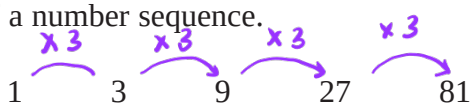
1 Here are the first five terms of a number sequence.



(a) Find the next term of this sequence.

$81 \times 3 = 243$ (1)

243

(1)

(b) Explain how you found this term.

Multiply the previous term with the common ratio (3) (1)

(1)

The 9th term of this number sequence is 6561

$T_n = a \times r^{n-1}$

(c) Find the 10th term of this sequence.

$10^{th}\text{ term} = ar^9 = 1 \times 3^9$

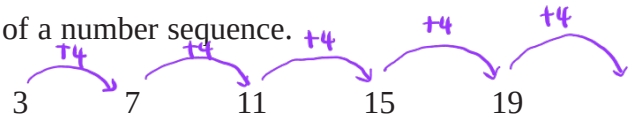
$= 19683$ (1)

19683

(1)

(Total for Question 1 is 3 marks)

2 Here are the first five terms of a number sequence.



(a) Write down the next term of the sequence.

19 + 4 = 23

23 (1)

(1)

(b) Explain how you worked out your answer.

Add 4 to the last term above. (1)

(1)

(c) Find the first number greater than 70 that is in the sequence.

List down : 23, 27, 31, 35, 39, 43, 47, 51, 55, (1)
59, 63, 67, 71 (1)

71

(2)

Ada says,

"96 is a number in the sequence"

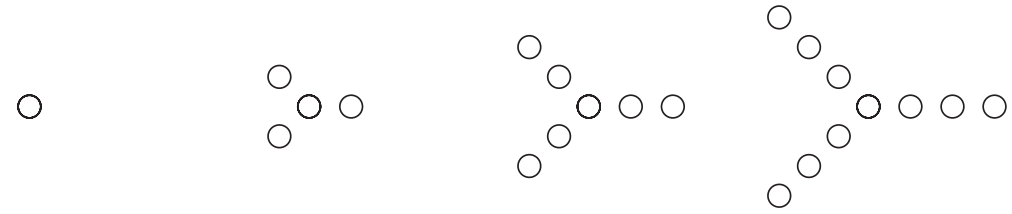
(d) Is Ada correct?
You must give a reason for your answer.

No. Because all number in the sequence are odd. (1)

(1)

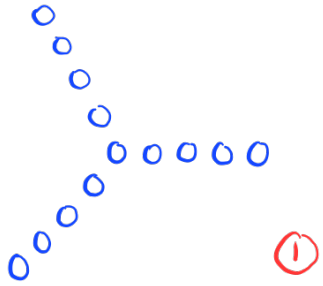
(Total for Question 2 is 5 marks)

3 Here is a sequence of patterns made from circles.



Pattern number 1 | Pattern number 2 | Pattern number 3 | Pattern number 4

(a) In the space below, draw Pattern number 5



(1)

(b) Complete the table.

Pattern number	1	2	3	4	5	6
Number of circles	1	4	7	10	13	16

(1)

(c) Work out the number of circles in Pattern number 8

7 : 16 + 3
: 19

8 : 19 + 3
: 22 (1)

22

(1)

C is the number of circles in Pattern number P

(d) Write down a formula for C in terms of P

C = 3P - 2 (2)

C = 3P - 2

(2)

A different sequence of patterns is made from triangles.
The rule to find the number of triangles in each pattern is

multiply the Pattern number by 5 and subtract 4

(e) Is there a pattern in this sequence that is made from exactly 136 triangles?
You must give a reason for your answer.

Let x = number of pattern

$136 = 5x - 4$

$5x = 140$

$x = \frac{140}{5}$

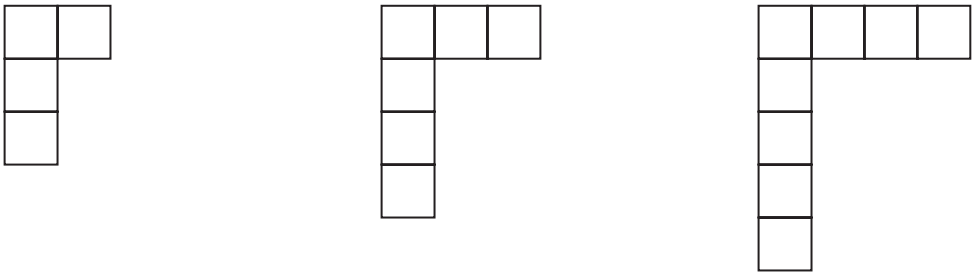
$= 28$ (1)

