



1 Write down the missing numbers in each sequence.

a. 5 9 ___ 17 ___

b. 40 ___ 28 22 ___

c. 3 6 12 ___ 48

(3 marks)

a) Rule: + 4

$$9 + 4 = 13$$

$$17 + 4 = 21$$

13, 21

b) Rule: - 6

$$40 - 6 = 34$$

$$22 - 6 = 16$$

34, 16

c) Rule: $\times 2$

$$12 \times 2 = 24$$

24

2 Here is a sequence.

4 11 18 25 ...

- Write down the 3rd term.
- Write down the term-to-term rule.
- Write down the position of the term 25 in the sequence.
- Is this an arithmetic sequence or a geometric sequence? Give a reason.

(4 marks)

a)

18

b)

$$11 - 4 = 7, 18 - 11 = 7$$

Add 7

c)

4 is 1st, 11 is 2nd, 18 is 3rd, 25 is 4th

4th

d) Same amount added each time

Arithmetic

3

- The first term of a sequence is 7. The term-to-term rule is "multiply by 2 then subtract 3". Write down the first four terms.
- The first term of another sequence is 50. The term-to-term rule is "subtract 8". Write down the first five terms.

(3 marks)

a)

$$7 \times 2 - 3 = 11$$

$$11 \times 2 - 3 = 19$$

$$19 \times 2 - 3 = 35$$

7, 11, 19, 35

b) - 8 each time

50, 42, 34, 26, 18

4 Here are the first four cube numbers.

1 8 27 64

- Write down the next cube number after 64.
- Write down the 10th cube number.
- Explain why 200 is not a cube number.

(3 marks)

The cube numbers are 1^3 , 2^3 , 3^3 and so on

The next one after 64 is $5^3 = 125$

The 10th cube number is $10^3 = 1000$

$5^3 = 125$ and $6^3 = 216$, so 200 falls between two consecutive cube numbers and cannot be one

5 Here are the first five triangular numbers.

1 3 6 10 15

- Describe how the sequence continues from one term to the next.
- Work out the next two terms of the sequence.

(3 marks)

The differences between terms are 2, 3, 4, 5, so the amount added goes up by 1 each time

Next term

$$15 + 6 = 21$$

The term after that

$$21 + 7 = 28$$

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

5 9 13 17

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

(2 marks)

n is the position in the sequence, starting with $n = 1$. The n th-term rule lets you calculate a term directly from its position

The common difference is 4, so the n th term contains $4n$

The sequence $4n$ gives 4, 8, 12, 16, which is 1 less than each term

The n th term is $4n + 1$

Check

$$\text{when } n = 3, 4(3) + 1 = 13$$

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

- 7 Here are the first four terms of an arithmetic sequence.

20 17 14 11

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

(2 marks)

The common difference is -3 , so the n th term contains $-3n$

The sequence $-3n$ gives $-3, -6, -9, -12$, which is 23 less than each term

The n th term is $23 - 3n$

Check

$$\text{when } n = 2, 23 - 6 = 17$$

$$23 - 3n$$

- 8 a. The n th term of a sequence is $4n + 3$. Write down the first three terms and work out the 20th term.

- b. The n th term of another sequence is $30 - 2n$. Write down the first three terms.

(3 marks)

a)

$$n = 1: 4 \times 1 + 3 = 7$$

$$n = 2: 4 \times 2 + 3 = 11$$

$$n = 3: 4 \times 3 + 3 = 15$$

$$n = 20: 4 \times 20 + 3 = 83$$

$$7, 11, 15; 20\text{th term} = 83$$

b)

$$n = 1: 30 - 2 = 28$$

$$n = 2: 30 - 4 = 26$$

$$n = 3: 30 - 6 = 24$$

$$28, 26, 24$$

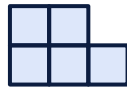
9

Here are the first three patterns in a sequence made from square tiles.

- Draw Pattern 4 in the space on the right.
- How many tiles are in Pattern 10?
- Find an expression, in terms of n , for the number of tiles in Pattern n .



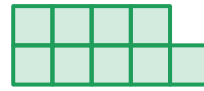
Pattern 1



Pattern 2



Pattern 3



Pattern 4

(4 marks)

a) Bottom row: 5 tiles, top row: 4 tiles

Pattern 4 drawn (9 tiles)

c) Count the tiles

3, 5, 7, 9, ...

Goes up by 2, so $2n$

$2n$: 2, 4, 6, 8

Each term is 1 more

$$2n + 1$$

b)

$$2 \times 10 + 1 = 21$$

21 tiles

10

Here are the first four terms of an arithmetic sequence.

7 12 17 22

Explain why 81 is not a term of this sequence.

(2 marks)

The n th term is $5n + 2$

If $5n + 2 = 81$ then $5n = 79$, so $n = 15.8$, which is not a whole number

Alternatively, every term ends in a 2 or a 7, but 81 ends in a 1

So 81 is not a term of the sequence

11

The n th term of a sequence is $5n - 3$

- Work out the 12th term of the sequence.
- Is 122 a term of the sequence? You must show how you get your answer.

(3 marks)

$$a) 5(12) - 3 = 60 - 3 = 57$$

$$b) \text{Solve } 5n - 3 = 122: 5n = 125, \text{ so } n = 25$$

$n = 25$ is a whole number, so 122 is the 25th term of the sequence

12

The n th term of a sequence is $7n - 4$.

- Show that 150 is a term of the sequence and write down its position.
- Is 200 a term of the sequence? Give a reason.
- Work out the first term of the sequence that is greater than 100.

(4 marks)

a)

$$\begin{array}{rcl} 7n - 4 & = & 150 \\ +4 & & +4 \\ 7n & = & 154 \\ \div 7 & & \div 7 \\ n & = & 22 \end{array}$$

Whole number, so 150 is the 22nd term

b)

$$\begin{array}{rcl} 7n - 4 & = & 200 \\ +4 & & +4 \\ 7n & = & 204 \\ \div 7 & & \div 7 \\ n & = & 29.14... \end{array}$$

Not a whole number, so No

c)

$$n = 14: 7 \times 14 - 4 = 94$$

$$n = 15: 7 \times 15 - 4 = 101$$

101