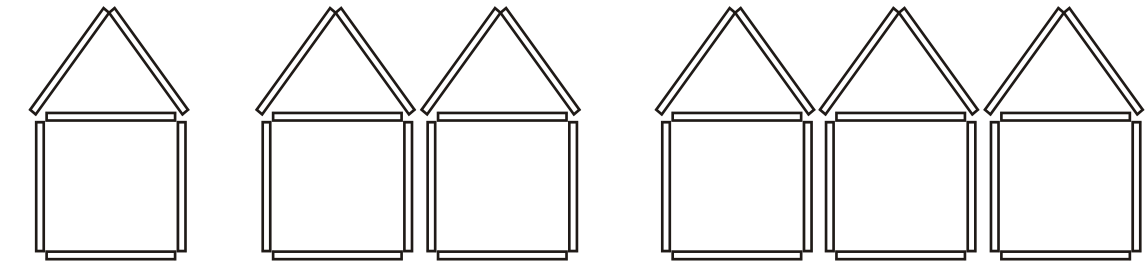
1. Here are some patterns made from matchsticks.



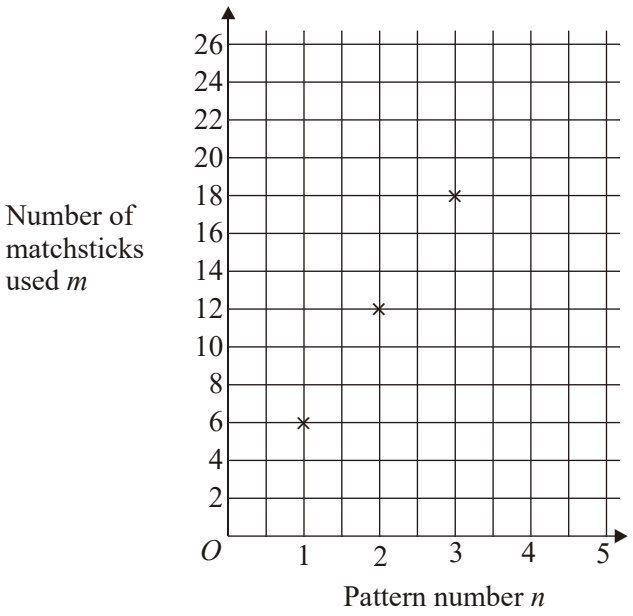
Pattern number 1 Pattern number 2 Pattern number 3

(a) Draw Pattern number 4, in the space below.

(1)

The graph shows the number of matchsticks m in pattern number n.

(b) Mark the point which shows the number of matchsticks used in Pattern number 4.



(1)

(c) How many matchsticks are used in Pattern number 10?

……

(1)

(d) Write down a formula for m in terms of n.

……

(2)
(Total 5 marks)

2. The table shows some rows of a number pattern.

Row 1	1	$= \frac{1 \times 2}{2}$
Row 2	1 + 2	$= \frac{2 \times 3}{2}$
Row 3	1 + 2 + 3	$= \frac{3 \times 4}{2}$
Row 4	1 + 2 + 3 + 4	
Row 8		

(a) In the table, complete row 4 of the number pattern.

(1)

(b) In the table, complete row 8 of the number pattern.

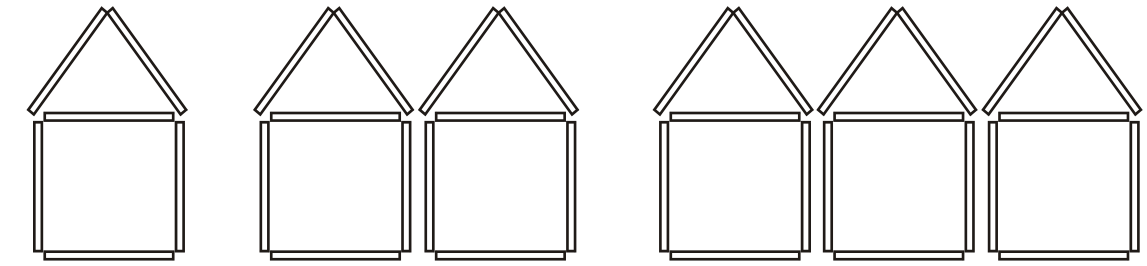
(1)

(c) Work out the sum of the first 100 whole numbers.