∴ Yes, Pattern 28 has 136 triangles

(1)

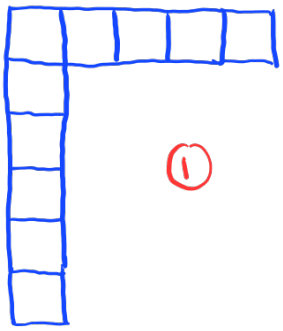
(Total for Question 3 is 6 marks)

4 Here is a sequence of patterns made from square tiles.



Pattern number 1 Pattern number 2 Pattern number 3

(a) In the space below, draw Pattern number 4



(1)

(b) Complete the table.

Pattern number	1	2	3	4	5
Number of tiles	4	6	8	10	12

(1)

(c) Work out the number of tiles in Pattern number 30

$2n + 2$

$2(30) + 2$

$60 + 2$

$= 62$

62

(2)

Liz says that in Pattern number n, the number of tiles is $2n$.

(d) Is Liz correct?
You must give a reason for your answer.

$2n = 4 + (n-1)(2)$

$= 4 + 2n - 2$

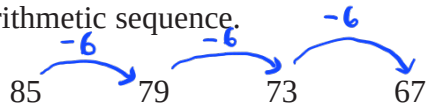
$2n \neq 2n + 2$

No. Because in pattern number n, the pattern number will always be $2n + 2$. (1)

(1)

(Total for Question 4 is 5 marks)

5 Here are the first 4 terms of an arithmetic sequence.



Find an expression, in terms of n, for the nth term of the sequence.

common difference, $d = -6$

first term, $a = 85$

$T_n = a + (n-1)d$

$T_n = 85 + (n-1)(-6)$ (1)

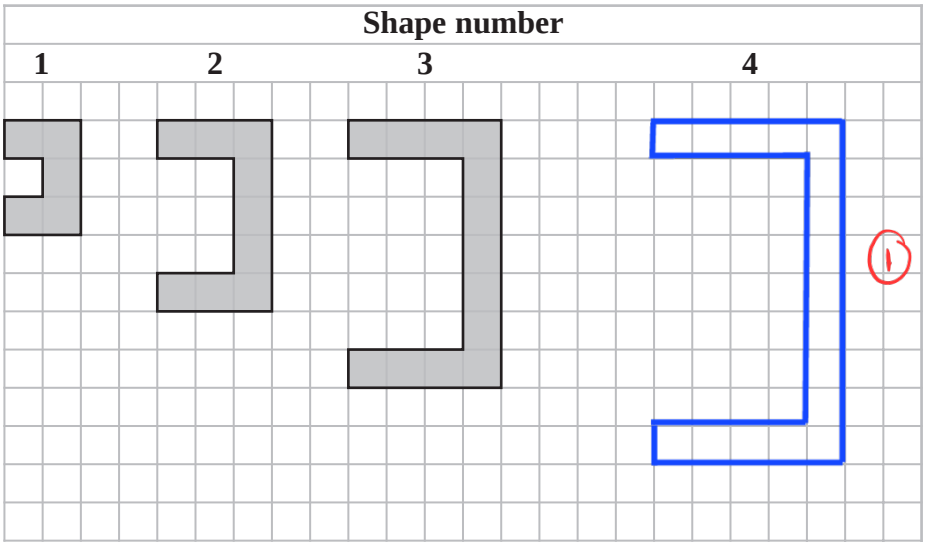
$= 85 - 6n + 6$

$= 91 - 6n$ (1)

$91 - 6n$

(Total for Question 5 is 2 marks)

6 A sequence of shapes is made by shading squares on a square grid.



(a) On the grid, draw Shape number 4

(1)

(b) Complete the table.

Shape number	1	2	3	4	5
Number of shaded squares	5	9	13	17	21

(1)

(c) Find the number of shaded squares in Shape number 8

8^{th} term $= a + (n-1)d$

$= 5 + (7)4$

$= 33$

33

(1)

(d) Explain why no shape in the sequence is made by shading exactly 50 squares.

