Planner

Sequences

- Generating sequences from the term-to-term rule and using ICT
- Generating sequences from practical problems
- Finding the *n*th term of an arithmetic sequence

Keywords

You should know

explanation 1a | explanation 1b | online

1 **a** Find the next three terms and write the term-to-term rule for generating each sequence.

i 12, 19, 26, …

ii 81, 27, 9, …

iii $\frac{1}{4}, \frac{1}{2}, 1, \ldots$

iv 9, 5, 1, …

v 6, 12, 24, …

vi −16, −12, −8, …

vii 0.25, 0.5, 0.75, …

viii −5, 10, −20, …

ix 64, −16, 4, …

b Which of the sequences in part **a** are linear?

2 Copy this table. Given the first term and term-to-term rule, write in the last column the first five terms of each sequence. Work these out and leave your answers as fractions where necessary. (Do not use a calculator.)

	First term(s)	Term-to-term rule	First five terms
a	2	+ 8	2,
b	25	÷ 5	25,
c	0	− 3	0,
d	$\frac{1}{2}$	$+\frac{1}{2}$	$\frac{1}{2}$,
e	1	$\times\frac{1}{3}$	1,
f	−16	− 4	−16,
g	7	÷ 2	7,
h	0, 1	Add the two previous terms	0, 1,
i	1, 1	Add the two previous terms	1, 1,

3 Write the next three terms of these sequences.

a 0.3, 0.6, 0.9, 1.2, …
b 3, 6, 12, 24, 48, …
c 1000, 100, 10, …
d 320, 160, 80, 40, …
e 0, 1, 1, 2, 3, 5, 8, …
f 1, 2, 4, 7, 11, 16, …

4 For each of the sequences in question **3a** to **e**, write the term-to-term rule.

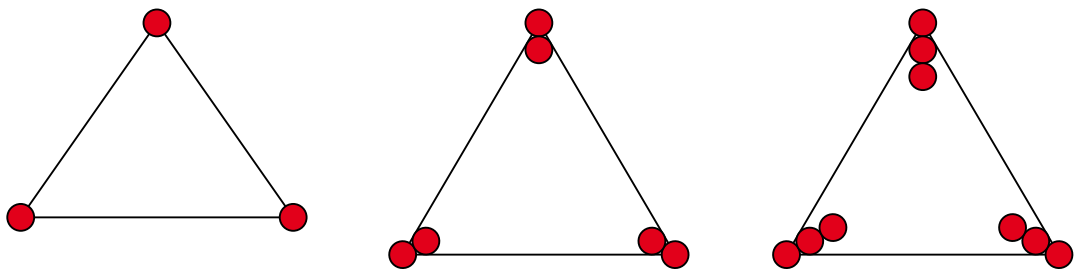
explanation 2 online

5 The position-to-term (*n*th term) rules for some sequences are given.
Write the first five terms in each linear sequence. Show your method.

a $t = n + 8$
b $t = 7n$
c $t = \frac{n}{2}$
d $t = -2n$
e $t = n - 0.4$
f $t = 2n - 1$
g $t = n + \frac{1}{2}$
h $t = 3n - 5$
i $t = 4 + 5n$
j $t = 88 - 12n$
k $t = 7 - 2n$
l $t = \frac{2n}{3} + 1$

explanation 3a explanation 3b

6 Look at the sequence of triangle patterns.



a Draw the next triangle in the sequence.
b Write down the sequence of red dot numbers in the first four patterns in this sequence.
c How many red dots will there be in the 5th pattern in the sequence?
d How many red dots will there be in the 10th pattern in the sequence?
e What is the *n*th term rule for this sequence?
f Why does this arrangement of dots give you this *n*th term rule?