.....

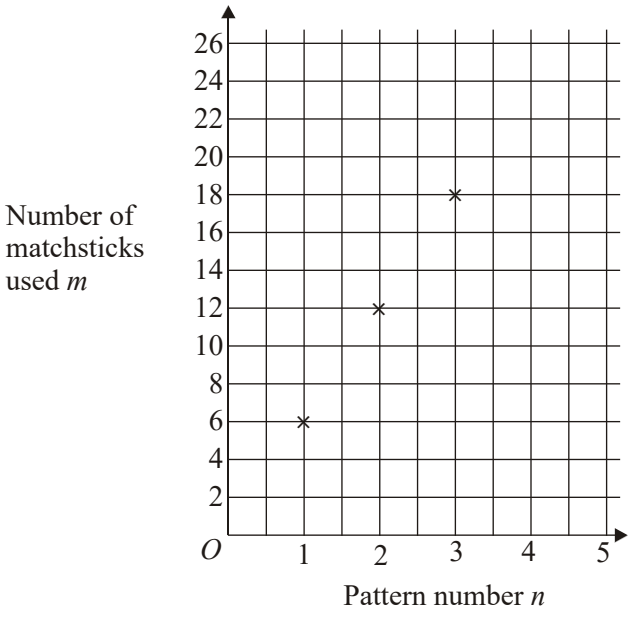
(1)
(Total 3 marks)

3. Here are some patterns made from matchsticks.



Pattern number 1 Pattern number 2 Pattern number 3

The graph shows the number of matchsticks m used in pattern number n.



Write down a formula for m in terms of n.

.....

(Total 2 marks)

4. The table shows some rows of a number pattern.

Row 1	1	$= \frac{1 \times 2}{2}$
Row 2	1 + 2	$= \frac{2 \times 3}{2}$
Row 3	1 + 2 + 3	$= \frac{3 \times 4}{2}$
Row 4	1 + 2 + 3 + 4	
Row 8		

(a) In the table, complete row 4 of the number pattern.

(1)

(b) In the table, complete row 8 of the number pattern.

(1)

(c) Work out the sum of the first 100 whole numbers.

.....

(1)

(d) Write down an expression, in terms of n, for the sum of the first n whole numbers.

.....

(2)
(Total 5 marks)

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

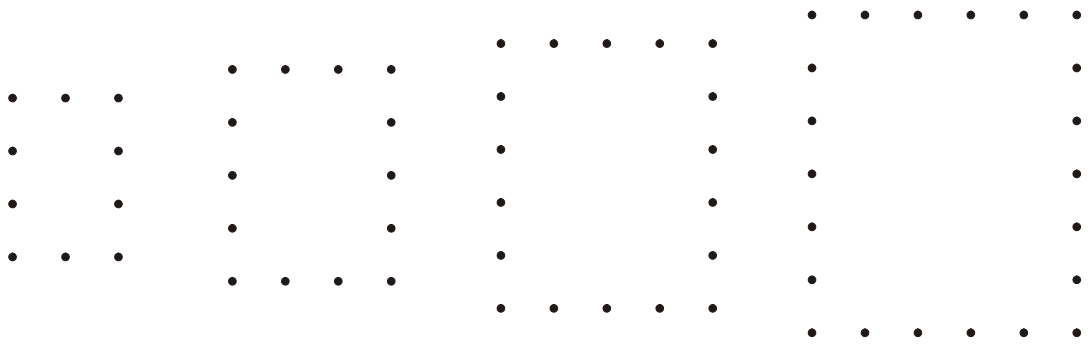
6, 11, 16, 21, 26

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

.....

(Total 2 marks)

6. Here are some patterns made from dots.



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

Write down a formula for the number of dots, d, in terms of the Pattern number, n.

(Total 2 marks)

7. The table shows some rows of a number pattern.

Row 1	$2^2 - 0^2 = 4 = 4 \times 1$
Row 2	$3^2 - 1^2 = 8 = 4 \times 2$
Row 3	$4^2 - 2^2 = 12 = 4 \times 3$
Row 4	

(a) Complete Row 4 of the number pattern.

