

4A Forming Recurrence Relations

A recurrence relation:

An initial condition:

First-order and second-order recurrence relations:

1. You owe £500 on a credit card that charges 1.5% interest each month. You decide to make no new charges and you pay off £50 each month. Formulate a recurrence relation that describes the balance remaining on the credit card after n months.
2. The deer population of a county was observed to be 1200 in a given year. The population is modelled to increase at a rate of 15% each year. Let d_n be the population of deer n years later. Explain why the deer population is modelled by the recurrence relation $d_n = 1.15d_{n-1}$, with $d_0 = 1200$.
3. A population of bacteria has initial size 200. After one hour, the population has reached 220. The population grows in such a way that the rate of growth doubles each hour. Write a recurrence relation to describe the number of bacteria, b_n , after n hours.

How to verify that a general term $u_n = f(n)$ satisfies a recurrence relation:

4. A sequence has the general term $u_n = 3n - 1$. Verify that the sequence satisfies the recurrence relation $u_n = 3 + u_{n-1}$.

5. A sequence has the general term $u_n = 2 \times 3^{n-1}$. Verify that the sequence satisfies the recurrence relation $u_n = 3u_{n-1}$.

Recursive form and closed form of a sequence: