Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Sequences and nth term

Time allowed: 1 hour 20 minutes

Subject code **0580**

Mathematics

Questions from Paper 1, Paper 2, Paper 3 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.
You may use a calculator.

Total marks

/ 66

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.
- Unless a question says otherwise, give answers that are not exact to 3 significant figures, and angles in degrees to 1 decimal place.

Information

- This paper has 10 questions worth 66 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1

$-1, \quad 3, \quad 7, \quad 11, \quad .....$

Write down the nth term for this sequence.

Answer..... [2]

The nth term of a linear sequence Click for more variations

1	$4n - 5$ oe	**2**	**M1** for $4n + k$ or for $jn - 5$ ($j \neq 0$)

2 Find the next term in each sequence.

(a) 1, 5, 10, 16, 23, …

..... [1]

(b) 1, 2, 4, 8, 16, …

..... [1]

(a) Introduction to sequences (b) Other sequences Click for more variations

2(a)	31	**1**	
2(b)	32	**1**	

3 Find the nth term of each sequence.

(a) $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}, \frac{1}{10}, \ldots$

..... [1]

(b) 1, 5, 25, 125, 625, ...

..... [2]

(a) Other sequences (b) Other sequences Click for more variations

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3(a)	$\frac{1}{2n}$ oe final answer	**1**	
3(b)	5^{n-1} oe final answer	**2**	**M1** for recognition of terms being powers of 5

4 **(a)** 2, *e*, *f*, 20, …

A linear sequence has a first term of 2 and a fourth term of 20.
The term-to-term rule for this sequence is add *k*.

Work out the values of *e*, *f* and *k*.

e = ...

f = ...

k = ...
[3]

(b) These are the first four terms of another sequence.

9 7 5 3

Find the *n*th term.

..... [2]

(a) The nth term of a linear sequence (b) The nth term of a linear sequence Click for more variations

4(a)	8 14 6	**3**	**B1** for each correctly assigned or **M1** for $\frac{20-2}{3}$ oe
4(b)	$11-2n$ oe final answer	**2**	**B1** for answer $j-2n$ or $11-kn$, $k \neq 0$ or $11-2n$ seen then spoilt

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5 **(a)** A sequence has nth term $3n^2 - 1$.

Find the second term in this sequence.

..... [1]

(b) The table shows the first five terms of sequences A and B.

	1st term	2nd term	3rd term	4th term	5th term	nth term
Sequence A	–6	–2	2	6	10	
Sequence B	3	17	55	129	251	

Complete the table to show the nth term of each sequence.

[4]

(a) Quadratic sequences (b)(A) The nth term of a linear sequence (b)(B) Other sequences Click for more variations

5(a)	11	**1**	
5(b)	$4n - 10$ oe final answer and $2n^3 + 1$ oe final answer	**4**	**B2** for $4n - 10$ oe final answer or **B1** for $4n + j$ or $kn - 10$ ($k \neq 0$) or $4n - 10$ seen then spoilt **B2** for $2n^3 + 1$ oe final answer or **B1** for any cubic expression in n or 3rd difference = 12 or for correct answer seen then spoilt

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6 **(a)** These are the first 5 terms of a sequence.

1 8 27 64 125

Find the 10th term of this sequence.

..... [1]

(b) These are the first 5 terms of a different sequence.

5 8 13 20 29

Find the *n*th term of this sequence.

..... [2]

(c) The **sum of the first *n* terms** of another sequence is $\frac{n}{2}(5n-1)$.

(i) Use $n = 2$ to find the sum of the first two terms in this sequence.

..... [1]

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

..... [2]

(a) Other sequences (b) Quadratic sequences (c)(i) Other sequences (c)(ii) Other sequences

Click for more variations

6(a)	1000 or 10^3	**1**	
6(b)	$n^2 + 4$ final answer oe	**2**	**B1** for second difference = 2 or for answer as a quadratic expression or for a correct expression shown in the working and then spoilt
6(c)(i)	9	**1**	
6(c)(ii)	12	**2**	**B1** for 21

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7 **(a)** These are the first four terms of a sequence.

$$11 \qquad 7 \qquad 3 \qquad -1$$

(i) Write down the next term.

..... [1]

(ii) Write down the term to term rule for this sequence.

..... [1]

(iii) Find the nth term of this sequence.

..... [2]

(b) The nth term of a different sequence is $\frac{2n}{n+1}$.

(i) Find the difference between the 5th term and the 6th term of this sequence.
Give your answer as a fraction.

..... [2]

(ii) Is $\frac{3}{4}$ a term in this sequence?
Show how you decide.

[3]

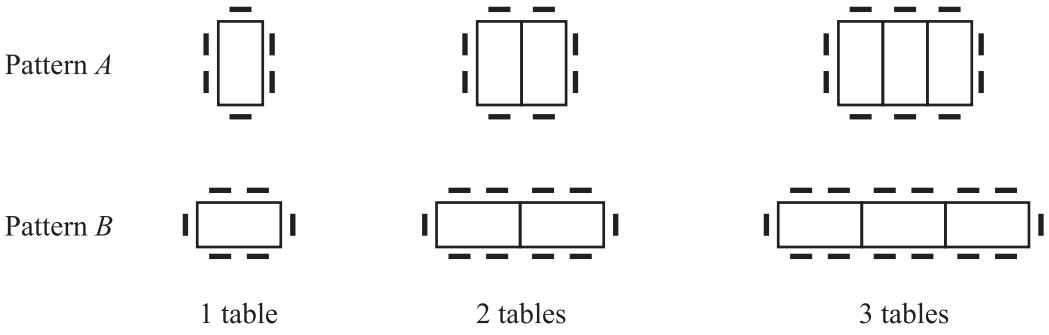
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(a)(i) Introduction to sequences (a)(ii) Introduction to sequences (a)(iii) The nth term of a linear sequence
(b)(i) Other sequences (b)(ii) Other sequences Click for more variations

