

A *recurrence relation* is a formula which defines a sequence of numbers by telling you how to get to the next term of the sequence from previous ones.

For instance, the Fibonacci numbers  $F(n)$  are defined by the recurrence relation

$$\begin{aligned}F(n) &= F(n-1) + F(n-2) \\ F(1) &= F(2) = 1,\end{aligned}$$

which says that each number in the sequence is equal to the sum of the two previous ones, and also gives the starting values.

Similarly, the sequence of powers of 2 can be defined by

$$\begin{aligned}a_{n+1} &= 2a_n \\ a_0 &= 1.\end{aligned}$$

Sometimes we can find ways to turn a recurrence relation into an ordinary formula which gives the  $n$ th term in terms of  $n$ , but this is not always easy. For the powers of 2 example,  $a_n = 2^n$ , but a formula for the  $n$ th Fibonacci number is harder to obtain.