



Number patterns

**Year 11
General Mathematics**

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Learning Objectives

By the end of the lesson I hope that you understand and can apply the following to a range of questions from the Unit 1 and 2 General Mathematics course.

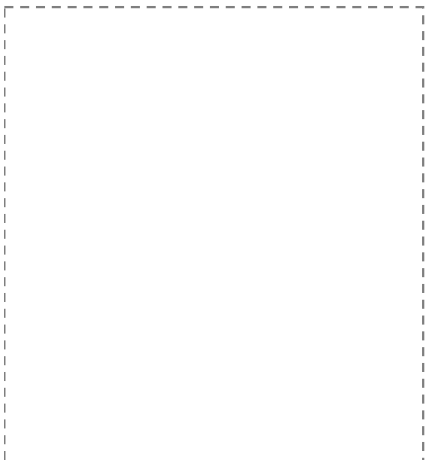
- Understand what it means to be a number pattern
- Understand that number patterns can be randomly generated or based on a rule
- Be able to find number patterns from rules
- Know what a **term** is and how to label the terms

Recap of past learning

This is a brand new topic and one which, to be honest, is like using your fingers to count! It doesn't start too hard but is filled with lots of stupid language which may, at times, trick you,

For example, there is a difference between something called a rule and a recurrence relation. Once you understand the difference it's fine, but a large number of students get tricked with this stuff all the time.

So, let's jump right in to the idea of a number pattern!



*Examples have been extracted, with
permission, from the Cambridge
General Mathematics Units 1 and 2
Textbook*

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Randomly generated sequences

I can use the CAS to come up with a random number of numbers.

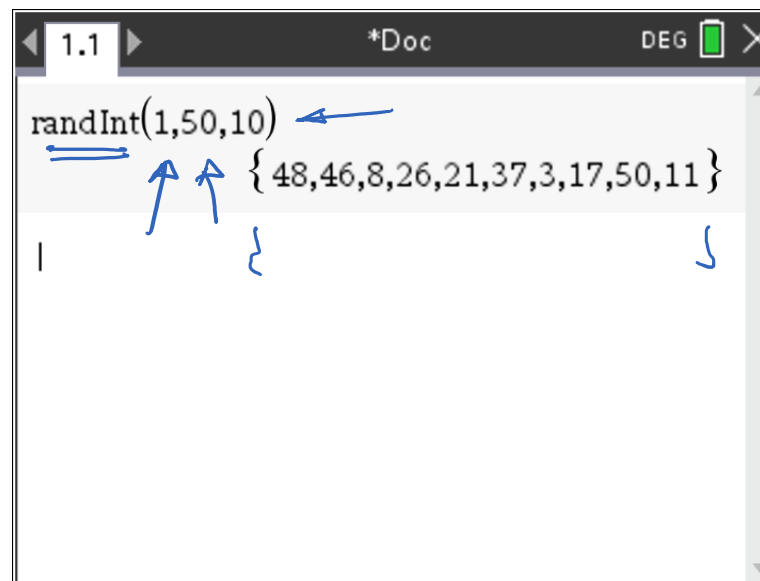
There is absolutely no pattern in the numbers. They are literally random.

You could ask what we would ever need such a list of numbers for ...

What if I wanted to randomly select 10 people from a group of 50 if they all had a number? This would be an excellent way of doing it.

The order of the numbers doesn't matter to us.

But it means we cannot predict the next number in the sequence.



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Rule based sequences

It is important to note that we like the idea of rules.

I think the textbook doesn't quite get this correct.

What we are going to be dealing with are **recurrence relationships**.

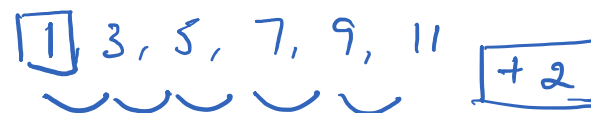
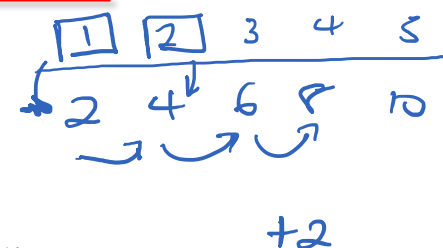
A recurrence relationship is where we have a "rule" which links how you get the next number if you know the previous number.

For example:

1, 3, 5, 7, 9, 11 ...

We know the rule is, "take the previous number and add two to it".

In the UK we call this a term-to-term rule. We can only get to the next term if we know the term before it.



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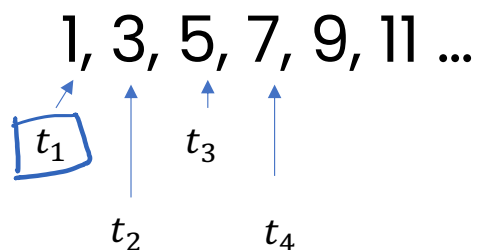
What is a term???

A term is nothing more than a number.

We find it useful to know the **first term** and the **last term** in a sequence.

The first term is labelled as t_1 with the next term being t_2 and so on.

Hence,



$$V_0 =$$

$$\begin{aligned} t_1 &= 1 \\ t_2 &= 3 \\ t_3 &= 5 \end{aligned}$$

$$t_n$$

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Example: Looking for a rule for a sequence of numbers

I prefer the idea of using the word pattern ... so find the pattern which can describe how to find the next number in each of the following sequences:

- 2, 8, 14, 20, ...
- 5, 15, 45, 135, ...
- 7, 4, 1, -2, ...
- 1, 4, 9, 16, ...
- 1, 1, 2, 3, 5, ...

* 1, 1, 2, 3, 5 ...

2, 8, 14, 20

plus 6 +6

5, 15, 45, 135

x3, times 3

7, 4, 1, -2 ..

-3, subtract 3

1, 4, 9, 16 ...

square numbers

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