Name: _____

IGCSE (9-1) Maths
topics new to Foundation tier:
*n*th term of sequences

Date:

Time: 60 minutes

Total marks available: 52

Total marks achieved: _____

Q1. Here are the first five terms of an arithmetic sequence.

7 10 13 16 19

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

(Total 2 marks)

Q2. The first four terms of an arithmetic sequence are

2 9 16 23

Write down an expression, in terms of *n*, for the *n*th term.

(Total 2 marks)

Q3. The first four terms of an arithmetic sequence are

5 9 13 17

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

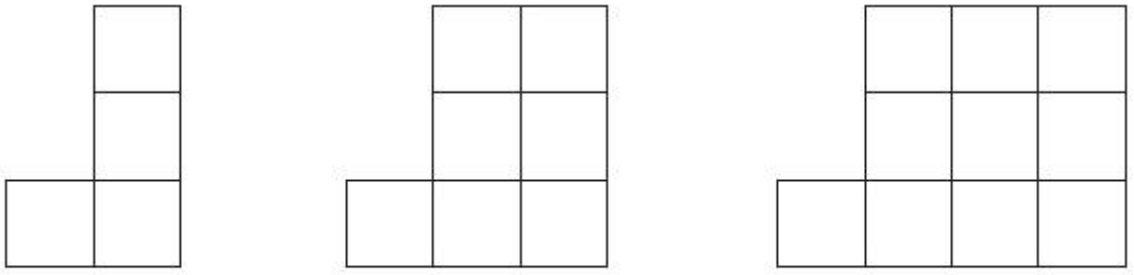
(2)

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

(1)

(Total 3 marks)

Q4. Here is a sequence of patterns made from centimetre squares.



Pattern number 1 Pattern number 2 Pattern number 3

(a) Find an expression, in terms of *n*, for the total number of centimetre squares in Pattern number *n*.

(2)

A pattern in this sequence has 88 centimetre squares.

(b) Work out the Pattern number of this pattern.

(2)

(Total 4 marks)

Q5. Here are the first five terms of an arithmetic sequence.

3 5 7 9 11

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

(Total 2 marks)

Q6. Here are the first four terms of a number sequence.

6 10 14 18

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

(Total 2 marks)

Q7. Here are the first four terms of an arithmetic sequence.

10 16 22 28

(*a*) Find the 10th term of this sequence.

(1)

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

(2)

(Total 3 marks)

Q8. Here are the first five terms of an arithmetic sequence.

2 7 12 17 22

(*a*) Explain why the number 271 cannot be a term in this sequence.

(1)

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

(2)

(Total 3 marks)

Q9. Here are the first four terms of an arithmetic sequence.

6 10 14 18

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

(2)

The *n*th term of a different arithmetic sequence is $3n + 5$

(*b*) Is 108 a term of this sequence?
Show how you get your answer.

(2)

(Total 4 marks)

Q10. Here are the first four terms of an arithmetic sequence.

11 17 23 29

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

(2)

(*b*) Is 121 a term of this arithmetic sequence?
You must explain your answer.

(2)

(Total 4 marks)

Q11. Here is an equilateral triangle.

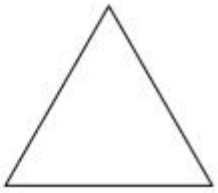
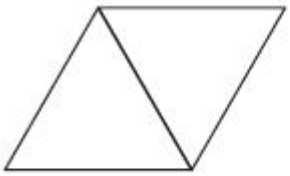
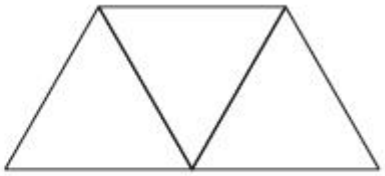


Diagram **NOT** accurately drawn

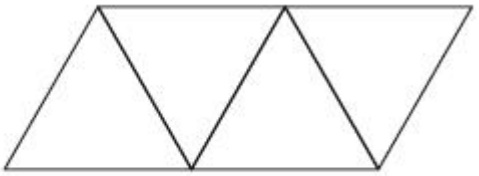
The equilateral triangle has a perimeter of 24 cm.
Some of these equilateral triangles are used to make this sequence of quadrilaterals.



quadrilateral 1



quadrilateral 2



quadrilateral 3

Find an expression for the perimeter, in centimetres, of quadrilateral *n*.

(Total 3 marks)

Q12. Here are the first 5 terms of an arithmetic sequence.

3 9 15 21 27

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

(2)

Ben says that 150 is in the sequence.

(*b*) Is Ben right?
You must explain your answer.

(1)

(Total 3 marks)

Q13. Here are the first five terms of an arithmetic sequence.

2 6 10 14 18

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

(2)

(*b*) Is 86 a term in the sequence?
You must give a reason for your answer.

(1)

(Total 3 marks)

Q14. Here are the first four terms of an arithmetic sequence.

