Sequences

A **sequence** is an ordered set of numbers. Each number in the sequence is called a **term**. The terms of the sequence form a pattern.

Below are three different types of sequence.

- 2   4   6   8   10   12

    In this sequence we are adding 2 to each term in order to produce the next term.

- 1   2   4   8   16   32

    In this sequence we double each term in order to produce the next term.

- 1   4   9   16   25   36

    Here, the difference between consecutive terms increases by 2 each time. It is also the sequence of square numbers.

Sequences can also be expressed as a series of diagrams. The example below shows the first four diagrams in a sequence of tile patterns.

We can see that the tile patterns grow according to a rule. We can enter the numbers of white and grey tiles in each pattern into a table of results.

Number of white tiles	1	2	3	4
Number of grey tiles	3	4	5	6

There are two rules that describe the sequence of grey tiles.

- The number of grey tiles increases by 1 each time.
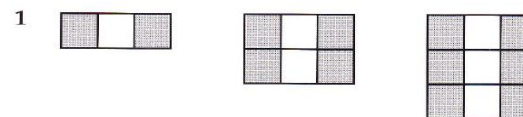- The number of grey tiles is always 2 more than the number of white tiles.

The second rule is useful if we know the number of white tiles and want to work out the number of grey tiles. For example, if there are 100 white tiles, how many grey tiles are there?

number of grey tiles = number of white tiles + 2
number of grey tiles = 100 + 2 = 102

Exercises

These diagrams show the first three patterns in a sequence of growing tile patterns.

1

(a) Draw the next two diagrams in the sequence.
(b) Copy and complete this table.

Number of white tiles	1	2	3	4	5
Number of grey tiles					

(c) Describe the pattern linking the number of white tiles to the number of grey tiles.
(d) Use your rule in part (c) to predict the number of grey tiles in a pattern with 100 white tiles.

2

(a) Draw the next two diagrams in the sequence.
(b) Copy and complete this table.

Number of white tiles	1	2	3	4	5
Number of grey tiles					

(c) Describe the pattern linking the number of white tiles to the number of grey tiles.
(d) Use your rule in part (c) to predict the number of grey tiles in a pattern with 100 white tiles.

Term-to-term rule

A rule which describes how to get from one term to the next is called a **term-to-term** rule.

Worked examples

(i) Here is a sequence of numbers.

4   9   14   19   24

+5   +5   +5   +5

The term-to-term rule for this sequence is +5. What is the tenth term?

To calculate the tenth term in the sequence, the pattern can be continued using the term-to-term rule.

4   9   14   19   24   29   34   39   44   49

Exercises

For each of the sequences in questions 1–12:

(a) describe the term-to-term rule

1   2   4   6   8   10

2   1   3   5   7   9

3   4   7   10   13   16

4   2   6   10   14   18

5   1   8   15   22   29

6   7   14   21   28   35

7   9   18   27   36   45

8   0.5   1   1.5   2   2.5

9   0.25   0.5   0.75   1   1.25

10   9   7   5   3   1

11   32   28   24   20   16

12   144   132   120   108

(b) calculate the next two terms.

For each of the sequences in questions 1–10

(a) describe the term-to-term rule

1   3   6   12   24   48

2   1   3   7   15   31

3   32   16   8   4   2

4   1.1   0.9   0.7   0.5   0.3

5 $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{5}$ $\frac{1}{6}$

6 $\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{4}$ $\frac{4}{5}$ $\frac{5}{6}$

7   1   4   9   16   25

8   4   7   12   19   28

9   1   8   27   64

10   5   25   125   625

(b) calculate the tenth term.

For each of the sequences in questions 1–15:

(a) write down the next two terms

1   3   5   7   9   11

2   4   6   8   10   12

3   4   7   10   13   16

4   5   8   11   14   17

5   5   9   13   17   21

6   7   11   15   19   23

7   6   11   16   21   26

8   9   14   19   24   29

9   8   15   22   29   36

10   9   19   29   39   49

11   4   9   14   19   24

12   1   8   15   22   29

13   0   4   8   12   16

14   1.5   3.5   5.5   7.5   9.5

15   0   1   2   3   4

(b) give an expression for the nth term.

EXERCISE 7.5

For each of the sequences in questions 1–6:

(a) write down the next two terms
(b) write down an expression for the nth term.

1   2   5   10   17   26

2   8   11   16   23   32

3   0   3   8   15   24

4   1   8   27   64

5   2   9   28   65

6   −2   5   24   61