

2.1 Generating sequences

This is a sequence of numbers.

5 7 9 11 13

This is a **linear sequence** because the terms in the sequence increase by the same amount each time. Each term is 2 more than the term before, so the **term-to-term rule** is 'add 2'.

In a linear sequence the terms in the sequence can increase **or** decrease by the same amount each time.

You can also use a **position-to-term rule** to describe a sequence.

This table shows the position number of each term in the sequence. The position-to-term rule for this sequence is:
term = $2 \times$ position number + 3

Position number	1	2	3	4	5
Term	5	7	9	11	13

Examples: 3rd term = $2 \times 3 + 3 = 6 + 3 = 9$ ✓
5th term = $2 \times 5 + 3 = 10 + 3 = 13$ ✓

Check that this rule works by substituting numbers into the rule.

Worked example 2.1

- a** The first term of a sequence is 4. The term-to-term rule of the sequence is 'subtract 3'. Write down the first three terms of the sequence.
- b** The position-to-term rule of a sequence is: term = $4 \times$ position number + 1. Work out the first three terms of the sequence.

- a** First three terms are 4, 1, -2. Write down the first term, which is 4, then use the term-to-term rule to work out the second and third terms.
2nd term = $4 - 3 = 1$, 3rd term = $1 - 3 = -2$.
- b** First three terms are 5, 9, 13. Use the position-to-term rule to work out each term.
1st term = $4 \times 1 + 1 = 5$, 2nd term = $4 \times 2 + 1 = 9$,
3rd term = $4 \times 3 + 1 = 13$.

Exercise 2.1

- Write down the first three terms of each sequence.
 - first term: 1 term-to-term rule: 'add 5'
 - first term: 20 term-to-term rule: 'subtract 4'
 - first term: 2 term-to-term rule: 'add 12'
 - first term: 6 term-to-term rule: 'subtract 5'
 - first term: -5 term-to-term rule: 'add 2'
 - first term: -3 term-to-term rule: 'subtract 6'
- The first term of a sequence is 15. The term-to-term rule is add 7. What is the fifth term of the sequence? Explain how you worked out your answer.

Exercise 2.2

1 Copy and complete the working to find the position-to-term rule for each sequence.

a 6, 7, 8, 9, ...

Term-to-term rule is 'add 1'.

Position-to-term rule is:

term = position number + \square

Position number	1	2	3	4
Term	6	7	8	9
Multiples of 1	1	2	\square	\square

term = $1 \times$ position number + \square

can be written as:

term = position number + \square

b 1, 4, 7, 10, ...

Term-to-term rule is 'add 3'.

Position-to-term rule is:

term = $3 \times$ position number - \square

Position number	1	2	3	4
Term	1	4	7	10
Multiples of 3	3	6	\square	\square

2 For each sequence of numbers:

i write down the term-to-term rule

ii write the sequence of numbers in a table

iii work out the position-to-term rule

iv check your rule works for the first three terms.

a 2, 4, 6, 8, ...

b 5, 10, 15, 20, ...

c 5, 8, 11, 14, ...

d 6, 8, 10, 12, ...

e 7, 11, 15, 19, ...

f 7, 12, 17, 22, ...

3 For each sequence:

i write down the term-to-term rule

ii write the sequence of numbers in a table

iii work out the position-to-term rule

iv check your rule works for the first three terms.

a 4, 5, 6, 7, ...

b 10, 11, 12, 13, ...

c 24, 25, 26, 27, ...

d 1, 3, 5, 7, ...

e 2, 6, 10, 14, ...

f 2, 7, 12, 17, ...

4 This pattern is made from blue squares.

Pattern 1



Pattern 2



Pattern 3



Pattern 4



a Write down the sequence of the numbers of blue squares.

b Write down the term-to-term rule.

c Explain how the sequence is formed.

d Work out the position-to-term rule.



5 This is part of Harsha's homework.

a Explain the mistake that she has made.

b Work out the correct answer.

Question

Work out the position-to-term rule for this sequence of triangles.

Pattern 1



Pattern 2



Pattern 3



Answer

The sequence starts with 4 and increases by 2 every time, so the position-to-term rule is:
term = $4 \times$ position number + 2