

3   8   13   18   23

+5   +5   +5   +5

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

28   33

(1)

Jim says that 50 is a term in this sequence.
Jim is wrong.

(b) Explain why.

All values in this sequence end in a 3 or
an 8, so the number 50 wont be seen.

(1)

(Total for Question 8 is 2 marks)

4

9 (a) The nth term of a sequence is $3n + 4$

   Explain why 21 is not a term of this sequence.

   $$3n + 4 = 21$$
   $$3n = 17 \qquad n = \text{decimal}$$
   $$n = \frac{17}{3}$$

   (2)

   (b) Here are the first three terms of a different sequence.

   $$1 \qquad 2 \qquad 4$$

   Write down two numbers that could be the 4th term and the 5th term of this sequence.
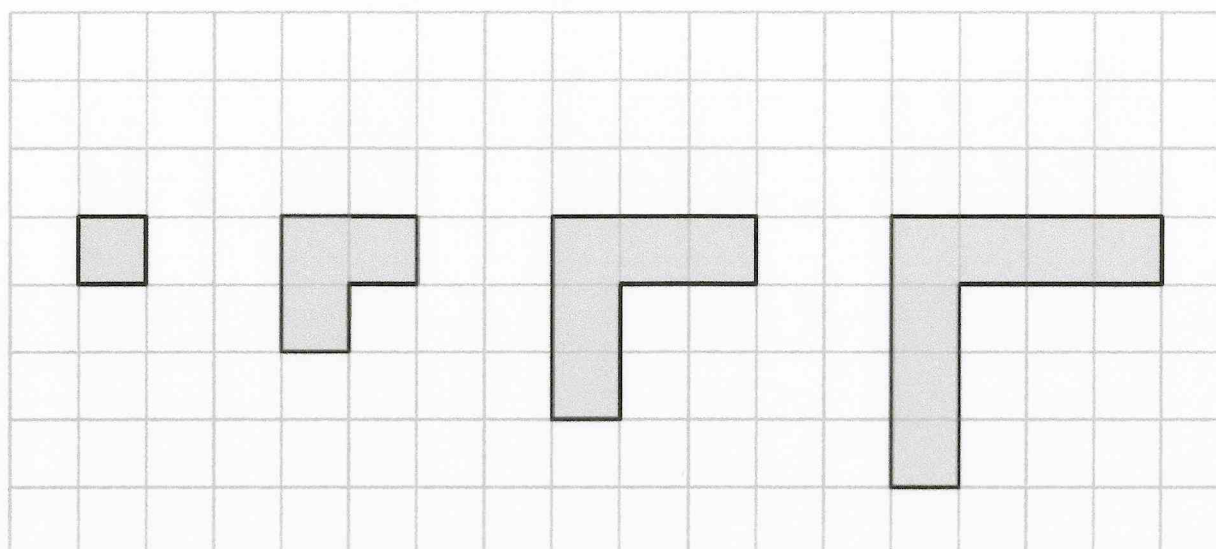   Give the rule you have used to get your numbers.

   8 , 16   Multiply the previous term by 2
   7 , 11   add 1 extra to the previous gaps.

   (2)

(Total for Question 9 is 4 marks)

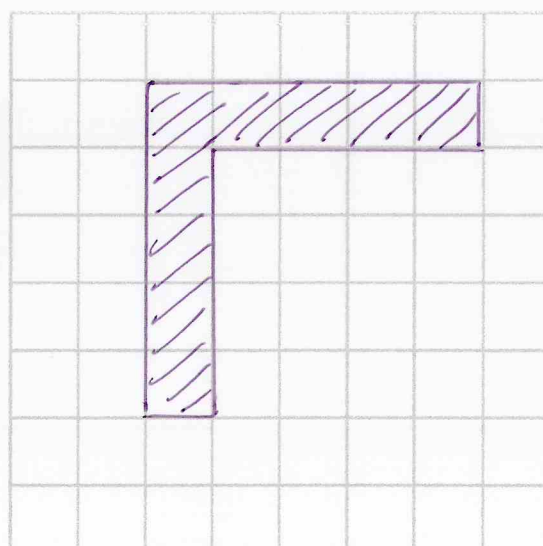9   Here is a sequence of patterns made from grey square tiles.