7(a)(i)	–5	**1**	
7(a)(ii)	Subtract 4 oe	**1**	
7(a)(iii)	$15 - 4n$ oe final answer	**2**	**B1** for $k - 4n$ or $15 - jn$ $j \neq 0$
7(b)(i)	$\frac{1}{21}$ or equivalent fraction	**2**	**B1** for $\frac{12}{7}$ and $\frac{10}{6}$
7(b)(ii)	$n = \frac{3}{5}$ oe or $2n \geqslant n + 1$ but $3 < 4$.	**M2**	**M1** for $\frac{3}{4} = \frac{2n}{n+1}$ oe or **M1** for $2n > n + 1$ but $3 < 4$
	No, n is not an integer oe or No, $\frac{3}{4}$ is less than 1, oe	**A1**	

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8 Tables and chairs can be arranged in two different patterns.



(a) Complete the following table.

Number of tables	1	2	3	4		8
Number of chairs in Pattern A	6	8				
Number of chairs in Pattern B	6	10				

[5]

(b) How many chairs are needed with n tables

(i) in Pattern A,

Answer(b)(i) ..... [2]

(ii) in Pattern B?

Answer(b)(ii) ..... [2]

(c) Sofia needs to arrange tables to seat 66 people.

Which pattern uses the least number of tables and by how many?

Answer(c) Pattern ..... by ..... tables [3]

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(a) Introduction to sequences (b)(i) The nth term of a linear sequence (b)(ii) The nth term of a linear sequence
(c) The nth term of a linear sequence Click for more variations

8	**(a)**	10 12 20 14 18 34	**5**	**B4** for 5 correct **B3** for 4 correct **B2** for 3 correct **B1** for 2 correct
	(b) (i)	$2n + 4$ oe final answer	**2**	**B1** for $2n + k$ or $jn + 4$ $j \neq 0$
	(ii)	$4n + 2$ oe final answer	**2**	**B1** for $4n + k$ or $jn + 2$ $j \neq 0$
	(c)	B [by] 15 [tables]	**3**	**M1FT** for *their* $(2n + 4) = 66$ or *their* $(4n + 2) = 66$ and **A1FT** for $n = 31$ or $n = 16$

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9 In all the following sequences, after the first two terms, the rule is to add the previous two terms to find the next term.

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

1 1 2 3 5 8 13 .... [1]

(b) Write down the first two terms of this sequence.

.... 3 11 14 [2]

(c) **(i)** Find the value of d and the value of e.

2 d e 10

Answer(c)(i) d = ...

e = ... [3]

(ii) Find the value of x, the value of y and the value of z.

-33 x y z 18

Answer(c)(ii) x = ...

y = ...

z = ... [5]

(a) Other sequences (b) Other sequences (c)(i) Other sequences (c)(ii) Other sequences

Click for more variations

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9	**(a)** 21 and 34	1	
	(b) –5 8	1 + 1	
	(c) **(i)** 4, 6	3	**M1** for $2 + d = e$ oe or $d + e = 10$ oe seen and either **M1** for a correct eqn in d or e seen e.g. $2e = 12$ oe or $2d = 8$ oe or **B1** for either correct
	(ii) $x = 28$ $y = -5$ $z = 23$	5	**B4** for any two correct or **M3** for **any** of $18 = 3x - 66$ oe or $3y + 33 = 18$ oe or $33 - 3z = -36$ oe or **M1** for **2** of $y = x - 33$ oe or $y + z = 18$ oe or $x + y = z$ oe and **M1** for combining two of the previous equations correctly isw (does not have to be simplified) after 0 scored **SC1** for –33 + their x = their y or their x + their y = their z or their y + their z = 18

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10 (a)

Sequence	1st term	2nd term	3rd term	4th term	5th term		*n*th term
A	-7	-3	1	5			
B	7	13	23	37			
C	$\frac{2}{27}$	$\frac{3}{81}$	$\frac{4}{243}$	$\frac{5}{729}$			

Complete the table for the three sequences.

[10]

(b) In a sequence, the sum of the first 49 terms is 7644.
The sum of the first 50 terms is 7975.

Find the 50th term of this sequence.

..... [1]

(a)(A) The nth term of a linear sequence (a)(B) Quadratic sequences (a)(C) Other sequences
(b) The nth term of a linear sequence Click for more variations
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10(a)	A 9	**B1**	
	$4n - 11$ oe final answer	**B2**	**B1** for $4n - k$ or $jn - 11$ oe $j \neq 0$
	B 55	**B1**	
	$2n^2 + 5$ oe final answer	**B2**	**B1** for any quadratic or second differences = 4
	C $\frac{6}{2187}$ oe	**B1**	
	$\frac{n+1}{3^{n+2}}$ oe final answer	**B3**	**B2** for 3^{n+2} oe OR **B1** for 3^{n+k} seen oe **B1** for $n + 1$ as the numerator of a fraction
10(b)	331 cao	**1**	

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