

1. Write down the n th term for the sequence $5, 14, 23, 32, 41, \dots$

$$+9 \quad +9 \quad +9 \quad +9$$

$$5, 14, 23, 32, 41, \dots$$

$$9, 18, 27, 36, 45$$

4 less than the
9 times table

$$\underline{9n - 4}$$

[2]

2. (a) Write down the n th term of the sequence $5, 9, 13, 17, 21, \dots$

$$+4 \quad +4 \quad +4 \quad +4$$

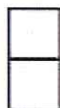
$$5, 9, 13, 17, 21, \dots$$

$$4, 8, 12, 16, 20$$

1 more than the
4 times table

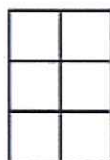
$$\underline{4n + 1}$$

- (b) The diagrams show tile patterns.



Pattern 1

$$1 \times 2$$



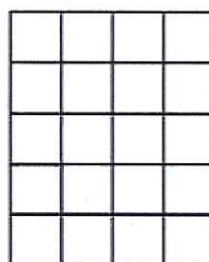
Pattern 2

$$2 \times 3$$



Pattern 3

$$3 \times 4$$



Pattern 4

$$4 \times 5$$

Find an expression for the number of tiles in Pattern n .

The first number is the pattern number.
This is then 'x' one more than the pattern
number

$$\underline{n(n+1)}$$

[2]

3. The n th term of a sequence is $n^2 + 10$. Write down the first three terms of this sequence.

$$1\text{st term} = (1)^2 + 10 = 11$$

$$2\text{nd term} = (2)^2 + 10 = 14$$

$$3\text{rd term} = (3)^2 + 10 = 19$$

$$\underline{11, 14, 19}$$

[2]

4. Square patterns are made using matchsticks. A matchstick can be placed horizontally — or vertically | .

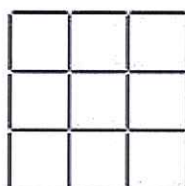
Pattern 1



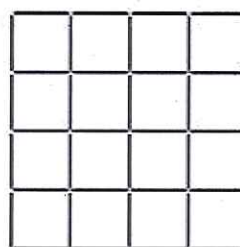
Pattern 2



Pattern 3



Pattern 4



There are 12 matchsticks in Pattern 2.

- (a) Complete the following table.

Pattern Number	Number of horizontal matchsticks	Number of vertical matchsticks	Total number of matchsticks
1	2	2	4
2	6	6	12
3	12	12	24
4	20	20	40

[1]

- (b) (i) Find how many horizontal matchsticks are in Pattern 7.

Pattern No	1	2	3	4	...	7
Horizontal	2x1	3x2	4x3	5x4		8x7
<u>$8 \times 7 = 56$</u>						

- (ii) State how many vertical matchsticks are in Pattern 7.

$$8 \times 7 = \underline{56}$$

[2]

- (c) Find how many vertical matchsticks are in Pattern 10.

$$11 \times 10 = \underline{110}$$

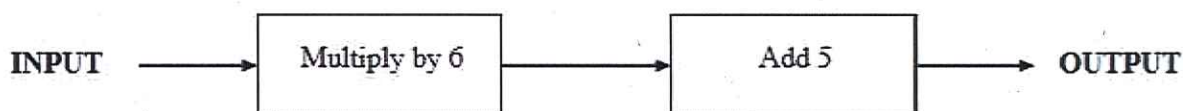
[1]

- (d) Find the rule, in terms of n , for working out how many vertical matchsticks are in Pattern n .

$$(n+1)n = \underline{n(n+1)} \quad \text{or} \quad \underline{n^2 + n}$$

[2]

5. a) The diagram below shows a number machine.



Write down the OUTPUT when the INPUT is n .

$$\underline{(n \times 6) + 5} \quad \text{or} \quad \underline{6n + 5}$$

[1]

- b) (i) Find the n th term of a sequence $5, 12, 19, 26, 33, \dots$
 $7, 14, 21, 28, 35$

2 less than the
7 times table

$$\underline{7n - 2}$$

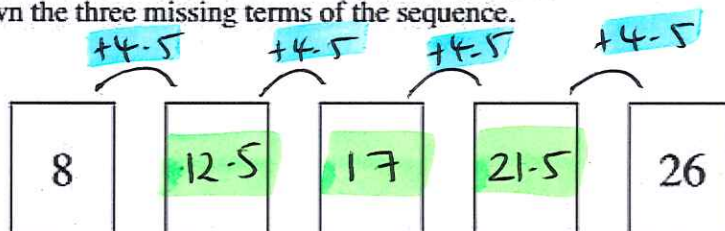
- (ii) The n th term of a sequence is $n^2 - 2$. Find the value of the twentieth term of the sequence.

$$\begin{aligned} 20^{\text{th}} \text{ term} &= (20)^2 - 2 \\ &= 400 - 2 \\ &= \underline{398} \end{aligned}$$

[4]

6. (a) A sequence starts with 8.
Equal amounts are added each time to get the next term.
Write down the three missing terms of the sequence.

