

SEQUENCES PRACTICE SHEET

1)

(i) Write the four missing terms in the table for sequences A, B, C and D.

Term	1	2	3	4	5		n
Sequence A	-4		2	5	8		$3n - 7$
Sequence B	1	4	9	16	25		
Sequence C	5	10	15	20	25		
Sequence D	6	14	24	36	50		

[4]

(ii) Which term in sequence D is equal to 500?

Answer(b)(ii) [2]

2)

(a) Write down the 10th term and the n th term of the following sequences.

(i) 1, 2, 3, 4, 5 [1]

(ii) 7, 8, 9, 10, 11 [1]

(iii) 8, 10, 12, 14, 16 [3]

(b) Consider the sequence


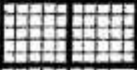

$1(8 - 7), 2(10 - 8), 3(12 - 9), 4(14 - 10), \dots, \dots$

(i) Write down the next term and the 10th term of this sequence in the form $a(b - c)$ where a, b and c are integers. [3]

(ii) Write down the n th term in the form $a(b - c)$ and then simplify your answer. [2]

3)

The table below shows a sequence of shapes made from squares with sides of 1 unit.

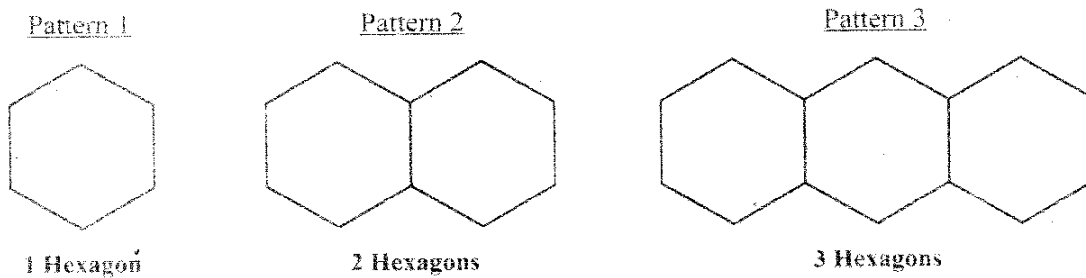
Shape	Area of Shape	Perimeter of Shape
	1	4
	2	6
	3	8

- (a) **On the answer sheet provided**, draw the next TWO shapes to continue the sequence.
- (b) For EACH shape drawn, in Part (a), complete the table by stating
- (i) the area of the shape
 - (ii) the perimeter of the shape. (4 marks)
- (c) A shape in the sequence has an area of 12 square units. What is the perimeter of this shape? (2 marks)
- (d) A shape in the sequence has a perimeter of 40 units. What is the area of this shape? (2 marks)
- (e) **On the answer sheet provided**, draw TWO shapes EACH made up of 4 unit squares so that one has a perimeter of 8 units and the other has a perimeter of 16 units. (2 marks)

Total 10 marks

4)

Bianca makes hexagons using sticks of equal length. She then creates patterns by joining the hexagons together. Patterns 1, 2 and 3 are shown below:



The table below shows the number of hexagons in EACH pattern created and the number of sticks used to make EACH pattern.

Number of hexagons in the pattern	1	2	3	4	5	20	n
Number of sticks used for the pattern	6	11	16	x	y	z	S

- (a) Determine the values of
- (i) x (2 marks)
 - (ii) y (2 marks)
 - (iii) z (2 marks)
- (b) Write down an expression for S in terms of n , where S represents the number of sticks used to make a pattern of n hexagons. (2 marks)
- (c) Bianca used a total of 76 sticks to make a pattern of h hexagons. Determine the value of h . (2 marks)

Total 10 marks

5)



Diagram 1

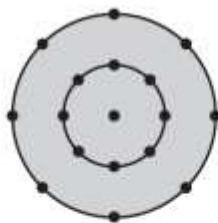


Diagram 2

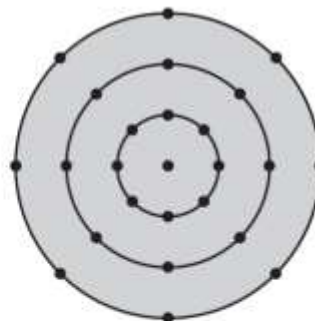


Diagram 3

The diagrams show a sequence of dots and circles.
 Each diagram has one dot at the centre and 8 dots on each circle.
 The radius of the first circle is 1 unit.
 The radius of each new circle is 1 unit greater than the radius of the previous circle.

(a) Complete the table for diagrams 4 and 5.

Diagram	1	2	3	4	5
Number of dots	9	17	25		
Area of the largest circle	π	4π	9π		
Total length of the circumferences of the circles	2π	6π	12π		

(b) (i) Write down, in terms of n , the number of dots in diagram n .

[4]

Answer(b)(i)

[2]

(ii) Find n , when the number of dots in diagram n is 1097.

Answer(b)(ii) $n =$

[2]

(c) Write down, in terms of n and π , the area of the largest circle in

(i) diagram n ,

Answer(c)(i)

[1]

(ii) diagram $3n$.

Answer(c)(ii)

[1]

(d) Find, in terms of n and π , the total length of the circumferences of the circles in diagram n .

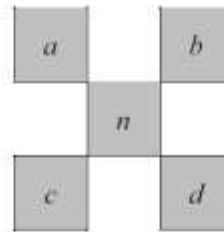
Answer(d)

[2]

6) Consecutive integers are set out in rows in a grid.

(a) This grid has 5 columns.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35



The shape drawn encloses five numbers 7, 9, 13, 17 and 19. This is the $n = 13$ shape.

