

Number Sequences

Essential information

Linear sequence This is given by the formula $u_n = an + b$, ($n = 1, 2, 3, \dots$) where a and b are constants. and u_n is the n th term in the sequence, $n = 1, 2, 3, \dots$
For example, $u_n = 3n + 4$ gives the sequence 7, 10, 13, 16, 19, ...

Fibonacci Sequence This is defined by $u_n = u_{n-1} + u_{n-2}$ ($n = 3, 4, 5, \dots$) with $u_1 = u_2 = 1$.
This gives the sequence

$$1, 1, 2, 3, 5, 8, 13, \dots$$

Iterative formula When the n th term in a sequence is given in a formula in terms of earlier terms, but with sufficient information to generate the complete sequence. For example,

$$u_n = u_{n-1} + 1, \quad u_1 = 0 \quad \text{for } n = 2, 3, \dots$$

$$u_n = u_{n-1} + u_{n-2}, \quad u_1 = 1, u_2 = 1 \quad \text{for } n = 3, 4, \dots$$

$$u_n = \frac{u_{n-1}}{2}, \quad u_1 = 2 \quad \text{for } n = 2, 3, \dots$$

Convergence This is where the terms of a sequence are tending towards a finite number.

For example, $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \dots$ converges to 0

$1, 1 - \frac{1}{2}, 1 - \frac{1}{3}, 1 - \frac{1}{4}, \dots$ converges to 1

Divergence This is where the terms of a sequence are tending towards infinity.

For example, $1, 2, 4, 8, 16, \dots$
 $5, 10, 15, 20, 25, \dots$