Sigma Notation

Introduction

An ordered set of numbers obeying a simple rule is called a **sequence**.

2, 4, 6, 8, 10...

17, 22, 27, 32, 37... etc.

A **series** or progression is when the terms of a sequence are considered as a sum.

2 + 4 + 6 + 8 + 10 +...

17 + 22 + 27 + 32 + 37 + ... etc.

Sigma Notation

Instead of writing long expressions like

$$1^3 + 2^3 + 3^3 + 4^3 + 5^3 \ldots + n^3$$

we are able to write:

$$\sum m^3$$

which means ' the sum of all terms like m^3 '

To show where a series begins and ends, numbers are placed above and below the sigma symbol. These are equal to the value of the variable, 'm' in this case, taken in order.

Hence

$$\sum_{1}^{n} m^3 = 1^3 + 2^3 + 3^3 + 4^3 + 5^3 + \ldots + n^3$$

more examples

$$\sum_{2}^{5} m(m-1) = 2(2-1)+3(3-1)+4(4-1)+5(5-1)$$

$$\sum_{3}^{7} m^2 = 3^2+4^2+5^2+6^2+7^2$$

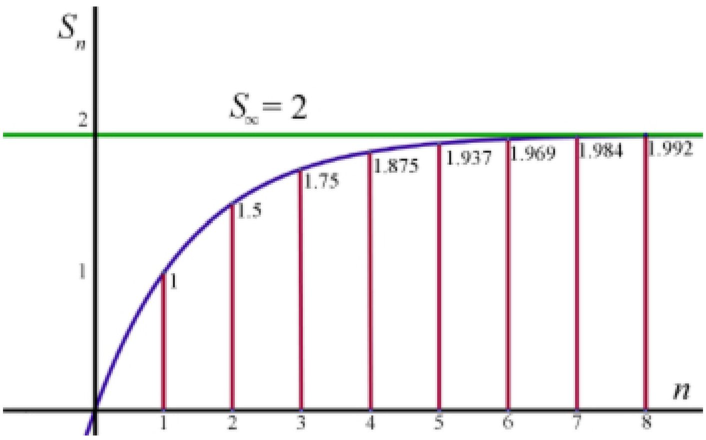
$$\sum_{4}^{9} \frac{1}{m} = \frac{1}{4}+\frac{1}{5}+\frac{1}{6}+\frac{1}{7}+\frac{1}{8}+\frac{1}{9}$$

Convergence

This concerns geometrical progressions that as the number of terms increase, the value of the sum approaches one specific number. This number is called **the sum to infinity**.

Look at this example. As the number of terms(n) increases, the sum of the progression (S_n)approaches the number 2.

$$\frac{1}{1}+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\frac{1}{32}+\frac{1}{64}+...+\frac{1}{2^{n-1}}$$



You can find out more about convergent series in the topic ‘geometrical progressions’.

Recurrence

Recurrence is when there is some mathematical relation between consecutive terms in a sequence.

The Fibonacci series is a good example of this. The numbers of the series are made up by adding the two previous numbers.

$$0 + 1 + 1 + 2 + 3 + 5 + 8 + 13 + 21 \ldots$$