Pattern
number 1

Pattern
number 2

Pattern
number 3

Pattern
number 4

(a) On the grid below, draw Pattern number 5

(1)

(b) Complete the table.

Pattern number	1	2	3	4	5	6
Number of squares	1	3	5	7	9	11

(1)

(Total for Question 9 is 2 marks)

10 Complete this table of values.

n	$3n + 2$
12	38
15	47

(Total for Question 10 is 3 marks)

10 Here are the first three terms of a sequence.

20   16   13

-4   -3

(i) Write down two numbers that could be the 4th and 5th terms of this sequence.

11   10

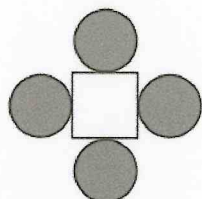(1)

(ii) Write down the rule you used to get your numbers.

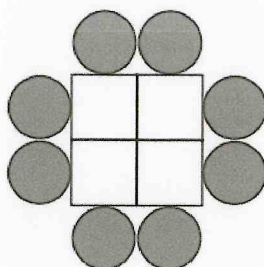The gaps are -4, -3, -2, -1,

(1)

(Total for Question 10 is 2 marks)

7

11 A sequence of patterns is made from circular tiles ⬤ and square tiles ☐
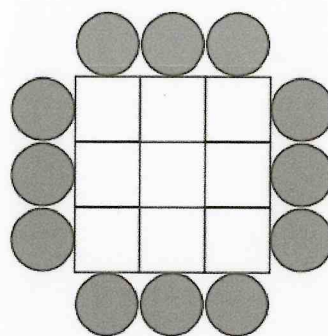
Here are the first three patterns in the sequence.

| pattern number 1 | pattern number 2 | pattern number 3 |

(a) How many square tiles are needed to make pattern number 6?

36

(2)

(b) How many circular tiles are needed to make pattern number 20?

4, 8, 12,

4n = 4(20)

80

(2)

Derek says,

"When the pattern number is odd, an odd number of square tiles is needed to make the pattern."

(c) Is Derek right?
You must give reasons for your answer.

Yes, when you square an odd number you always get an odd number

(2)

(Total for Question 11 is 6 marks)

11 The first three terms of a number pattern are   1   2   4

Hester says the first five terms of this number pattern are   1   2   4   8   16

(a) Write down the rule Hester could have used to get the 4th and 5th terms.

Double the previous number

(1)

(b) Write down the 6th term of Hester's number pattern.

(1)

Jack uses a different rule.

He says the first six terms of the number pattern are   1   2   4   7   11   16   22   29

(c) Write down the 7th and 8th terms of Jack's number pattern. +2 +3 +4 +5 +6 +7

22 , 29

(1)

(Total for Question 11 is 3 marks)

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

$$45 \quad 40 \quad 35 \quad 30 \quad 25$$

(handwritten annotations: arrows between terms each labelled −5)

(a) (i) Write down the next two terms of this sequence.

(handwritten: 6 → 20, 7 → 15)

20, 15

(1)

A term of this sequence is −5

(ii) Which term?
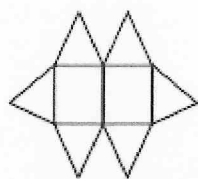
(handwritten: 8 → 10, 9 → 5, 10 → 0, 11 → −5)

11th

(1)

The *n*th term of a different sequence is given by the expression $4n + 3$

(b) Find the 9th term of this sequence.

(handwritten)
$$4(9) + 3$$
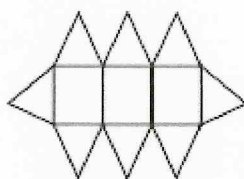$$36 + 3$$

39

(1)
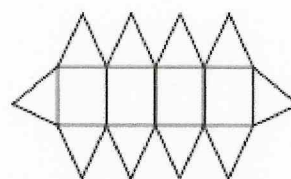
(Total for Question 12 is 3 marks)

12 Here are the first three patterns in a sequence.
The patterns are made from triangles and rectangles.

| pattern number 1 | pattern number 2 | pattern number 3 |

(a) How many triangles are there in pattern number 7?

$6, 8, 10 = 2n+4$

$2(7)+4$

$\underline{\hspace{1cm} 18}$

(2)

Charlie says

"There are 4 rectangles in pattern number 3 so there will be 8 rectangles in pattern number 6"

(b) Is Charlie right?
Give a reason for your answer.