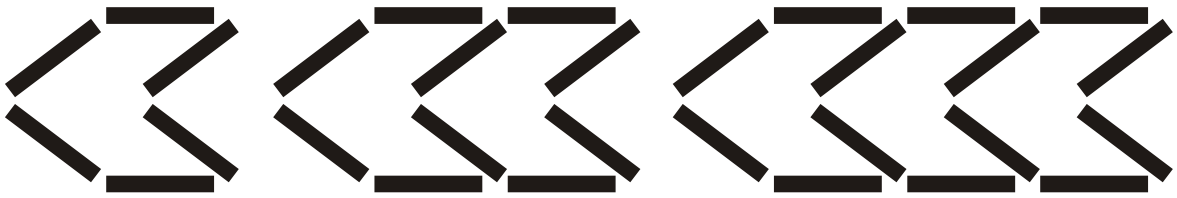
(1)

(b) Use the number pattern to find the answer to $121^2 - 119^2$

……

(2)
(Total 3 marks)

8. Here are some patterns made from sticks.



Pattern number 1 Pattern number 2 Pattern number 3

Complete the table.

Pattern number	Number of sticks
1	6
2	10
3	14
4	18
5	
n	

(Total 3 marks)

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

3 7 11 15 19

(a) Work out the 8th term of the number sequence.

.....

(1)

(b) Write down an expression, in terms of *n*, for the *n*th term of the number sequence.

.....

(2)

(Total 3 marks)

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

3 7 11 15 19

(a) Write down an expression, in terms of *n*, for the *n*th term of this sequence.

.....

(2)

Adeel says that 319 is a term in the number sequence.

(b) Is Adeel correct?
You must justify your answer.

.....

.....

(2)
(Total 4 marks)

11. The first five terms of an arithmetic sequence are

2 9 16 23 30

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

.....
(Total 2 marks)

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

3 7 11 15

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

.....
(Total 2 marks)

13. The first four terms of an arithmetic sequence are

21 17 13 9

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

.....

(Total 2 marks)

14. The first five terms of an arithmetic sequence are

2 7 12 17 22

Write down, in terms of n, an expression for the nth term of this sequence.

.....

(Total 2 marks)

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

2 7 12 17

(a) Write down the **6th** term of this number sequence.

.....

(1)

The nth term of a different number sequence is $4n + 5$

(b) Work out the first three terms of this number sequence.

....

(2)

(Total 3 marks)

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

7 11 15 19 23

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

.....

(2)

Pat says that 453 is a term in this sequence.
Pat is wrong.

(b) Explain why.

.....

.....

(1)
(Total 3 marks)

17. The first five terms of an arithmetic sequence are

9 13 17 21 25

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

.....

(Total 2 marks)

18. (a) The first five terms of an arithmetic sequence are

4 11 18 25 32

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

.....

(2)

Jane says that 697 is a term in the arithmetic sequence,

(b) Is Jane correct?

You must justify your answer.

.....

.....

(2)
(Total 4 marks)

19. The table shows some rows of a number pattern.

Row 1	$2^2 - 0^2 = 4 = 4 \times 1$
Row 2	$3^2 - 1^2 = 8 = 4 \times 2$
Row 3	$4^2 - 2^2 = 12 = 4 \times 3$
Row 4	

(a) Complete Row 4 of the number pattern.

(1)

(b) Use the number pattern to find the answer to $121^2 - 119^2$

…….

(2)
(Total 3 marks)

20. The first four terms of an arithmetic sequence are

7 13 19 25

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

…….

(Total 2 marks)

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

3 7 11 15 19

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

.....

(Total 2 marks)

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

4 7 10 13 16

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

.....

(Total 2 marks)

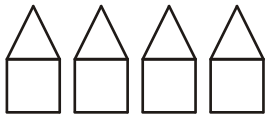
23. Here is an arithmetic sequence.

1 4 7 10 13

Work out the expression, in terms of n, for the nth term of the sequence.

