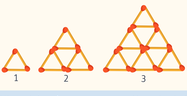
Simple Sequences

What do you need to know?

Sequences show an ordered set of pictures or numbers which follow a particular pattern or rule.



To find the next shape in a sequence, we need to work out what the **rule** is. Here, another layer of triangles gets added along the bottom row each time.
We describe the pictures in the sequence as **terms**.

In the first term we have 1 triangle, in the second term we have 3 triangles on the bottom layer, then in the third term there are 5 triangles in the bottom later.

The fourth term in the sequence would have 7 triangles along the bottom layer and 4 layers of triangles to make up the bigger triangle in total!

Remember!

Rule: the instruction which governs the sequence and which we can use to work out what the next term in the sequence will be

Term: each number or picture in the sequence.

Sequences can also be **numerical!**

2 4 6 8 10 ?

1 2 3 4 5 6

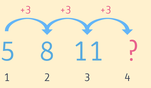
The rule here is we +2 each time. The 6th term in the sequence would therefore be 10 + 2.

10 + 2 = 12

We can also use **numbers** to better understand picture sequences:

How many leaves would there be in the 4th term of this sequence? First we need to identify the **rule**.

In the first term there are 5 leaves, in the second term there are 8 leaves, and in the third term there are 11 leaves.



The rule here is you add three leaves each time to the left hand side of the image.

11 + 3 = 14

So in the 4th term we would have 14 leaves!

Sometimes we might need to find the rule in a sequence to identify the missing term!

In this sequence, the difference between each terms is – 0.3. So the rule is we subtract 0.3 each time. To find the second term in the sequence, we can subtract 0.3 from 3.4:

3.4 - 0.3 = 3.1

So our missing term is 3.1!

If we know the rule of a sequence, the number of terms and one of the values, we can use this information to **generate** the sequence. For this sequence we have the following information:

-The rule is to add 10 each time.

- There are 5 terms.

- The second term is 12.

To get the first term, we have to subtract 10 from 12:

12 - 10 = 2

To get the 3rd , 4th , and 5th terms we add 10 each time, to give us our final sequence:

2 12 22 32 42

Let's take a look at an example:

Find the 1st and 2nd terms in this sequence:

? ? 56 78 100

1st 2nd 3rd 4th 5th

The first thing we have to do is find out what the rule is. To work this out we need to calculate what is the difference between 56 and 78, and what is the difference between 78 and 100.

56 + ? = 78 78 + ? = 100

78 - 56 = 22 100 - 78 = 22

Using subtraction, we can see that the difference each time is the addition of 22! So to calculate the 1st and 2nd terms, we need to work backwards and subtract from the 3rd term:

56 - 22 = 34 (2nd term)

34 - 22 = 12 (1st term)

So our final sequence is:

12 34 56 78 100

1st 2nd 3rd 4th 5th

Let's try a more complicated example!

What term do these 3 sequences have in common?

Sequence 1: The first term is 10, the rule is add 2.5 and there are 5 terms.

Sequence 2: 10 80 60 ? ?

Sequence 3: 24 ? ? 12 8 4

To answer this, we first need to work out what the rules are the for the sequences, so we can find the missing terms!

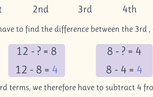
We know the rule for Sequence 1 and we know there should be 5 terms. If it starts with 10 as the first term, we add 2.5 each time to get the full sequence:

For Sequence 2, we have to find the difference between the terms to identify the rule.

The difference between 100 and 80 is -20.

The difference between 80 and 60 is also -20.

The rule therefore is to subtract 20 each time, and therefore the 4th and 5th terms must be 40 and 20. This is because 60 - 20 = 40, and 40 - 20 = 20.



For Sequence 3, we have to find the difference between the 3rd , 4th and 5th terms to identify the rule.

12 - ? = 8

12 - 8 = 4

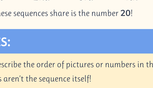
8 - ? = 4

8 - 4 = 4

To find the 2 st and 3 rd terms, we therefore have to subtract 4 from 24.

24 – 4 = 20 (2nd term)

20 – 4 = 16 (3rd term)



The term that all of these sequences share is the number **20**!

Key Points:

Terms are how we describe the order of pictures or numbers in the sequence! Remember, the terms aren't the sequence itself!

The most important thing to remember before solving any problem in a sequence is you need to work out what the **rule** is. What is the instruction which determines what comes next in the sequence? Which instruction links the terms in the sequence together?

You can work this out by calculating what the difference is between two consecutive terms in a sequence.