[3]



$$26 - 8 = 18$$

$$4 \text{ 'jumps'} = 18$$

$$1 \text{ jump} = 18/4 = 4.5$$

- (b) The n th term of a sequence is $n^2 - 3$. Write down the first three terms of this sequence.

$$1\text{st term} = (1)^2 - 3 = -2$$

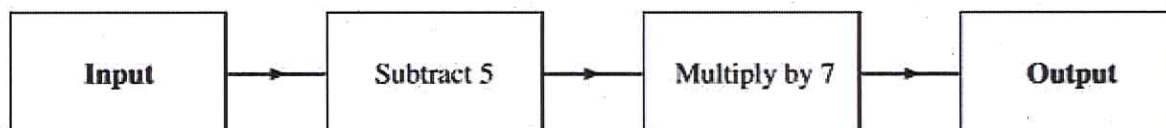
$$2\text{nd term} = (2)^2 - 3 = 1$$

$$3\text{rd term} = (3)^2 - 3 = 6$$

-2, 1, 6

[2]

- (c) The diagram shows a number machine.



- (i) Find the **Input** to the number machine when the **Output** is -49.

$$-49 \div 7 = -7$$

$$-7 + 5 = -2$$

- (ii) Write down the **Output** from the number machine when the **Input** is n .

$$(n-5) \times 7$$

or $7(n-5)$

or $7n-35$

[3]

(It is NOT $n-5 \times 7$)

- (d) Write down the n th term of the sequence $8, 13, 18, 23, 28, \dots$

$+5, +5, +5, +5$

$5, 10, 15, 20, 25$

3 more than the
5 times table

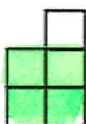
$5n + 3$

[2]

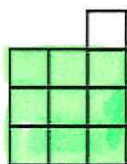
- (e) The diagrams show tile patterns.



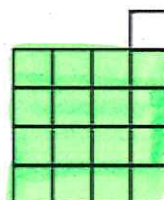
Pattern 1



Pattern 2



Pattern 3



Pattern 4

Find an expression for the number of tiles in Pattern n .

TIP notice the green squares. This helps you see ' n^2 ' then you need to $+1$

$n^2 + 1$

[2]

7. The n th term of a sequence is $n^2 - 6$. Find the first three terms of the sequence.

1st term = $(1)^2 - 6 = 1 - 6 = -5$

2nd term = $(2)^2 - 6 = 4 - 6 = -2$

3rd term = $(3)^2 - 6 = 9 - 6 = 3$

$-5, -2, 3$

[2]

8. Here is a sequence of numbers.

267 $\xrightarrow{-8}$ 259 $\xrightarrow{-8}$ 251 $\xrightarrow{-8}$ 243

- (a) What is the first number in the sequence that is less than zero?

Sequence has n^{th} term

$$275 - 8n$$

Require $275 - 8n < 0$ $(+8n)$

$$275 < 8n \quad (\div 8)$$

$$\frac{275}{8} < n$$

$$34.375 < n$$

$$n = 35$$

$\therefore$ 35th term

$$275 - 8(35)$$

$$= -5$$

[3]

- (b) Find the n^{th} term of the sequence.

$$275 - 8n$$

[2]

9. Write down the n^{th} term of the sequence 1, 4, 9, 16, 25, ...

$$n^2$$

[1]

10. The n^{th} term of a sequence is $n^2 + 3$.
Write down the first three terms of the sequence.

1st term = $(1)^2 + 3 = 4$

2nd term = $(2)^2 + 3 = 7$

3rd term = $(3)^2 + 3 = 12$

$$4, 7, 12$$

[2]

11. Write down the n^{th} term of the sequence 8, 15, 22, 29, 36, ...

$$+7 \quad +7 \quad +7 \quad +7$$

$$7, 14, 21, 28, 35$$

1 more than the
7 times table

$$7n + 1$$

[2]

12. (a) Write down the n th term of the sequence

$9, 17, 25, 33, 41, \dots$
 $8, 16, 24, 32, 40$

1 more than the
8 times table

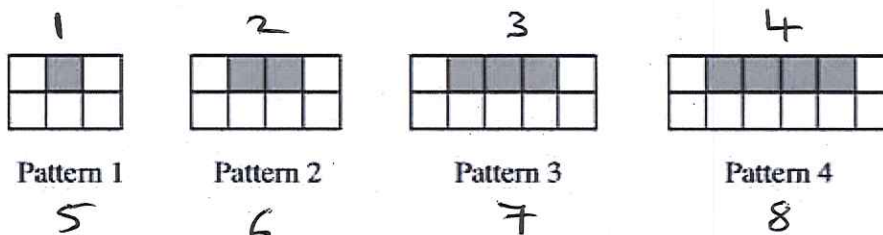
$8n+1$

[2]

- (b) The diagrams show tile patterns.
Each pattern has some shaded tiles and some white tiles.