The numbers of shaded squares are odd numbers

(1)

(Total for Question 6 is 4 marks)

7 In a warehouse there are two types of shelves, type **R** and type **S**.

These two types of shelves are arranged into shelving units that form a sequence of patterns.

Here are the first three terms in the sequence.

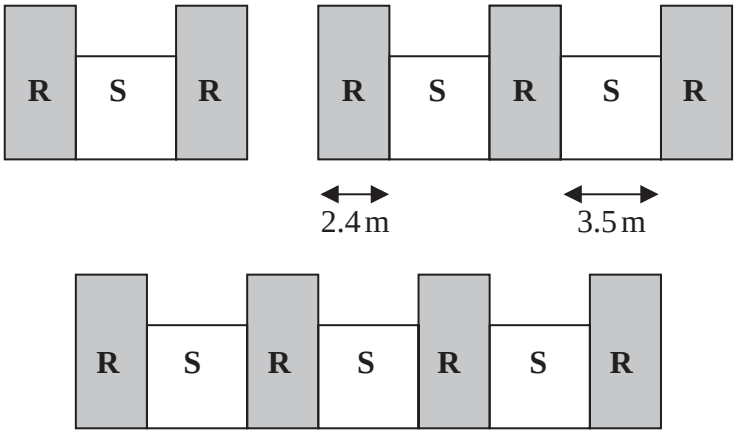


Diagram **NOT** accurately drawn

2R + 1S

The width of each type **R** shelf is 2.4 m and the width of each type **S** shelf is 3.5 m

(a) Work out the total width of a shelving unit that has 6 type **R** shelves.

[6 R shelves + 5 S shelves]

$= 6 \times R + 5 \times S$

$= (6 \times 2.4) + (5 \times 3.5)$ (1)

$= 14.4 + 17.5$

$= 31.9$ (1)

31.9 m

(2)

A shelving unit has n type **R** shelves.
The total width of this shelving unit is W metres.

(b) Find an expression for W in terms of n
Give your answer in its simplest form.

$T_1 = 2R + S$

$T_2 = 3R + 2S$

$T_n = nR + (n-1)S$

$W = n(2.4) + (n-1)(3.5)$

$= 2.4n + 3.5n - 3.5$ (1)

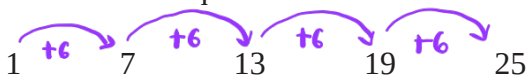
$W = 5.9n - 3.5$ (1)

$W =$ 5.9n - 3.5

(2)

(Total for Question 7 is 4 marks)

8 Here are the first five terms of a number sequence.



(a) (i) Write down the next term of the sequence.

25 + 6 = 31

31 (1)

.....

(1)

(ii) Explain how you worked out your answer.

Add 6 to 25. (1)

.....

(1)

(b) Explain why 188 cannot be a number in the sequence.

All terms in the sequence are odd. (1)

.....

.....

(1)

(Total for Question 8 is 3 marks)

9 Here are the first five terms of an arithmetic sequence.

1 5 9 13 17

(a) Find an expression, in terms of n, for the nth term of this sequence.

$d = 4$

$a = 1$

$T_n = a + (n-1)d$

$= 1 + (n-1)4$ (1)

$= 1 + 4n - 4$

$= 4n - 3$ (1)

$4n - 3$

(2)

The nth term of another arithmetic sequence is $3n + 5$

(b) Find an expression, in terms of m, for the $(2m)$th term of this sequence.

$= 3(2m) + 5$

$= 6m + 5$ (1)

$6m + 5$

(1)

(Total for Question 9 is 3 marks)

10 Here are the first five terms of a number sequence.

+6 +6

7 13 19 25 31 37

(a) (i) Write down the next term of the sequence.

37 (1)

(1)

(ii) Explain how you found your answer to part (a)(i)

Add 6 to 31. (1)

(1)

The 30th term of the sequence is 181

(b) Work out the 28th term of the sequence.

29th term = 181 - 6 = 175

28th term = 175 - 6 = 169

169 (1)

(1)

Brian says that 96 is a number in the sequence.
Brian is wrong.

(c) Explain why.

All numbers in the sequence are odd numbers. (1)

(1)

(Total for Question 10 is 4 marks)

11 Here are the first 4 terms of a number sequence.

+5 +5

7 12 17 22 27

(a) (i) Write down the next term of the sequence.

