Writing recurrence relations in symbolic form

Year 11 General Maths
Units 1 and 2

www.maffsguru.com

Learning Objectives

By the end of the lesson I would hope that you have an understanding and be able to apply to questions the following concepts:

- To be able to number and name terms in a sequence
- To be able to general a sequence from a recurrence relation

Recap

In the last lesson we looked at what a sequence is (a list of numbers which follows some rule) and how to create one (given a start number and the rule).

Mathematics is filled with notation. Using the correct notation allows us to communicate effectively and ensure we don't get confused. Sadly, sometimes, the notation confuses us. But, this is where this lesson will come in handy to unfog the language we're going to use.

-2

10 12 14 16 18 ...

The positions of a number in a list can be numbered

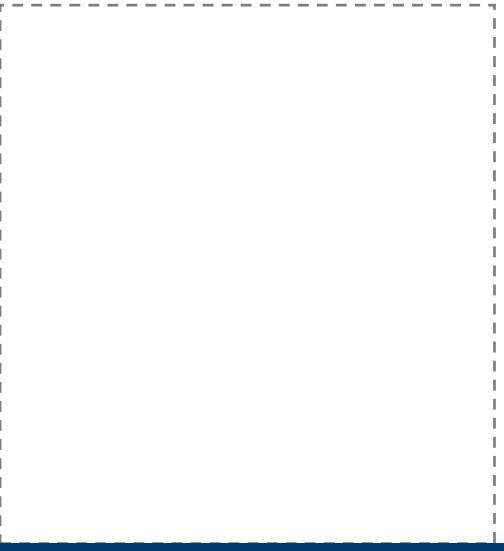
Like standing in the lunch queue waiting to be served nuggets and chips, order is important. Each person has their place and, if I wanted to, I could number each person in the queue.

A sequence is just a queue of numbers. And each place in the queue has a number.

The first number in a queue is generally given the number ‘0’.
The second number in the queue is generally given the number ’1’.
And so it continues.

Because we use algebra to make things a little clearer we can use the following notation to stand for the **position of each of the numbers**:

$$t_0, t_1, t_2, t_3, t_4, \ldots$$



The positions of a number in a list can be numbered

So, for the sequence 54. 50, 46, 42, 38, 34, 30, 26, … we can see it can be expressed as:

Term number	0	1	2	3	4	5	6	7
Term symbol	$t_0 = 54$	$t_1 = 50$	$t_2 = 46$	$t_3 = 42$	$t_4 = 38$	$t_5 = 34$	$t_6 = 30$	$t_7 = 26$
Term name	term 0	term 1	term 2	term 3	term 4	term 5	term 6	term 7

Example

For the sequence: 54, 50, 46, 42, 38, 34, 30, 26, … , state the values of:

a t_2
b t_5
c t_7

54 50 46 42 38 34 30 26

t_0 t_1 t_2 t_3 t_4 t_5 t_6 t_7

$t_2 = 46$ $t_5 = 34$ $t_7 = 26$

Recurrence relations

It is really important that you understand the difference between a recurrence relation and a rule.

A recurrence relation tells you what number to start a sequence from and how to get from term to term.

term to term

A rule tells you how to get a sequence from the **position** a number occupies in a list.

So, if I am told to start from 2 and add two to the current term, this is a recurrence relation.

$t_0 = 2$

There is a short cut (mathematical notation) which allows us to write this simpler:

$$t_0 = 2, \qquad t_{n+1} = t_n + 2$$

Add two

Take the current term

To get to the next number

2 4 6 8

Example: Recurrence relationship

Write down the first five terms of the sequence defined by the recurrence relation:

$$t_0 = 30, \qquad t_{n+1} = t_n - 5$$

Add two

Start number

To get to the next number

Take the current term

30 25 20 15 10

Making Maths
Easy, Engaging
Educational, Entertaining

Why choose MaffsGuru?

I hate talking about myself.
So, here are some of the amazing comments I receive about the videos and content I produce followed by reasons to use the resource: