Past Papers Worksheet P4 Number Sequence IGCSE Mathematics 0580

1. The table shows the first four terms in sequences A, B, C and D.
Complete the table.

Sequence	1st term	2nd term	3rd term	4th term	5th term		*n*th term
A	16	25	36	49			
B	5	8	11	14			
C	11	17	25	35			
D	$\frac{3}{2}$	$\frac{4}{3}$	$\frac{5}{4}$	$\frac{6}{5}$			

[12]

0580/43/M/J/17 Q11)

2. (a) The table shows the first five terms of sequence A and sequence B

Term	1	2	3	4	5	6
Sequence *A*	7	13	23	37	55	
Sequence *B*	1	3	9	27	81	

(i) Complete the table for the 6th term of each sequence. [2]
(ii) Find the nth term of
(a) sequence A, [2]
(b) sequence B. [2]

(b) The nth term of another sequence is $4n^2 + n + 3$.
Find
(i) the 2nd term, [1]
(ii) the value of n when the nth term is 498. [3]

0580/42/F/M/19 Q11)

Fundoo Tutor offers personalized coaching for IGCSE, IB, and SAT students. Need a tutor? http://fundootutor.com/book-a-call/

3. The sequence of diagrams above is made up of small lines and dots.

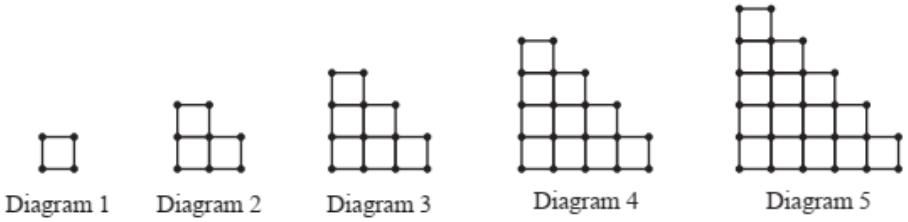


Diagram 1 Diagram 2 Diagram 3 Diagram 4 Diagram 5

(a) Complete the table

	Diagram 1	Diagram 2	Diagram 3	Diagram 4	Diagram 5	Diagram 6
Number of small lines	4	10	18	28		
Number of dots	4	8	13	19		

[4]

(b) For Diagram n find an expression, in terms of n, for the number of small lines. [2]

(c) Diagram r has 10 300 small lines. Find the value of r [2]

(d) The number of dots in Diagram n is

$an^2 + bn + 1$.

Find the value of a and the value of b. [2]

0580/42/M/J/19 Q11)

Fundoo Tutor Focused. On You.

4. These are the first four diagrams of a sequence.

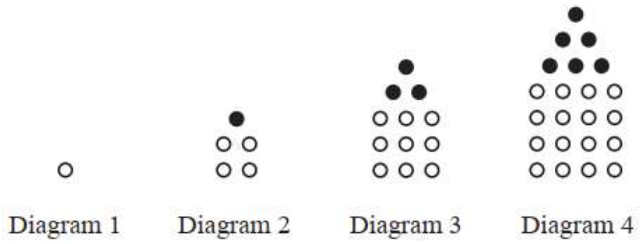


Diagram 1 Diagram 2 Diagram 3 Diagram 4

The diagrams are made from white dots and black dots.

(a) Complete the table for Diagram 5 and Diagram 6

Diagram	1	2	3	4	5	6
Number of white dots	1	4	9	16		
Number of black dots	0	1	3	6		
Total number of dots	1	5	12	22		

(b) Write an expression, in terms of n, for the number of white dots in Diagram n [1]

(c) The expression for the total number of dots in Diagram n is $\frac{1}{2}(3n^2 - n)$

(i) Find the total number of dots in Diagram 8. [1]

(ii) Find an expression for the number of black dots in Diagram n. Give your answer in its simplest form. [2]

(d) T is the total number of dots used to make **all** of the first n diagrams.

$T = an^3 + bn^2$

Find the value of a and the value of b.

You must show all your working [5]

0580/41/O/N/20 Q7)

Fundoo Tutor Focused. On You.

5. (a) Complete the table for the 5th term and the nth term of each sequence. [11]

1st term	2nd term	3rd term	4th term	5th term		*n*th term
9	5	1	−3			
4	9	16	25			
1	8	27	64			
8	16	32	64			

(b) 0, 1, 1, 2, 3, 5, 8, 13, 21, …

This sequence is a Fibonacci sequence.