$3n + 2$	$2n - 3$	$3n$	$3n - 2$	$2n$
☐	☐	☐	☐	☐
A	**B**	**C**	**D**	**E**

(Total 1 mark)

1. (a) 

B1

1

(b) Plotting (4, 24)

B1 ft from their matchsticks

1

(c) 60

B1 cao

1

(d) $m = 6n$

B2 for $m = 6n$ oe
*(B1 for 6*n *oe or* m = *multiple of* n *except* m = n*)*

2

[5]

2. (a) $\frac{4 \times 5}{2}$

B1 cao

1

(b) $\frac{8 \times 9}{2}$

$1 + 2 + 3 + 4 + 5 + 6 + 7 + 8$

B1 cao

1

(c) 5050 1

$\frac{100 \times 101}{2}$

B1 cao

[3]

3. $m = 6n$ 2

B2 for m = 6n oe accept 6 × n, n 6
(B1 for 6n alone, or 6n + 1 oe OR m = multiple of n except m = n)

[2]

4. (a) $\frac{4 \times 5}{2}$ 1

B1 cao

(b) $\frac{8 \times 9}{2}$ 1

$1 + 2 + 3 + 4 + 5 + 6 + 7 + 8$

B1 cao

(c) 5050 1

$\frac{100 \times 101}{2}$

B1 cao

(d) $\frac{n(n+1)}{2}$ 2

B2 cao
(B1 for any quadratic in n)

[5]

5. $5n + 1$ 2

B2 oe
(B1 for 5n seen)
NB: n = gets B1 max

[2]

6. $d = 4n + 6$ 2

B2 d = 4n + 6 oe
(B1 d = 4n + k, k an integer ≠ 6, 4n + 6, n = 4n + 6)

[2]

7. (a) $5^2 - 3^2 = 16$
$= 4 \times 4$ 1

B1 cao

(b) 120×4

121	1071
2420	1190
12100	11900
14641	14161

other methods are also permissible.
480 2

M1 for 4 × 120 or 2 × 240
A1 cao 480
Or
M1 14641 – 14161 condone one arithmetic error
A1 cao 480

[3]

8. 22
$4n + 2$ 3

B1 for 22
B2 for 4n + 2 oe
(B1 for 4n ± k, k ≠ 2)

[3]

9. (a) 31 1

B1 for 31, accept 23, 27, 31

(b) $4n - 1$ 2

B2 for 4n – 1 oe
(B1 for 4n + k, k any integer)

[3]

10. (a) $4n - 1$ 2

B2 for 4n – 1
(B1 for 4n + k or kn – 1, k any integer)

(b) Yes 2

M1 for "4n – 1" = 319
A1 for n = 80 accept: 4(80) – 1 = 319; 320 is a multiple of 4, subtract 1 gives 319; if you add 1 and divide by 4 you get a whole number; yes it's the 80^{th} term.

[4]

11. $7n - 5$ 2

B2
(B1 for 7n + k, k any integer including zero)

[2]

12. $4n - 1$ oe 2

B2 for 4n – 1 oe
(B1 for 4n + k, k any integer including 0, n ≠ – 1)

[2]

13. $25 - 4n$ 2

B2 for 25 – 4n
(B1 for k – 4n, k any integer including 0)

[2]

14. $5n - 3$oe 2

B2 for 5n – 3oe
[B1 for 5n + k where k is a constant, k ≠ – 3]

[2]

15. (a) 27 1

B1 cao

(b) $4 \times 1 + 5$
$4 \times 2 + 5$
$4 \times 3 + 5$
9 13 17 2

M1 for4 × l (or 2 or 3) + 5
A1 cao
[If no working: B2 for all 3 correct, B1 for 1 or 2 correct]

[3]

16. (a) $4n + 3$ oe 2

B2 for 4n + 3 oe
(B1 for 4n + k)

(b) $4n + 3 = 453$
$4n = 450$
n not an integer 1

B1 (ft from 4n + k, k ≠ 0) for 450 not divisible by 4 (oe)

[3]

17. $4n + 5$ oe 2

B2 for 4n + 5 oe
(B1 for 4n + k, k any integer including zero, k ≠ 5)

[2]

18. (a) $7n - 3$ 2

B2 for 7n – 3 oe
(B1 for 7n + k, k any integer including zero)