27 (1)

(1)

(ii) Explain how you worked out your answer.

Add 5. (1)

(1)

(b) Is 256 a number in the sequence?

Tick one of the boxes below and give a reason for your answer.

Yes	No
☐	☑

Give a reason for your answer.

Because the terms only end with 2 or 7. (1)

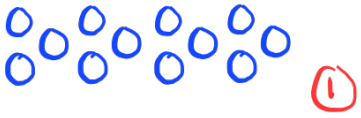
(1)

(Total for Question 11 is 3 marks)

12 Here is a sequence of patterns made from counters.

Pattern number 1 | Pattern number 2 | Pattern number 3

(a) In the space below, draw Pattern number 4



(1)

(b) Complete the table.

Pattern number	1	2	3	4	5
Number of counters	3	6	9	12	15

(1)

(c) Work out the number of counters in Pattern number 10

$10 \times 3 = 30$

30

(1)

Sven has exactly 70 counters.

(d) Can Sven make Pattern number 25 using his 70 counters?

Tick the appropriate box below.

Yes	No
☐	☑

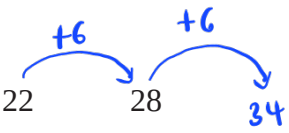
Give a reason for your answer.

$25 \times 3 = 75$. Sven only has 70 counters.

(1)

(Total for Question 12 is 4 marks)

13 Here are the first five terms of a number sequence.



(a) (i) Write down the next term of the sequence.

34 (1)

.....

(1)

(ii) Explain how you worked out your answer.

Added 6. (1)

.....

(1)

(b) Work out the 13th term of the sequence.

$a = 4$

$d = 6$

$T_{13} = 4 + 12(6)$

$= 4 + 72$

$= 76$ (1)

76

.....

(1)

(c) Explain why 467 cannot be a number in the sequence.

All numbers in the sequence are even. (1)

.....

.....

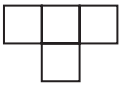
(1)

(Total for Question 13 is 4 marks)

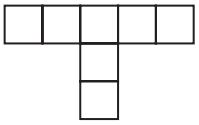
14 A sequence of patterns is made from squares.

Pattern number 1

Pattern number 2

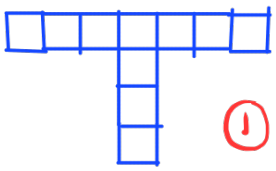


Pattern number 3



(a) In the space below, draw Pattern number 4

Pattern number 4



(1)

(b) Complete the table.

Pattern number	1	2	3	4	5
Number of squares	1	4	7	10	13

(1)

(c) Work out the number of squares in Pattern number 8

6 7 8

16 19 22

22

.....

(1)

Angus says

"there are 42 squares in Pattern number 15"

Angus is incorrect.

(d) Explain why.

$3 \times 15 - 2 = 43$

.....

.....

.....

(1)

(Total for Question 14 is 4 marks)

15 Here are the first four terms of a number sequence.

2 6 10 14

Elsie correctly works out that the next term in the sequence is 18

(a) Explain how she was able to work this out.

Add 4 (1)

(1)

(b) Explain why 217 cannot be a number in the sequence.

All terms in the sequence are even. (1)

(1)

(Total for Question 15 is 2 marks)

16 Here are the first four terms of an arithmetic sequence.

38 −7 31 24 17

Find an expression, in terms of n, for the nth term of the sequence.

$a = 38$

$d = -7$

$T_n = 38 + (n-1)(-7)$

$= 38 - 7n + 7$

$= 45 - 7n$ (2)

$45 - 7n$

(Total for Question 16 is 2 marks)

17 Here is a sequence of patterns made from sticks.

Pattern number 1 Pattern number 2 Pattern number 3

(a) In the space below, draw Pattern number 4

(1)

(b) Complete the table.

Pattern number	1	2	3	4	5
Number of sticks	5	9	13	17	21

(1)

(c) Work out the number of sticks in Pattern number 10

pattern : $4n+1$

$4(10)+1 = 41$

41

(1)

Connor says that in Pattern number 25 there are 102 sticks.

(d) Explain why Connor is wrong.

The number of sticks are always an odd number.

(1)

(Total for Question 17 is 4 marks)