



EXAM PAPERS PRACTICE

Sequences

Question Paper



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Question 1

Here are the first four terms of a sequence.

23 17 11 5

(a) Find the next term. [1]

(b) Find the n th term. [2]

Question 2

7, 5, 3, 1, -1, ...

(a) Find the next term in this sequence. [1]

(b) Find the n th term of the sequence. [2]



Question 3

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Find the n th term of each sequence.

(a) 4, 8, 12, 16, 20,

[1]

(b) 11, 20, 35, 56, 83,

[2]

Question 4

5, 11, 21, 35, 53, ...

Find the n th term of this sequence.

[2]



Question 5

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These are the first five terms of a sequence.

13 8 3 -2 -7

Find the n th term of this sequence.

[2]

Question 6

32 25 18 11 4

These are the first 5 terms of a sequence.

Find

(a) the 6th term,

[1]

(b) the n th term,

[2]

(c) which term is equal to -332 .

[2]



Question 7

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The first five terms of a sequence are shown below.

$$13 \quad 9 \quad 5 \quad 1 \quad -3$$

Find the n th term of this sequence.

[2]

Question 8

A sequence is given by $u_1 = \sqrt{1}$, $u_2 = \sqrt{3}$, $u_3 = \sqrt{5}$, $u_4 = \sqrt{7}$, ...

(a) Find a formula for u_n , the n th term.

[2]

(b) Find u_{29} .

[1]



Question 9

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(a) The formula for the n th term of the sequence

$$1, 5, 14, 30, 55, 91, \dots \text{ is } \frac{n(n+1)(2n+1)}{6}.$$

Find the 20th term.

[1]

(b) The n th term of the sequence $10, 17, 26, 37, \dots, 50, \dots$ is $(n+2)^2 + 1$.

Write down the formula for the n th term of the sequence $17, 26, 37, 50, 65, \dots$

[1]



Question 10

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For each of the following sequences, write down the next term.

(a) 2, 3, 5, 8, 13, ...

[1]

(b) $x^6, 6x^5, 30x^4, 120x^3, \dots$

[1]

(c) 2, 6, 18, 54, 162, ...

[1]



Question 11

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For the sequence $5\frac{1}{2}$, 7, $8\frac{1}{2}$, 10, $11\frac{1}{2}$, ...

(a) find an expression for the n th term, [2]

(b) work out the 100th term. [1]

Question 12

Write down the next term in each of the following sequences.

(a) 8.2, 6.2, 4.2, 2.2, 0.2, ... [1]

(b) 1, 3, 6, 10, 15, ... [1]



Question 13

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A pattern of numbers is shown below.

				1					
				1		1			
			1	2		1			
		1	3	3		1			
	1	4	6	4		1			
	1	5	10	10		5		1	
1	6	x	20	x	6	1			

Write down the value of x .

[1]



Question 14

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8, 15, 22, 29, 36,

A sequence of numbers is shown above.

(a) Find the 10th term of the sequence. [1]

(b) Find the n th term of the sequence. [1]

(c) Which term of the sequence is equal to 260? [1]



Question 15

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The first five terms of a sequence are 4, 9, 16, 25, 36, ...
Find

(a) the 10th term,

[1]

(b) the n th term.

[1]

Question 16



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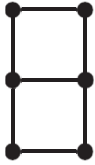


Diagram 1

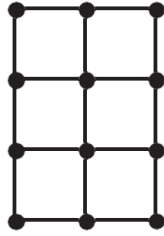


Diagram 2

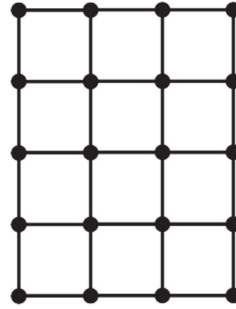


Diagram 3

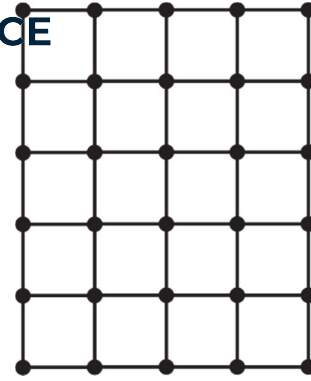


Diagram 4

The first four Diagrams in a sequence are shown above.
 Each Diagram is made from dots and one centimetre lines.
 The area of each small square is 1 cm^2 .