After the first two terms, the rule to find the next term is "add the two previous terms".

For example, 5 + 8 = 13.

Use this rule to complete each of the following Fibonacci sequences.

2 4 ....

1 11

..... −1 1

[3]

(c) $\frac{1}{3}, \frac{3}{4}, \frac{4}{7}, \frac{7}{11}, \frac{11}{18}, \ldots$

(i) One term of this sequence is p/q .
Find, in terms of p and q, the next term in this sequence. [1]

(ii) Find the 6th term of this sequence. [1]

0580/41/O/N/19 Q10)

Fundoo Tutor offers personalized coaching for IGCSE, IB, and SAT students. Need a tutor? http://fundootutor.com/book-a-call/

6. The table shows the first five terms of sequences A, B and C.

Sequence	1st term	2nd term	3rd term	4th term	5th term	6th term
A	0	1	4	9	16	
B	4	5	6	7	8	
C	-4	-4	-2	2	8	

(a) Complete the table. [3]

(b) Find an expression for the nth term of

(i) sequence A, [2]

(ii) sequence B. [1]

(c) Find the value of n when the nth term of sequence A is 576.

[2]

(d) (i) Find an expression for the nth term of sequence C.

Give your answer in its simplest form. [3]

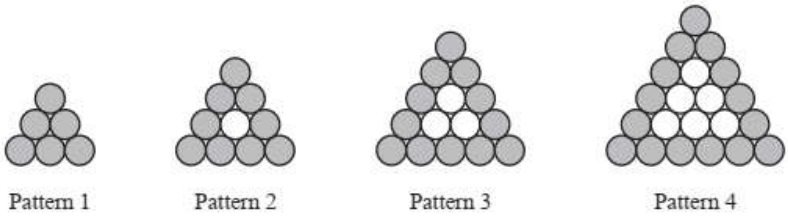
(ii) Find the value of the 30th term of sequence C. [2]

0580/42/F/M/18 Q11)

Fundoo Tutor
Focused. On You.

Fundoo Tutor offers personalized coaching for IGCSE, IB, and SAT students. Need a tutor? http://fundootutor.com/book-a-call/

7. Marco is making patterns with grey and white circular mats.



The patterns form a sequence.
Marco makes a table to show some information about the patterns.

Pattern number	1	2	3	4	5
Number of grey mats	6	9	12	15	
Total number of mats	6	10	15	21	

(a) Complete the table for Pattern 5. [2]
(b) Find an expression, in terms of n, for the number of grey mats in Pattern n. [2]
(c) Marco makes a pattern with 24 grey mats. Find the total number of mats in this pattern. [2]
(d) Marco needs a total of 6 mats to make the first pattern.
He needs a total of 16 mats to make the first two patterns.
He needs a total of $\frac{1}{6}n^3 + an^2 + bn$ mats to make the first n patterns.
Find the value of a and the value of b. [6] **0580/41/M/J/18 Q12)**

Fundoo Tutor offers personalized coaching for IGCSE, IB, and SAT students. Need a tutor? http://fundootutor.com/book-a-call/

8. (a) The nth term of a sequence is 8n - 3.

(i) Write down the first two terms of this sequence. [1]

(ii) Show that the number 203 is not in this sequence. [2]

(b) Find the nth term of these sequences.

(i) 13, 19, 25, 31, … [2]

(ii) 4, 8, 14, 22, … [2]

(c) … , 20, 50, …

The second term of this sequence is 20 and the third term is 50.

The rule for finding the next term in this sequence is subtract y then multiply by 5.

Find the value of y and work out the first term of this sequence.

[4]

0580/41/M/J/17 Q9)

Fundoo Tutor
Focused. On You.

9. These are the first four diagrams in a sequence.

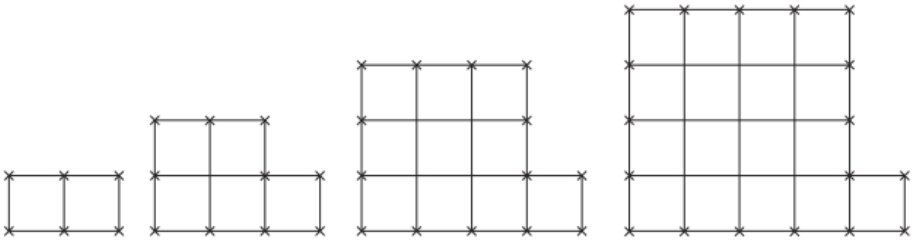


Diagram 1 Diagram 2 Diagram 3 Diagram 4

Each diagram is made from small squares and crosses.