Shaded

White



- (i) Find an expression for the number of shaded tiles in Pattern n .

n

- (ii) Find an expression for the number of white tiles in Pattern n .

$+1 \quad +1 \quad +1$
 $5, 6, 7, 8$
 $1, 2, 3, 4$

4 more than
the 1 times table

$n+4$

13. (a) Find the n th term of the sequence

$4, 10, 16, 22, 28, \dots$
 $6, 12, 18, 24, 30$

2 less than the
6 times table

$6n-2$

[3]

[2]

- (b) The n th term of a sequence is $n^2 + 7$. Find the value of the 20th term of the sequence.

$20^{\text{th}} \text{ term} = (20)^2 + 7$
 $= 400 + 7 = \underline{\underline{407}}$

[2]

14. (a) Find the n th term of the sequence 7, 10, 13, 16, 19,
3, 6, 9, 12, 15

4 more than the
3 times table

$3n + 4$

- (b) Find the n th term of the sequence 2, 5, 10, 17, 26,
 $n^2 \rightarrow 1, 4, 9, 16, 25$

not linear [2]
so something to do
with n^2

always 1 more
than n^2

$n^2 + 1$

[2]

15.

- (a) The diagram below shows a number machine:



Write down the OUTPUT when the INPUT is n .

$(n+7) \times 5$ or $5(n+7)$ or $5n+35$

(NOT $n+7 \times 5$)

[1]

- (b) Find the n th term of the sequence 1, 7, 13, 19, 25, ...
6, 12, 18, 24, 30

Always 5 less
than 6x table

$6n - 5$

[2]

- (c) The n th term of a sequence is $n^2 + 6$.
Find the value of the 15th term of the sequence.

15th term = $(15)^2 + 6$
= $225 + 6$
= 231

[2]

16. Write down, in terms of n , the n th term of each of the following sequences.

(a) $\begin{array}{ccccccccc} & +4 & & +4 & & +4 & & +4 & \\ 3 & \frown & 7 & \frown & 11 & \frown & 15 & \frown & 19 \\ 4 & & 8 & & 12 & & 16 & & 20 \end{array} \dots$ 1 less than the 4 times table

$4n - 1$

[2]

(b) $1 \times 3 \quad 2 \times 4 \quad 3 \times 5 \quad 4 \times 6 \quad \dots$ $n \times (n + 2)$

[2]

17. Write down the n th term for the sequence $\begin{array}{ccccccc} & +9 & & +9 & & +9 & & +9 \\ 5 & \frown & 14 & \frown & 23 & \frown & 32 & \frown & 41 \\ 9 & & 18 & & 27 & & 36 & & 45 \end{array} \dots$ 4 less than the 9 times table.

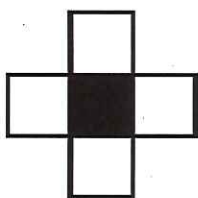
$9n - 4$

[2]

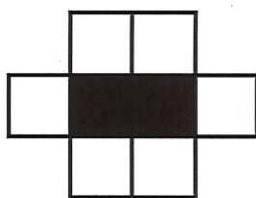
18. Write down the n th term of the sequence $\begin{array}{ccccccc} & +4 & & +4 & & +4 & & +4 \\ 6 & \frown & 10 & \frown & 14 & \frown & 18 & \frown & 22 \\ 4 & & 8 & & 12 & & 16 & & 20 \end{array} \dots$ 2 more than the 4 times table

$4n + 2$

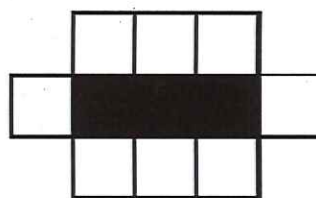
[2]



Pattern 1



Pattern 2



Pattern 3

Complete the following table.

the same

$\times 2 + 2$

Pattern number	Number of black squares	Number of white squares
1	1	4
2	2	6
3	3	8

15	15	32
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100	100	102
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n	n	$2n + 2$
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Pattern Number	1	2	3	...	15	...	n	} always the same
Black	1	2	3	...	15	...	n	

Pattern Number	1	2	3	...	15	...	n	} multiply by 2 then +2
White	4	6	8	...	32	...	$2n + 2$	