3 10 17 24

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

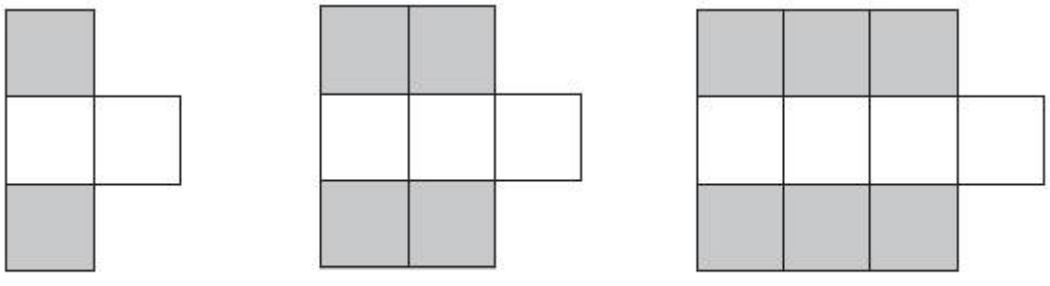
(2)

(*b*) Is 150 a term of this sequence?
You must explain how you get your answer.

(2)

(Total 4 marks)

Q15. Here are some patterns made from white centimetre squares and grey centimetre squares.



Pattern 1 Pattern 2 Pattern 3

A Pattern has 20 grey squares.

(*a*) Work out how many white squares there are in this Pattern.

(2)

(*b*) Find an expression, in terms of *n*, for the total number of centimetre squares in Pattern *n*.

(2)

(Total 4 marks)

Q16. The *n*th term of an arithmetic sequence is $3n + 2$ where *n* is a positive integer.

(*a*) Determine whether 93 is a term in this arithmetic sequence.

(2)

(*b*) Find an expression for the sum of the *n*th term and the $(n + 1)$th term of this sequence. Give your answer in its simplest form.

(2)

The sum of two consecutive terms in this sequence is 91

(*c*) Find the smaller of these two terms.

(2)

(Total 6 marks)

Examiner's Report

Q1.

Fewer students than expected showed that they understood the requirements of this question. Those who secured part marks usually gave an answer of 3n + α where $\alpha \neq 4$. Incorrect responses included $4n + 3$ and $n + 3$.

Q2.

No Examiner's Report available for this question

Q3.

The first part was standard with the correct simplified expression $4n + 1$ often seen, although any correct form was acceptable. There were still many students who thought the answer was $n + 4$, however. Part (b) proved to be unknown territory for many of the students who had got both marks in part (a). It was expected that students would take one of two approaches. The first was to replace n by $(n + 1)$ to give the expression $4(n + 1) + 1$. This was acceptable although many students went on to $4n + 5$ by expanding the bracket. An alternative approach was to recognise that the difference between successive terms was 4 so the $n + 1$ th term was the nth term + 4. However, many made the error of simply adding one onto their answer from (a).

Q4.

$n + 3$ was a common incorrect answer to (a), but many correct answers were seen.

In part (b) the common error was to substitute 88 for n rather than equate the expression for the nth term to 88.

Q5. [GCSE (1MA0) June 2014]

Most students recognised that the numbers went up by 2 each time and many were able to access the first mark by writing $2n$. The most common incorrect responses were $2n - 1$ and also $3n + 2$. Some students did understand that the correct expression was $2n + 1$ but wrote their answer as $n = 2n + 1$, losing the accuracy mark.

Q6. [GCSE (2MB01) June 2012]

The majority of candidates were able to score at least one mark, and often two marks, on this question. $4n - 2$, $4n + 6$, $n = 4n + 2$ and $4n$ were all common responses each gaining one mark. The most common incorrect answers seen gaining no credit were $n + 4$ and $2n \pm 4$. Some candidates wrote 22, the next term of the sequence, as their final answer.

Mark Scheme

Q1.

Q	Working	Answer	Mark	Notes
		$3n + 4$	2	M1 For $an + 4$ where a is an integer and $a \neq 0$ or for $3n + b$ where b is an integer A1 Fully correct expression ScB1 for $n = 3n + 4$ ScB1 for $3t + 4$, etc.
				Total 2 marks

Q2.

Question	Working	Answer	Mark	AO	Notes
		$7n - 5$ oe	2	AO1	M1 for $7n + k$ (k may be zero) A1

Q3.

The correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.

Question	Working	Answer	Mark	Notes
(a)			2	M1 $4n + k$ (k may be zero)
		$4n + 1$		A1 oe eg. $5 + (n - 1)\times 4$ **NB: $n = 4n + 1$ oe scores M1 A0**
(b)		$4n + 5$	1	B1 ft from (a) if (a) is of the form $4n + k$ oe **NB: Accept $4(n + 1) + 1$ oe**
				Total 3 marks

Q4.

Question	Working	Answer	Mark	Notes
(a)				M1 for $3n + k$ (k may be zero) oe
		$3n + 1$ oe	2	A1 need not be simplified eg. $4 + 3(n - 1)$ NB: $n = 3n + 1$ gains M1 A0
(b)	$3n + 1 = 88$ **or** $(88 - 1) \div 3$			M1 ft "$3n + 1$" $= 88$ NB. Only ft if their expression is of the form $an + b$ where $a > 1$ and $b \neq 0$
		29	2	A1 ft NB. unrounded answer must be an integer
				Total 4 marks

Q5.