7 The first five terms of some linear sequences are given. For each sequence, write the term-to-term rule, the position-to-term (nth term) rule and the 20th term.

a 4, 8, 12, 16, 20

b 3, 7, 11, 15, 19

c $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$

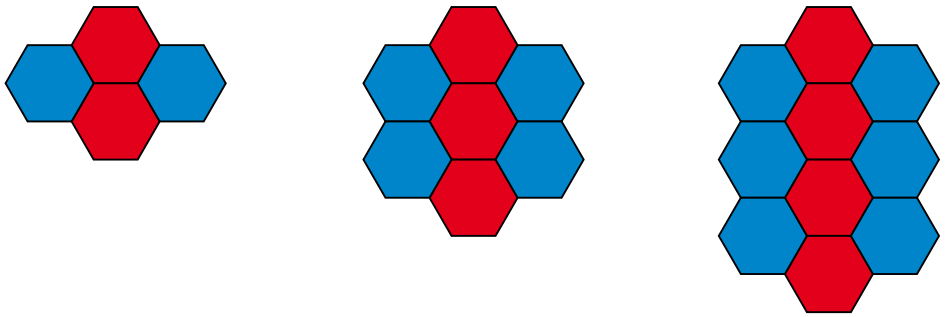
d −3, −6, −9, −12, −15

e −1, −3, −5, −7, −9

f 3, −1, −5, −9, −13

8 For each sequence in question **7**, say whether the sequence is ascending or descending.

9 Remla made tile designs with red and blue tiles.



Design 1 **Design 2** **Design 3**

a Copy and complete this table.

Design number	1	2	3	4	5	6
Number of red tiles						
Number of blue tiles						
Total number of tiles						

b Choose an expression from the box for each of these.

i The number of red tiles in the nth design.

ii The number of blue tiles in the nth design.

iii The total number of tiles in the nth design.

$2n$
$n + 2$
$n + 1$
$2n - 1$
$3n + 1$
$n + 3$

10 'Email Expert' made a sequence of neon signs of the letter E to put on her shop window.

Size 1 **Size 2** **Size 3**

a Copy and complete this table.

Size	1	2	3	4	5
Number of lights	7	10	13		

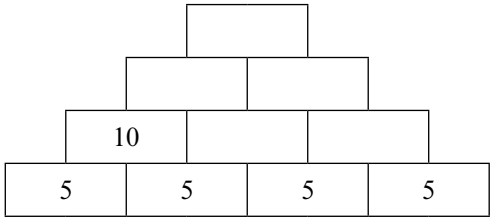
b Write the numbers of lights in the first five sizes as a sequence.

c What is the term-to-term rule for finding the next term of this sequence?

d What the *n*th term of the sequence?
Justify your expression by referring to the diagrams.

11 In an addition pyramid, each number is the sum of the numbers on the two bricks below it.

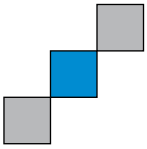
a Copy and complete this addition pyramid.
The first answer has been done for you.



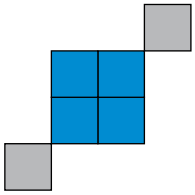
b If there were ten bricks on the bottom row, each with the number 5 on them, what number would be on the top brick?

c If the ten numbers on the bottom level were all 7, what number would be on the top brick?

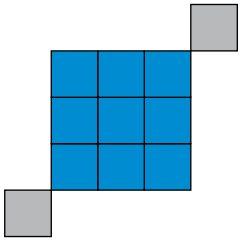
12 Fred, a landscape gardener, is designing a new range of fishponds with paving slabs at the opposite corners.



Pattern 1



Pattern 2



Pattern 3

a Draw the next two patterns in the sequence.

b Copy and complete this table.

Pattern number (n)	1	2	3	4	5
Number of blue squares					
Number of grey squares					

c How many grey squares would be in the 10th pattern?

d How many blue squares would be in the 10th pattern?

e What is the nth term for the sequence of blue squares?

f What do we call the numbers in the sequence of blue squares?

g What is the nth term for the sequence of grey squares?

explanation 4a explanation 4b

13 You will need spreadsheet software.

a Use a spreadsheet to find the first 10 terms in each of these sequences.

i $t = 3n - 5$ **ii** $t = \frac{-n}{3} + 2$ **iii** $t = n^2 + 4$ **iv** $t = \frac{3}{n^2} - 1$

b Using your spreadsheet data, plot a graph for each sequence using the position (n) as the x-coordinate and the term as the y-coordinate.

c Which of the sequences are linear sequences?