Recurrence relations

Monday, 18 March 2019 5:55 pm

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

- Know what a recurrence relation is
- Know how to read a recurrence relation

RECAP

In the previous lesson we looked at what a sequence was.
It's effectively a list of numbers where, to get between each term, we perform the same mathematical calculation.

An example might be: "Take the previous term, multiply it by 3 and then add 2".

Trying to describe these types of rules using words can get very time consuming! So, Barry has come to save the day. Well … sort of!

Like Barry is want to do … he has made the language look complicated.

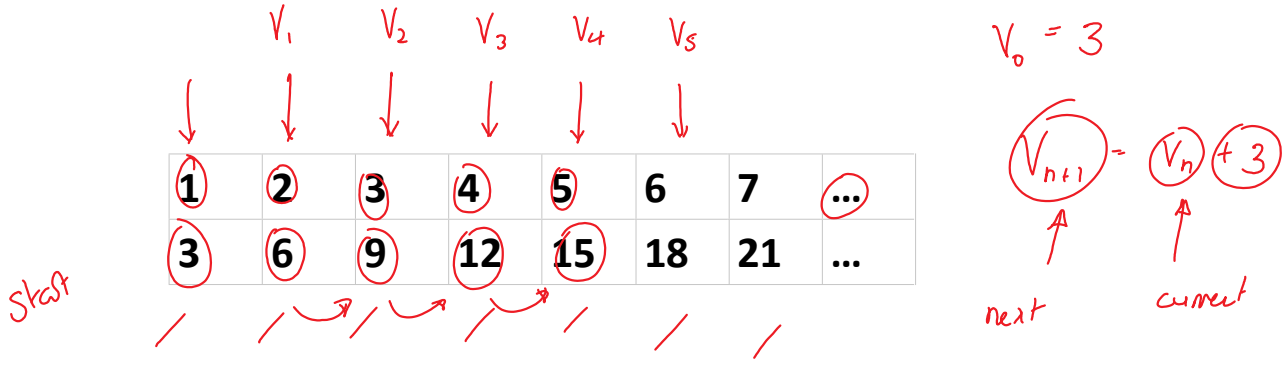
Language, language, language

OK! So … when we know the language, we can write these things with ease.
Let's look at an example …

$$V_0 = 5 \qquad V_{n+1} = V_n + 10$$

Looks confusing doesn't it!

Let's think of terms as having a position in a queue.
Much like you will have when queuing for cinema tickets, or to buy stuff at a deli counter.



$V_2 = V_0 + 3$ $\quad V_{n+1} = V_n + 3$

So, going back to our example …
Let's decode what the letters are asking us to do …

$V_0 = 5$ $\quad V_{n+1} = V_n + 10$

next current

$V_7 = V_6 + 10$

Term	1	2	3	4	5	6	7	…
	V_0	V_1	V_2	V_3	V_4	V_5	V_6	
	5	15	25	35	45	55	65	…

Important word: **ITERATIONS**
This simply means how many times we are going to do the formula after the first term has been written

Examples:

Extracted from the *Cambridge Further Mathematics Units 3 and 4 Textbook Series*

Example 1:
Write down the first five terms of the sequence defined by the recurrence relation

$V_0 = 9, V_{n+1} = V_n - 4$

showing the values of the first four iterations.

$V_{n+1} = V_n + 4$

9 5 1 −3 −7

Example 2:
A sequence is generated by the recurrence relation $V_0 = 300, V_{n+1} = 0.5V_n - 9$.

Use your **calculator** to generate this sequence and determine how many terms of the sequence are positive.

$V_{n+1} = 0.5V_n - 9$

300

5 of my terms are positive