(a) Complete the table. [6]

Diagram	1	2	3	4	5		n
Number of crosses	6	10	14				
Number of small squares	2	5	10				

(b) Find the number of crosses in Diagram 60 [1]

(c) Which diagram has 226 squares? [1]

(d) The side of each small square has length 1cm.
The number of lines of length 1cm in Diagram n is $2n^2 + 2n + q$.
Find the value of q. [2]
(**0580/41/O/N/17 Q6)**

Fundoo Tutor
Focused. On You.

10. Each diagram is made from tiles in the shape of equilateral triangles and rhombuses.
The length of a side of each tile is 1 unit.

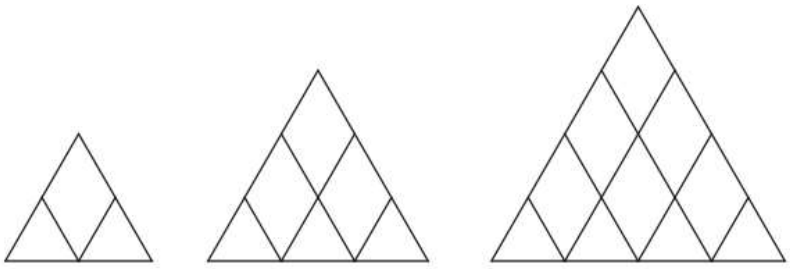


Diagram 1 Diagram 2 Diagram 3

(a) Complete the table below for this sequence of diagrams. [6]

Diagram	1	2	3	4	5
Number of equilateral triangle shaped tiles	2	3	4	5	6
Number of rhombus shaped tiles	1	3	6		
Total number of tiles	3	6	10		
Number of 1 unit lengths	8	15	24		

(b) (i) The number of 1 unit lengths in Diagram n is $n^2 + 4n + p$. Find the value of p [2]

(ii) Calculate the number of 1 unit lengths in Diagram 10 [1]

(c) The total number of tiles in Diagram n is $an^2 + bn + 1$. Find the value of a and the value of b. [5]

(d) Part of the Louvre museum in Paris is in the shape of a square-based pyramid made from glass tiles. Each of the triangular faces of the pyramid is represented by Diagram 17 in the sequence.

(i) Calculate the total number of glass tiles on one triangular face of this pyramid[2]

(ii) 11 tiles are removed from one of the triangular faces to create an entrance into the pyramid. Calculate the total number of glass tiles used to construct this pyramid. [1]

0580/43/M/J/16 Q10)

Fundoo Tutor offers personalized coaching for IGCSE, IB, and SAT students. Need a tutor? http://fundootutor.com/book-a-call/

11. The table shows the first five terms of sequences A, B and C. [2]

Sequence	1st term	2nd term	3rd term	4th term	5th term	6th term
A	3	4	5	6	7	
B	0	1	4	9	16	
C	–3	–3	–1	3	9	

(a) Complete the table for the 6th term of each sequence. [2]

(b) Write down the nth term of sequence A. [1]

(c) (i) Find the nth term of sequence B. . [2]

(ii) Find the value of n when the nth term of sequence B is 8281. [2]

(d) (i) Find the nth term of sequence C in its simplest form. [2]

(ii) Find the 8th term of sequence C. [1]

(e) The nth term of another sequence D is $(-1/2)^{n-1}$. Complete the table for the first four terms of sequence D. [3]

Sequence	1st term	2nd term	3rd term	4th term
D				

0580/42/O/N/15 Q10)

Fundoo Tutor
Focused. On You

12. Complete the table for each sequence. [11]

Sequence	1st term	2nd term	3rd term	4th term	5th term	6th term		nth term
A	15	8	1	–6				
B	$\frac{5}{18}$	$\frac{6}{19}$	$\frac{7}{20}$	$\frac{8}{21}$				
C	2	5	10	17				
D	2	6	18	54				

0580/43/O/N/15 Q10)

Fundoo Tutor
Focused. On You.