In this shape, $a = 7$, $b = 9$, $c = 17$ and $d = 19$.

(i) Calculate $bc - ad$ for the $n = 13$ shape.

Answer(a)(i) [1]

(ii) For the 5 column grid, $a = n - 6$.

Write down b , c and d in terms of n for this grid.

Answer(a)(ii) $b =$

$c =$

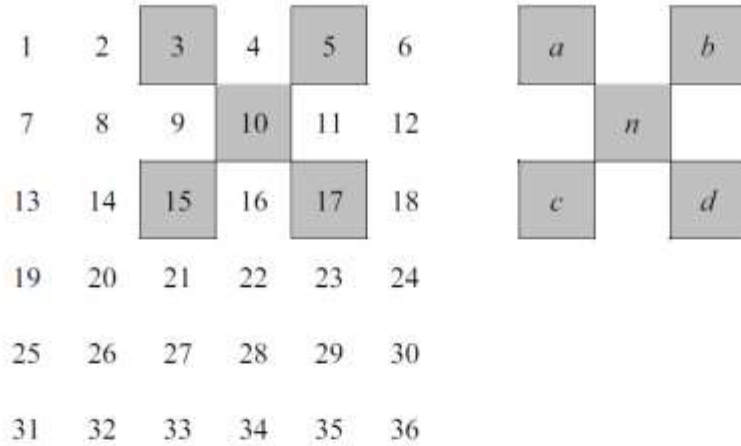
$d =$ [2]

(iii) Write down $bc - ad$ in terms of n .
Show clearly that it simplifies to 20.

Answer(a)(iii)

[2]

(b) This grid has 6 columns. The shape is drawn for $n = 10$.



(i) Calculate the value of $bc - ad$ for $n = 10$.

Answer(b)(i) [1]

(ii) Without simplifying, write down $bc - ad$ in terms of n for this grid.

Answer(b)(ii) [2]

(c) This grid has 7 columns.



Show clearly that $bc - ad = 28$ for $n = 17$.

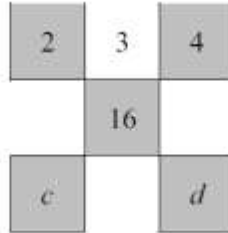
Answer(c)

[1]

(d) Write down the value of $bc - ad$ when there are t columns in the grid.

Answer(d) [1]

(e) Find the values of c , d and $bc - ad$ for this shape.



Answer (e) $c =$

$d =$

$bc - ad =$ [2]

7)

(a) The n th term of a sequence is $n(n+1)$.

(i) Write the two missing terms in the spaces. 2, 6,, 20, [2]

(ii) Write down an expression in terms of n for the $(n+1)$ th term.

Answer(a)(ii)

(iii) The difference between the n th term and the $(n+1)$ th term is $pn+q$.

Find the values of p and q .

Answer(a)(iii) $p =$

$q =$ [2]

(iv) Find the positions of the two consecutive terms which have a difference of 140.

Answer(a)(iv) and [2]

(b) A sequence $u_1, u_2, u_3, u_4, \dots$ is given by the following rules.

$$u_1 = 2, \quad u_2 = 3 \quad \text{and} \quad u_n = 2u_{n-2} + u_{n-1} \quad \text{for } n \geq 3.$$

For example, the third term is u_3 and $u_3 = 2u_1 + u_2 = 2 \times 2 + 3 = 7$.
So, the sequence is 2, 3, 7, u_4 , u_5 ,

(i) Show that $u_4 = 13$.

Answer(b)(i)

(ii) Find the value of u_5 .

Answer(b)(ii) $u_5 =$ [1]

(iii) Two consecutive terms of the sequence are 3413 and 6827.

Find the term before and the term after these two given terms.

Answer(b)(iii), 3413, 6827, [2]

8)

The first four terms of a sequence are

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

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

Work out the value of T_{23} .

$$\text{Answer(a)} \quad T_{23} = \dots\dots\dots [2]$$

(b) A new sequence is formed as follows.

$$U_1 = T_2 - T_1 \quad U_2 = T_3 - T_2 \quad U_3 = T_4 - T_3 \quad \dots\dots$$

(i) Find the values of U_1 and U_2 .

$$\text{Answer(b)(i)} \quad U_1 = \dots\dots\dots \text{ and } U_2 = \dots\dots\dots [2]$$

(ii) Write down a formula for the n th term, U_n .

$$\text{Answer(b)(ii)} \quad U_n = \dots\dots\dots [1]$$

(c) The first four terms of another sequence are

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

By comparing this sequence with the one in **part (a)**, find a formula for the n th term, V_n .

$$\text{Answer(c)} \quad V_n = \dots\dots\dots [2]$$

9)

The first and the n th terms of sequences A , B and C are shown in the table below.

(a) Complete the table for each sequence.

	1st term	2nd term	3rd term	4th term	5th term	n th term
Sequence A	1					n^3
Sequence B	4					$4n$
Sequence C	4					$(n + 1)^2$

[5]

(b) Find

(i) the 8th term of sequence A ,

Answer(b)(i) [1]

(ii) the 12th term of sequence C .

Answer(b)(ii) [1]

(c) (i) Which term in sequence A is equal to 15 625?

Answer(c)(i) [1]

(ii) Which term in sequence C is equal to 10 000?

Answer(c)(ii) [1]

(d) The first four terms of sequences D and E are shown in the table below.

Use the results from **part (a)** to find the 5th and the n th terms of the sequences D and E .

	1st term	2nd term	3rd term	4th term	5th term	n th term
Sequence D	5	16	39	80		
Sequence E	0	1	4	9		

[4]