$\overset{1}{2}, \overset{2}{3}, \overset{3}{4}, \overset{4}{5}, \overset{5}{6}, \overset{6}{7}$

The number of rectangles increases by 1 each time.

(1)

(Total for Question 12 is 3 marks)

13 Here are the first three terms of a sequence.

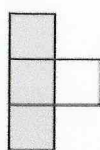32   26   20   14   8   2   -4

Find the first two terms in the sequence that are less than zero.

$\underline{\hspace{1cm} -4 \hspace{1cm}} \quad \underline{\hspace{1cm} -10 \hspace{1cm}}$
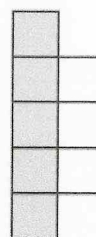
(Total for Question 13 is 3 marks)

13 Here is a sequence of patterns made with grey square tiles and white square tiles.

pattern number 1   pattern number 2   pattern number 3

(a) In the space below, draw pattern number 4

(1)

(b) Find the total number of tiles in pattern number 20

$4, 6, 8 \quad = 2n + 2$

$2(20) + 2$

$\underline{42}$

(2)

(c) Write an expression, in terms of n, for the number of grey tiles in pattern number n.

$3 \quad 4 \quad 5$

$n + 2$

$\underline{n+2}$

(2)

(Total for Question 13 is 5 marks)

13 A number sequence starts   1   2   4   7
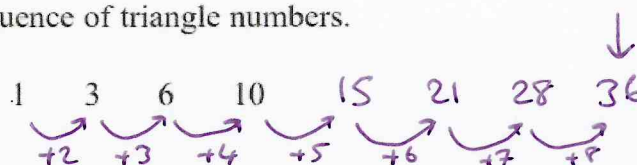$+1$ $+2$ $+3$

Emma says that the next term is 7

(a) Explain why Emma may be correct.

Adding 1 to the previous additions

(1)

Here are the first four terms of the sequence of triangle numbers.

1   3   6   10   15   21   28   36
$+2$ $+3$ $+4$ $+5$ $+6$ $+7$ $+8$

(b) Find the 8th term of this sequence.

36

(2)

(Total for Question 13 is 3 marks)

13 The first term of a sequence of numbers is 24
The term-to-term rule of this sequence is 'add 8'

Josie says,

"No number in this sequence is in the 5 times table."

(a) Give an example to show that Josie is wrong.

24, 32, 40
+8   +8

(1)

(b) Is 85 a number in this sequence?
Give a reason for your answer.

No adding an even number to even numbers is always an even number.

(1)

(Total for Question 13 is 2 marks)

18 Here is a sequence of patterns made with counters.

pattern number 1   pattern number 2   pattern number 3

(a) Find an expression, in terms of n, for the number of counters in pattern number n.

$$3, 7, 10 = 4n - 1$$

$$4n - 1$$

....

(2)

Bayo has 90 counters.

(b) Can Bayo make a pattern in this sequence using all 90 of his counters?
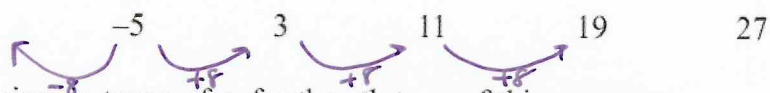You must show how you get your answer.

$$4n - 1 = 90$$
$$4n = 91$$
$$n = \frac{91}{4}$$
$$n = \text{decimal}$$

No Bayo cannot make
a pattern with
90 counters

(2)

(Total for Question 18 is 4 marks)

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

$$-5 \qquad 3 \qquad 11 \qquad 19 \qquad 27$$

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

$8n - 13$

(Total for Question 19 is 2 marks)

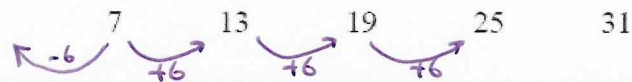20 Here are the first four terms of an arithmetic sequence.

$$1 \qquad 5 \qquad 9 \qquad 13$$

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

$4n - 3$

(Total for Question 20 is 2 marks)

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

$$7 \quad 13 \quad 19 \quad 25 \quad 31$$

-6 +6 +6 +6

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

$6n + 1$

(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.

$$8 - 6n = -58$$
$$8 = 6n - 58$$
$$66 = 6n$$
$$11 = n$$

Yes its the 11ᵗʰ term

(2)

(Total for Question 20 is 4 marks)

20 Here are the first six terms of a Fibonacci sequence.

$$
\begin{array}{ccccccccc}
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\
1 & 1 & 2 & 3 & 5 & 8 & 13 & 21 & 34
\end{array}
$$

The rule to continue a Fibonacci sequence is,

> the next term in the sequence is the sum of the two previous terms.