Fundoo Tutor offers personalized coaching for IGCSE, IB, and SAT students. Need a tutor? http://fundootutor.com/book-a-call/

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

$U_1 = 1^3$ $U_2 = 1^3 + 2^3$ $U_3 = 1^3 + 2^3 + 3^3$

The nth term is given by Un = $\frac{1}{4}n^2(n+1)^2$

Work out the value of U_{39} . [2]

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

$V_1 = 2^3$ $V_2 = 2^3 + 4^3$ $V_3 = 2^3 + 4^3 + 6^3$

By comparing this sequence with the sequence in part (a), find a formula for the nth term, V_n[1]

0580/23/O/N/14 Q11)

14. The first four terms of a sequence are

$T_1 = 1^2$ $T_2 = 1^2 + 2^2$ $T_3 = 1^2 + 2^2 + 3^2$ $T_4 = 1^2 + 2^2 + 3^2 + 4^2$.

(a) The nth term is given by $T_n = \frac{1}{6}n(n+1)(2n+1)$

Work out the value of T^{23}. [2]

(b) A new sequence is formed as follows.

$U_1 = T_2 - T_1$ $U_2 = T_3 - T_2$ $U_3 = T_4 - T_3$ .....

(i) Find the values of U1 and U2. [2]

(ii) Write down a formula for the nth term, Un . [1]

(c) The first four terms of another sequence are

$V_1 = 2^2$ $V_2 = 2^2 + 4^2$ $V_3 = 2^2 + 4^2 + 6^2$ $V_4 = 2^2 + 4^2 + 6^2 + 8^2$.

By comparing this sequence with the one in part (a), find a formula for the nth term, Vn . [2]

0580/21/O/N/11 Q18)

Fundoo Tutor offers personalized coaching for IGCSE, IB, and SAT students. Need a tutor? http://fundootutor.com/book-a-call/

Answers

1)	64 $(n + 3)^2$, 17 $3n + 2$, 47 $(n + 3)^2 - (3n + 2)$, 7/6 $(n+2)/(n+1)$
2)	(a)(i) 77, 243 (ii)(a) $2n^2 + 5$ (ii)(b)3^{n-1} (b)(i)21 (b)(ii 11 (from$(x$-11)(4x+45)=0),
3)	(a) 40 54 , 26 34 (b) $n^2 + 3n$ (c) 100 (from (x-100)(x+103)=0) (d)a = 1/2 , b = 5/2
4)	(a) 25 36 10 15 35 51 (b)n^2 (c)(i) 92 (ii)$\frac{1}{2}(n^2 - n)$(d) ½ & ½
5)	(a) -7 , 13 – 4n , 36 , $(n + 1)^2$, 125 , n^3 , 128 , 8 x 2^{n-1} or 2^{n+2} (b) 6, 10, 16 ….. 3, 4, 7, …. 2, 1, 0 (c) (i)q/p+q (ii)18/29
6)	(a)25 9 16 (b)(i) $(n - 1)^2$ (b)(ii) n +3 (c) 25 (d)(i) $n^2 – 3n – 2$ (d)(ii) 808
7)	(a)18 , 28 (b) 3n + 3 (c) 45 (d)(a)=3/2 (b)=13/3
8)	(a)(i) 5 and 13 (ii)25.75 (b)(i) 6n + 7 (b)(ii) $n^2 + n + 2$ 9(c) 10 and 14
9)	(a) 18 22 , 4n + 2 17 26 , $n^2 + 1$ (b) 242 (c) 15 (d) 3
10)	(a) 10 15 15 21 35 48 (b) (i) 3 (ii) 143 (c)a=1/2 b =3/2 (d)(i)171 (ii)673
11)	(a) 8 25 17 (b) n + 2 (c) (i) $(n – 1)^2$ (ii) 92 (d) (i) $n^2 – 3n – 1$ (ii) 39 (e) 0, - 0.5 , 0.25, -0.125
12)	A –13, –20 –7n + 22 B 9/22 10/23 (n+4)/(n+17) C 26, 37 n^2 +1 D 162, 486 $2 \times 3^{n-1}$
13)	(a) 608 400 (b)$2n^2(n+1)^2$
14)	(a) 4324 (b) (i) 4, 9 (ii) $(n + 1)^2$ or $n^2 + 2n + 1$ (c)2/3 n(n+ 1)(2n + 1)

Fundoo Tutor
Focused. On You.