(a) Complete the table for Diagrams 5 and 6.

Diagram	1	2	3	4	5	6
Area (cm^2)	2	6	12	20		
Number of dots	6	12	20	30		
Number of one centimetre lines	7	17	31	49		

[4]

(b) The area of Diagram n is $n(n + 1) \text{ cm}^2$.

(i) Find the area of Diagram 50.

[1]

(ii) Which Diagram has an **area** of 930 cm^2 ?

[1]

(c) Find, in terms of n , the number of **dots** in Diagram n .

[1]



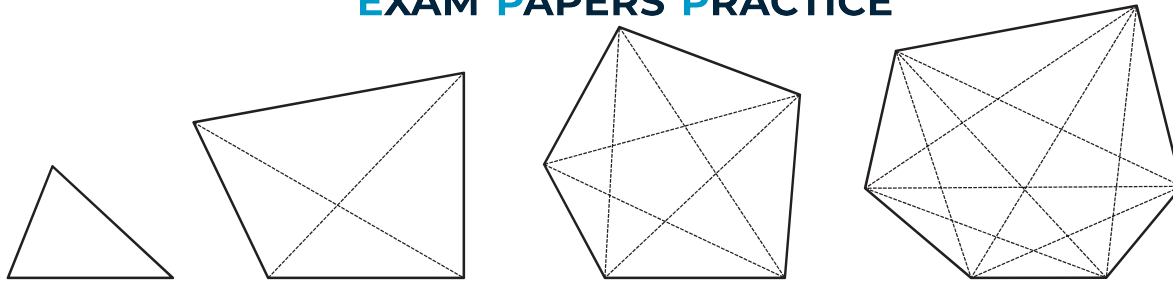
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- (d) The number of one centimetre lines in Diagram n is $2n^2 + pn + 1$.
- (i) Show that $p = 4$. [2]
- (ii) Find the number of one centimetre lines in Diagram 10. [1]
- (iii) Which Diagram has 337 one centimetre lines? [3]
- (e) For **each** Diagram, the number of squares of area 1 cm^2 is A , the number of dots is D and the number of one centimetre lines is L .
- Find a connection between A , D and L that is true for each Diagram. [1]

Question 17



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The diagrams show some polygons and their diagonals.

(a) Complete the table.

Number of sides	Name of polygon	Total number of diagonals
3	triangle	0
4	quadrilateral	2
5		5
6	hexagon	9
7	heptagon	14
8		

[3]

(b) Write down the total number of diagonals in

(i) a decagon (a 10-sided polygon), [1]

(ii) a 12-sided polygon. [1]



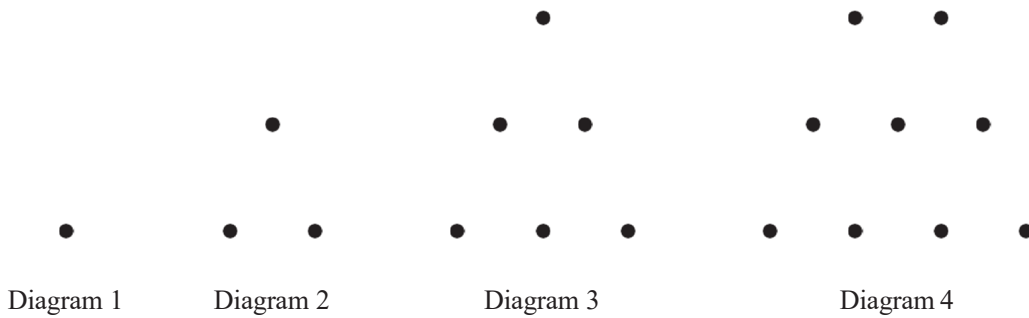
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- (c) A polygon with n sides has a total of $\frac{1}{p} n (n - q)$ diagonals, where p and q are integers.
- (i) Find the values of p and q . [3]
- (ii) Find the total number of diagonals in a polygon with 100 sides. [1]
- (iii) Find the number of sides of a polygon which has a total of 170 diagonals. [2]
- (d) A polygon with $n + 1$ sides has 30 more diagonals than a polygon with n sides.
Find n . [1]

Question 18



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The first four terms in a sequence are 1, 3, 6 and 10.
They are shown by the number of dots in the four diagrams above.