PAPER: 5MB2H_01					
Question		Working	Answer	Mark	Notes
			$2n + 1$	2	M1 for $2n$ or $2n + k$ where $k \neq 1$ A1 for $2n + 1$

Q6.

Question		Working	Answer	Mark	Notes
			$4n + 2$	2	B2 for $4n + 2$ oe (eg $4 \times n + 2$ or $n4 + 2$, ...) or nth = $4n + 2$ (B1 for a linear expression in $4n$ e.g. $4n + a$ ($a \neq 2$) or $n = 4n + 2$) (B0 for $n = 4n$ and $n + 4$)

Q7.

Question		Working	Answer	Mark	Notes
	(a)		64	1	B1 cao
	(b)		$6n + 4$	2	B2 for $6n + 4$ (oe, including unsimplified) (B1 for $6n + k$, $k \neq 4$ or k is absent, $n=6n+4$)

Q8.

Question		Working	Answer	Mark	Notes
	(a)		Terms must end in 2 or 7	1	B1 for any correct reason; eg terms must end in 2 or 7
	(b)		$5n - 3$	2	B2 for $5n - 3$ (oe, including unsimplified) (B1 for $5n + k$, $k \neq -3$ or k is absent, or $n = 5n - 3$)

Q9.

Paper 1MA1: 2H			
Question	Working	Answer	Notes
(a)		$4n+2$	M start to deduce nth term from information given eg. $4n + k$ where $k \neq 2$ A1 cao
(b)		No (supported)	M1 starts method that could lead to a deduction eg uses inverse operations C1 for a convincing argument eg. 34 is 107 so NO; $(108 - 5) \div 3$ is not an integer

Q10.

Question	Working	Answer	Mark	Notes
(a)		$6n + 5$	2	B2 for $6n + 5$ (B1 for $6n + k$ where k is an integer or absent)
(b)		No with explanation	2	M1 for "$6n + 5$" = 121 or any other valid method, e.g. counting on 6s (to get to 119 or more) A1 for No with complete explanation, e.g. $6n$=116 will not give a whole number

Q11.

5MB2H_01 November 2015				
Question	Working	Answer	Mark	Notes
		$8n + 24$	3	M1 for generating at least 3 terms of sequence 32, 40, 48 or sequence 4, 5, 6 M1 for $8n \pm k$ or $8(n \pm m)$ where $k \neq 24$, $m \neq 3$ A1 for $8n + 24$ or $8(n + 3)$ oe

Q12.

	Working	Answer	Mark	Notes
(a)		$6n - 3$	2	M1 for attempt to establish linear expression in n with coefficient of 6 e.g. $6n + k$ where k is an integer (accept $n = 6n - 3$ for one mark) A1 cao
(b)		No + Reason	1	C1 ft from their answer to part (a) for decision and explanation eg " stating no and because all the terms in the sequence are odd **and** 150 is even" **or** "no and '$6n - 3$' = 150, n = 153/6 ... so n is not an integer" **or** Continuing the sequence to show terms 147 **and** 153 and state "no as 150 is not in the sequence" oe

Q13.

PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
(a)		$4n - 2$	2	B2 for $4n - 2$ oe (B1 for $4n + k$, $k \neq -2$ or k is absent, or $n = 4n - 2$)
*(b)		Yes + reason	1	C1 ft from (a) for decision and explanation, e.g. equating 86 with nth term **and** "Yes, its the 22nd term" or continuing the sequence up to 86 **and** "Yes, 86 is in the sequence" oe

Q14.

PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
(a)		$7n - 4$	2	B2 for $7n - 4$ (B1 for $7n + d$ where d is an integer)
(b)		explanation	2	M1 for '$7n - 4$' = 150 **or** any other valid method, eg. counting on 7s (to get 150) A1 for a complete explanation eg. the 22nd term is 150 or $n = 22$ from solution of equation or a clear demonstration based on 22 or complete sequence

Q15.

PAPER: 5MB2H_01					
Question		Working	Answer	Mark	Notes
	(a)		11	2	M1 for $20 \div 2$ or 10 or list/table with 4 pairs of at least 5 pairs correct A1 cao
	(b)		$3n + 1$	2	B2 for $3n + 1$ oe (B1 for $3n + k$, $k \neq 1$ or absent)

Q16.

Question	Working	Answer	Mark	AO	Notes
(a)		No + written evidence	P C	2.2 2.4a	P1 for a start to the process that leads to a decision, e.g. $n = \frac{93 - 2}{3}$ oe C1 for a convincing argument for 'No' (e.g. because n is not a whole number)
(b)	$3n + 2 + 3n + 2 + 3$	$6n + 7$	M A	1.3a 1.3a	M1 for $3n + 2 + 3n + 2 + 3$ oe A1 cao
(c)	$3n + 2 + 3n + 2 + 3 = 91$ $n = 14$ $3 \times 14 + 2$	44	P A	3.1a 1.3a	P1 for a process that translates the problem into a suitable form that would lead to a solution, e.g. '$6n + 7$' $= 91$ Or $t + t + 3 = 91$ or $(91 - 3) \div 2$ A1 cao