(b) $7n - 3 = 697$
$7n = 700$
$n = 100$
Yes 2

M1 (ft ; an + b; a, b ≠ 0, a ≠ 1) for "7n – 3" = 697 ***or*** *sight of 697 + 3* ***or*** *repeated addition seen*
A1 ft for n = 100 ***or*** *correct concluding statement*

[4]

19. (a) $5^2 - 5^3 = 16$ 1
$= 4 \times 4$

B1 cao

(b) 120×4

121	1071
2420	1190
12100	11900
14641	14161

Other methods are also permissible.
480 2

M1 for 4 × l20 or 2 × 240
A1 cao 480
or
M1 14641 – 14161 condone one arithmetic error
A1 cao 480

[3]

20. $6n + 1$ oe 2

B2
(B1 for 6n + k , where k ≠ 1)

[2]

21. $4n - 1$ oe 2

B2 for 4n – 1 oe (allow nth = 4n – 1 or 4x – 1 but not × 4 –1
(B1 for 4n + k (k could be zero) or n = 4n – 1)

[2]

22. $3n + 1$ 2

B2 for 3n + 1 oe
(B1 for 3n ± k)
SC: Award B1 for n = 3n + 1

[2]

23. D

[1]

1. Few marks were lost in the first three parts but only stronger candidates had the knowledge of algebra needed for the formula in part (d), for which $m \times n$, $m = n$ and $n + 6$ were popular wrong answers.

2. A good proportion of candidates were able to complete rows 4 and 8 in the table to gain the first two marks in this question. Few candidates were able to identify the numerical expression needed to answer (c) and of those who successfully did, hardly any worked out its value – necessary to gain the mark available here.

3. Centres need to ensure that candidates are aware of the difference between giving a *formula* and giving an *expression*. Many candidate omitted the "$m =$", and could not therefore be given full marks. $n + 6$ was a common incorrect answer.

4. **Mathematics A Paper 4**

Nearly all candidates answered parts (a) and (b) correctly. Part(c) was less well attempted. Many candidates wrote $\frac{100 \times 101}{2}$ but failed to evaluate it. A fully correct expression was not often given in part (d) although quite a few candidates gained one mark for either $\frac{n \times n + 1}{2}$ or some other quadratic in n.

Mathematics B Paper 17

All but a small minority failed to gain the first 2 marks in this question for identifying the next terms of a pattern. In part (c) many candidates continued the pattern to give an answer of $100 \times \frac{101}{2}$, not realising that the question required them to evaluate it.

Part (d) proved more difficult. Attempts at n^{th} terms often failed or were spoiled by a lack of understanding of the term 'expression' giving answers of $n =$ ……. This only gained one of the two marks if the right hand side was perfectly correct. Often this was not the case with an expression of $n \times n + \frac{1}{2}$, omitting the brackets, being the usual error.

5. Paper 3

Many able candidates gained full marks. The most common incorrect answer was $n + 5$. Some candidates extended the sequence, giving 31 as their answer. It was discouraging to see candidates spoiling their answer by writing the incorrect statement $n = n + 5$.

Paper 5

Most candidates gave the correct answer to this familiar style question. The most common wrong answer was "$n + 5$".

6. Paper 4

This question discriminated well at the top end. Many candidates failed to notice that a formula was required, and only gave an expression. But correct expressions were rare. The most common answers included $n + 4$.

Paper 6

This arithmetic sequence was generally spotted although some candidates gave the expression $4n + 6$ rather than the formula $d = 4n + 6$. There were a few correct although more complex formula based on the way that the pattern was made up – for example $2(n + 2) + 2n + 2$.

7. The few who did not give the correct answer in part (a) usually confused their numbers in the expression. In part (b) many did not use the number pattern already identified. Some who did spot the connection failed to use 120, choosing 119 instead. Many tried two sets of long multiplication, but arithmetic errors were common.

8. Specification A

Incorrect answers for pattern number 5 were very rare but only 25% of candidates went on to gain full marks. Many simply continued the pattern and wrote 26 for the nth term. Other common incorrect responses were +4, $n + 4$ and $\times 4 + 2$.

