

Sequences

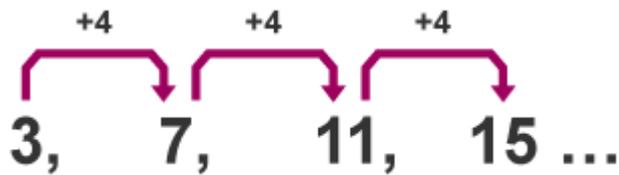
Number sequences are sets of numbers that follow a pattern or a rule.

Each number in a sequence is called a **term**.

The (term to term) **rule** of a sequence describes how to get from one term to the next. This is the pattern of the sequence.

Example Find out the rule and then work out the next two terms in the sequence 3, 7, 11, 15, ...

Firstly, work out the difference in the terms.



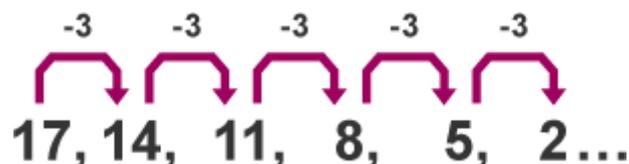
This sequence is going up by four each time, so add 4 on to the last term to find the next term in the sequence.

3, 7, 11, 15, **19**, **23**, ...

Example Write the next two terms of the sequence: 17, 14, 11, 8, ...?

First, we need to find the rule or pattern. The pattern is to subtract 3 each time, so the term to term rule is 'start at 17 and subtract 3'.

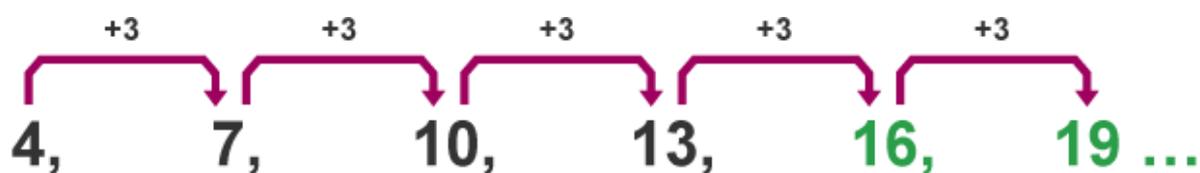
The next two terms of the sequence are 5 and 2, giving the sequence as:



To find the common difference, you need to work out how much the terms are increasing or decreasing by from one term to the next.

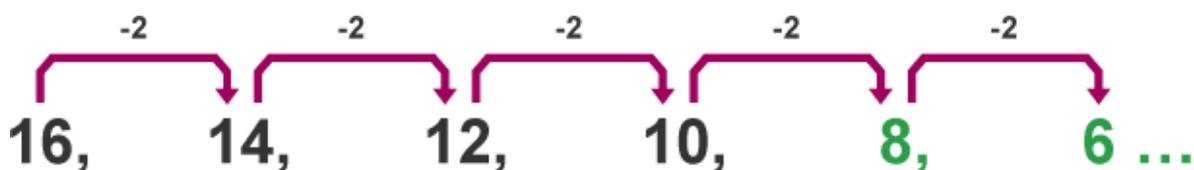
Example Find the common difference and the next two terms of the sequence 4, 7, 10, 13, ...

We can see that these terms go up by 3 every time, or we state that the common difference is 3. The next two terms will then be 16 and 19.



Example Find the common difference and the next two terms of the following sequence. 16, 14, 12, 10

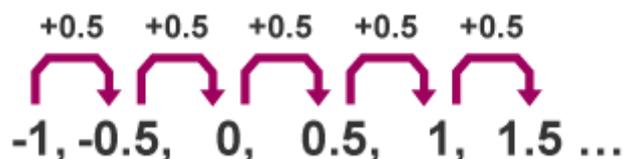
The common difference is -2. The next two terms are 8 and 6.



Example Find the rule and then work out the next two terms in the sequence -1, -0.5, 0, 0.5, ...

The first term is -1. The rule is 'add 0.5'.

So, the next two answers should be: $0.5 + 0.5 = 1$ and $1 + 0.5 = 1.5$



Example What are the next three terms of a sequence that has a first term of 1, where the term to term rule is multiply by 2?