(a) Find the 9th term of this sequence.

34

(1)

The first three terms of a different Fibonacci sequence are

$$
\begin{array}{ccc}
1 & 2 & 3 \\
a & b & a + b
\end{array}
$$

(b) Show that the 6th term of this sequence is $3a + 5b$

$$
\begin{array}{ccc}
4 & 5 & 6 \\
a + 2b & 2a + 3b & 3a + 5b
\end{array}
$$

(2)

Given that the 3rd term is 7 and the 6th term is 29,
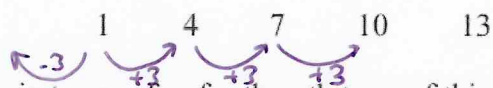
(c) find the value of a and the value of b.

$$\text{(×3)} \rightarrow \quad a + b = 7$$
$$3a + 5b = 29$$

$$
\begin{array}{r}
3a + 3b = 21 \\
-\ \ 3a + 5b = 29 \\
\hline
-2b = -8 \\
2b = 8 \\
b = 4
\end{array}
$$

$a =$ **3**

$b =$ **4**

(3)

(Total for Question 20 is 6 marks)

20 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.

$3n - 2$

(Total for Question 20 is 2 marks)

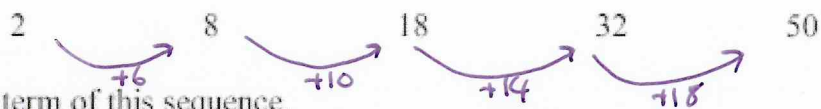**21** Here are the first five terms of an arithmetic sequence.

− 3   1   5   9   13

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

$4n - 7$

(Total for Question 21 is 2 marks)

24 Here are the first five terms of a sequence.

$$2 \quad\quad 8 \quad\quad 18 \quad\quad 32 \quad\quad 50$$

+6   +10   +14   +18

(a) Find the next term of this sequence.

72

(1)

The nth term of a different sequence is $3n^2 - 10$

(b) Work out the 5th term of this sequence.

$$3(5)^2 - 10$$
$$3(25) - 10$$
$$75 - 10$$

65

(1)

(Total for Question 24 is 2 marks)

25 The first four terms of a Fibonacci sequence are

$$\overset{1}{a} \qquad \overset{2}{2a} \qquad \overset{3}{3a} \qquad \overset{4}{5a} \qquad \overset{5}{8a}$$

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

Work out the value of *a*.

$$a + 2a + 3a + 5a + 8a = 228$$

$$19a = 228$$

$$a = \frac{228}{19}$$

$$\underline{a = 12}$$

12

(Total for Question 25 is 3 marks)

25 Here are the first six terms of an arithmetic sequence.

$$3 \qquad 8 \qquad 13 \qquad 18 \qquad 23 \qquad 28$$

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

$$5n - 2$$

(2)

The nth term of a different sequence is $3n^2$
Nathan says that the 4th term of this sequence is 144

(b) Is Nathan right?
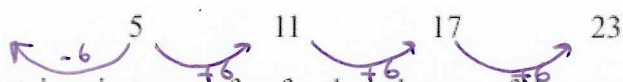Show how you get your answer.

$$= 3(4)^2$$
$$= 3(16)$$
$$= 48$$

Nathan is wrong

(1)

(Total for Question 25 is 3 marks)

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

$$5 \qquad 11 \qquad 17 \qquad 23$$

-6 +6 +6 +6

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

$6n - 1$

(Total for Question 26 is 2 marks)

28 Here are the first five terms of a Fibonacci sequence.

$$3 \quad 3 \quad 6 \quad 9 \quad 15$$

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

24 , 39

(1)

The first three terms of a different Fibonacci sequence are

1	2	3	4	5	6
a	a	$2a$	$3a$	$5a$	$8a$

(b) Find the 6th term of this sequence.

8a

(2)

(Total for Question 28 is 3 marks)