Specification B

Most candidates accurately completed that part of the table for pattern number 5, however many, using the common difference of 4, assumed that the sixth term was being requested and gave an answer of 26. Some candidates misunderstood where they had to write the general expression and having found the correct answer of $4n + 2$, wrote "$\times 4 + 2$" in the table. This was not penalised provided $4n + 2$ had been seen. A significant number of candidates, realising the rule, gave $n + 4$ as their answer.

9. Part (a) was answered very well. Errors occurred when candidates did not read which term was required and some made addition errors. About a quarter of the candidates found the correct expression for the *n*th term in part (b). The most common incorrect answer was $n + 4$.

10. In part (a), most of the candidates spotted that the common difference in the terms of the sequence was 4 and could give the correct expression for the *n*th term- but some gave this expression as $n + 4$. Part (b) was done well by many candidates, most finding that $n = 80$ was the solution to the equation $4n – 1 = 319$. Some of those equating $4n – 1$ to 319 and trying to solve this for n were not always able to rearrange the equation correctly (a common error was $4n = 318$). A few incorrectly substituted $n = 319$ into $4n – 1$.

11. **Paper 9**

This question was not done well at all, the majority of candidates of all abilities giving the rule "$n + 7$" instead of the nth term. Some candidates did offer $7n$ to score 1 mark

Paper 10

This question was generally tackled well by the majority of candidates. The incorrect answer of $n + 7$ was frequently seen.

12. The predictable error here was to give an answer of $n + 4$ for the *n*th term of the sequence. Disappointingly less than a third of the candidature gained any marks, with just 23% gaining full marks. Many weaker candidates gave an answer of 19, the next term in the sequence.

13. A number of candidates were unable to cope with the idea of a decreasing sequence leading to $4n$ being used instead of $– 4n$ in a number of cases. The incorrect answer of $n – 4$ was also frequently seen. Those candidates who attempted to use $a + (n – 1)d$ often got into a muddle and ended up with an incorrect expression.

14. $n + 5$ was the usual incorrect answer offered, although many gave subsequent terms of the sequence. $5n$ alone without any numerical term, was a typical error gaining one mark only. The correct answer of $5n – 3$ was achieved by a third of candidates.

15. In part (a) very many candidates correctly found the 6^{th} term although the 5^{th} term of 22 was a common error. In part (b) over 50% failed to score at all. Candidates showing some working out usually guaranteed at least one mark, however answers of (9, 14, 19), (5, 9, 13) and (4, 9, 14) were not uncommon.

16. The correct answer of $4n+3$ was frequently seen. Fewer candidates than usual gave the incorrect answer of $n + 4$. Just over half of all candidates were able to offer correct reasons in part (b). The explanation that 450 was not divisible exactly by 4 being the most popular.

17. No report available.

18. In part (a) the correct expression for the nth term was seen from approximately 75% of the candidates. The answers of $n + 7$ and $4n - 3$ were the most common incorrect expressions seen. Many correct justifications were seen in part (b). The most popular method was to add 3 to 697 and state that 700 was a multiple of 7 or show that 697 was the 100^{th} term in the sequence. There was evidence of careless arithmetic with the answer to $700 \div 7$ given as 10 on occasions. The most common error in this part was for candidate to subtract 3 from 697 and then divide by 7 which then led to the incorrect conclusion that 697 wasn't in the sequence.

19. The vast majority of candidates earned the mark in part(a) for a correct Row 4. Those spotting the pattern, often succeeded in part (b) to compute 480 from 4×120. Many resorted to long multiplication methods to evaluate 121^2 and 119^2. These often resulted in incorrect answers owing to poor arithmetic.

20. Just over 70% of candidates were able to give the correct expression for the nth term. The most common incorrect answer seen was $n + 6$.

21. This question was poorly attempted with 82% of candidates gaining no marks. Only 11% of candidates gained full marks and 7% gained 1 mark for obtaining $4n$.

22. Fewer than 20% of the candidates were able to find the correct nth term of the arithmetic sequence. By far the most popular incorrect answer was to spot that each term was 3 more than the term before and therefore writing that the nth term was $n + 3$. Others recognised that they had to write $3n$, scoring one mark, but then did not go on to put $3n + 1$. The most common incorrect response was to write '19' which was the next number in the sequence.

23. No Report available for this question.