The first term is given as 1. Each number that follows is double the number before.



Example Write down the rule and the next two terms in the number pattern: 2, 4, 8, 16 ... and then check your answer.

We can see that from 2 to 4, there is an increase of 2; from 4 to 8, there is an increase of 4; and from 8 to 16, there is an increase of 8.

The rule is, in fact, 'multiply by 2' and the next 2 terms are $16 \times 2 = 32$ and $32 \times 2 = 64$.

Exploring number patterns

2, 6, 10, 14 ... is a number pattern that follows the rule 'add 4'.

The next number is $14 + 4 = 18$

81, 27, 9, 3 ... is a number pattern that follows the rule 'divide by 3'.

The next number is $3 \div 3 = 1$

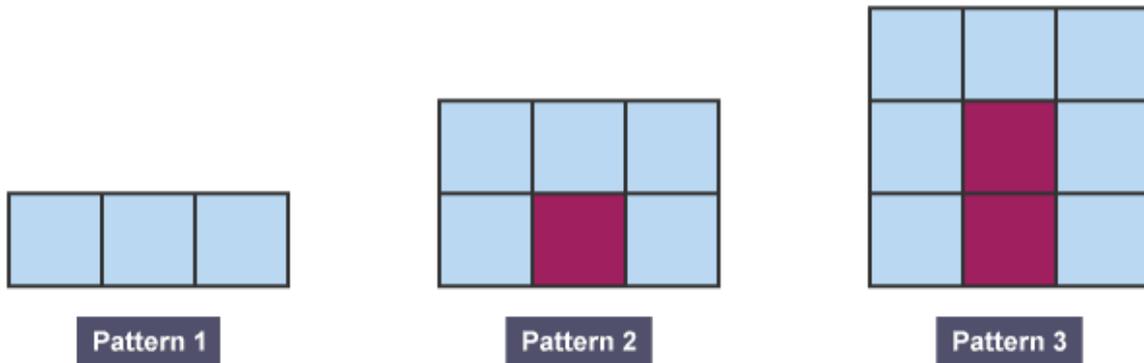
5, 8, 14, 23 ... is a number pattern that follows the rule 'add 3, add 6, add 9 ...'.

So, the next number is $23 + 12 = 35$

Number patterns in diagrams

A number pattern in a diagram often requires counting shapes to find the rule. Look at how the pattern grows from one term to the next.

Example



pattern 1 has 0 purple tiles and 3 blue tiles, so it has 3 tiles altogether

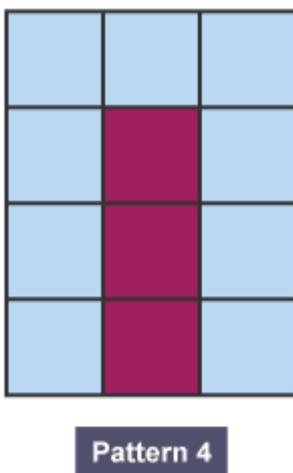
pattern 2 has 1 purple tile and 5 blue tiles, so it has 6 tiles altogether

pattern 3 has 2 purple tiles and 7 blue tiles, so it has 9 tiles altogether

Pattern Number	1	2	3
Number of purple tiles	0	1	2
Number of blue tiles	3	5	7
Total Number of tiles	3	6	9

Questions:

1. Based on the number patterns above, draw pattern 4.



2. Complete the table for pattern 4

Pattern Number	1	2	3	4
Number of purple tiles	0	1	2	3
Number of blue tiles	3	5	7	9
Total Number of tiles	3	6	9	12

3. Look again at the number patterns above. How do you think you can calculate the rule for:

a) purple tiles

b) blue tiles

c) all the tiles

a) Number of purple tiles = Pattern number – 1

b) Number of blue tiles = Pattern number \times 2 + 1 (each time we are adding 2

c) Total Number of tiles = Pattern Number \times 3 (times table of 3)

4. Complete the table for patterns 5 and 6

Pattern Number	1	2	3	4	5	6
Number of purple tiles	0	1	2	3	4	5
Number of blue tiles	3	5	7	9	11	13
Total Number of tiles	3	6	9	12	15	18