Year 7 Maths - Sequences

1. Generating sequences

Use these rules to generate the first 5 terms of each sequence.

Add 5 to the previous term, start with 2.

2, 7, 12, 17, 22, …

Double the previous term, start with 1.

1, 2, 4, 8, 16, …

Half the previous term and then add 4. Start with 80.

80, 44, 26, 17, 12.5, …

If the last term is even, halve it.
If the last term is odd, subtract 1 and double. Start with 24.

24, 12, 6, 3, 4, …

2. Linear sequences

Look at the sequence: **3, 5, 7, 9, 11, …**

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

The difference between two consecutive terms is 2.

A sequence is **linear** if there is a **common difference** between consecutive terms.

In this sequence the **common difference** is 2.

B. Generating linear sequences

A sequence has an nth term of **3n + 1**.

Find the first 5 terms:

$1st = 3 \times 1 + 1 = 4$
$2nd = 3 \times 2 + 1 = 7$
$3rd = 3 \times 3 + 1 = 10$
$4th = 3 \times 4 + 1 = 13$
$5th = 3 \times 5 + 1 = 16$

4, 7, 10, 13, 16, …

Notice that the sequence goes up in 3s.

The **3** in the formula represents the **common difference** between terms.

C. Finding the nth term of linear sequences

Find the nth term of this sequence **5, 9, 13, 17, 21, …**

Step 1: find the common difference

The difference between consecutive terms is **4**.

Step 2: Compare to the first 5 multiples of 4.

4, 8, 12, 16, 20, …
+1 +1 +1 +1 +1
5, 9, 13, 17, 21, …

So, the nth term formula is **4n + 1**

Find the nth term of this sequence **2, 9, 16, 23, 30, …**

Step 1: find the common difference

The difference between consecutive terms is **7**.

Step 2: Compare to the first 5 multiples of 7.

7, 14, 21, 28, 35, …
-5 -5 -5 -5 -5
2, 9, 16, 23, 30, …

So, the nth term formula is **7n - 5**

3. Special sequences

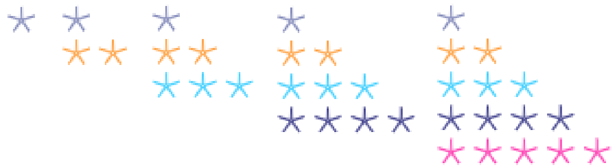
Here is a sequence: **1, 1, 2, 3, 4, 8, …**

The term-to-term rule is:

add the last two terms to get the next one

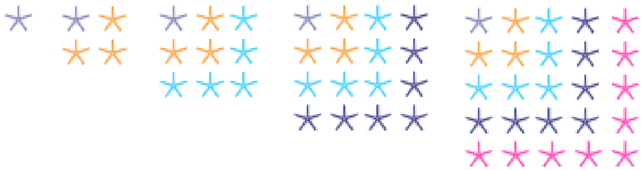
This sequence is called the **Fibonacci sequence**.

A sequence may come from a pattern.



1, 3, 6, 10, 15, …

This sequence is called the **triangular numbers.**



1, 4, 9, 16, 25, …

This sequence is called the **square numbers**.

4. Geometric progressions

Look at the sequence **2, 4, 8, 16, …**

Can you find a pattern?

Each term is multiplied by **2** to get the next term.

Look at the sequence $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \ldots$

Can you find a pattern?

Each term is multiplied by $\frac{1}{2}$ to get the next term.

> Sequences where each term is multiplied by the same number to get the next term are called geometric sequences.

The multiplier for a geometric sequence is called the **common ratio**.

Just like other sequences, a geometric sequence follows a rule.

To make a geometric sequence, you need to know the **starting point** and the **common ratio**.

Generate the first 4 terms of the geometric sequence given by the rule "start with –1 and multiply each term by 10 to get the next term."

-1 -10 -100 -1000
×10 ×10 ×10

So, the sequence is **-1, -10, -100, -1000, …**