(a) Write down the next four terms in the sequence. [2]

(b) (i) The sum of the two consecutive terms 3 and 6 is 9. The sum of the two consecutive terms 6 and 10 is 16.

Complete the following statements using different pairs of terms.

The sum of the two consecutive terms and is

The sum of the two consecutive terms and is [1]

(ii) What special name is given to these sums? [1]

(c) (i) The formula for the n th term in the sequence 1, 3, 6, 10... is $\frac{n(n+1)}{k}$,

where k is an integer.

Find the value of k . [1]



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(ii) Test your formula when $n = 4$, **showing your working.** [1]

(iii) Find the value of the 180th term in the sequence. [1]

(d) (i) Show clearly that the sum of the n th and the $(n + 1)$ th terms is $(n + 1)^2$. [3]

(ii) Find the values of the two consecutive terms which have a sum of 3481. [2]

Question 19



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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	36

A 3 by 3 square

x	b	c
d	e	f
g	h	i

can be chosen from the 6 by 6 grid above.

(a) One of these squares is

8	9	10
14	15	16
20	21	22

In this square, $x = 8$, $c = 10$, $g = 20$ and $i = 22$.

For this square, calculate the value of

(i) $(i - x) - (g - c)$, [1]

(ii) $cg - xi$. [1]

(b)

x	b	c
d	e	f
g	h	i

(i) $c = x + 2$. Write down g and i in terms of x . [2]

(ii) Use your answers to **part(b)(i)** to show that $(i - x) - (g - c)$ is constant. [1]

(iii) Use your answers to **part(b)(i)** to show that $cg - xi$ is constant. [2]



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(c) The 6 by 6 grid is replaced by a 5 by 5 grid as shown.

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

A 3 by 3 square

x	b	c
d	e	f
g	h	i

can be chosen from the 5 by 5 grid.

For any 3 by 3 square chosen from this 5 by 5 grid, calculate the **value** of

(i) $(i - x) - (g - c)$,

[1]

(ii) $cg - xi$.

[1]

(d) A 3 by 3 square is chosen from an n by n grid.

(i) Write down the value of $(i - x) - (g - c)$.

[1]

(ii) Find g and i in terms of x and n .

[2]

(iii) Find $cg - xi$ in its simplest form.

[1]

Question 20



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The table shows some terms of several sequences.

Term	1	2	3	4		8
Sequence P	7	5	3	1		p
Sequence Q	1	8	27	64		q
Sequence R	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{4}{5}$		r
Sequence S	4	9	16	25		s
Sequence T	1	3	9	27		t
Sequence U	3	6	7	-2		u

- (a) Find the values of p , q , r , s , t and u . [6]
- (b) Find the n th term of sequence
- (i) P, [1]
 - (ii) Q, [1]
 - (iii) R, [1]
 - (iv) S, [1]
 - (v) T, [1]
 - (vi) U. [1]
- (c) Which term in sequence **P** is equal to -777 ? [2]
- (d) Which term in sequence **T** is equal to 177 147? [2]

Question 21



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Diagram 1

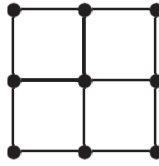


Diagram 2

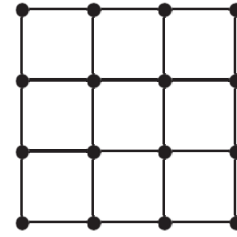


Diagram 3

The first three diagrams in a sequence are shown above.

The diagrams are made up of dots and lines. Each line is one centimetre long.

(a) Make a sketch of the next diagram in the sequence.

[1]

(b) The table below shows some information about the diagrams.

Diagram	1	2	3	4	-----	n
Area	1	4	9	16	-----	x
Number of dots	4	9	16	p	-----	y
Number of one centimetre lines	4	12	24	q	-----	z

(i) Write down the values of p and q .

[2]

(ii) Write down each of x , y and z in terms of n .

[4]

(c) The **total** number of one centimetre lines in the first n diagrams is given by the expression

$$\frac{2}{3}n^3 + fn^2 + gn.$$

(i) Use $n = 1$ in this expression to show that $f + g = \frac{10}{3}$.

[1]

(ii) Use $n = 2$ in this expression to show that $4f + 2g = \frac{32}{3}$.

[2]

(iii) Find the values of f and g .

[3]

(iv) Find the total number of one centimetre lines in the first 10 diagrams.

[1]