

SOLUTIONS FOR QUIZ 9

A sequence (a_n) satisfies the recurrence relation $a_n = a_{n-1} + 6a_{n-2}$ ($n \geq 2$), and the initial conditions $a_0 = 3$, $a_1 = -1$. Find an explicit formula for a_n .

Answer: $a_n = 3^n + 2(-2)^n$.

First, write down the characteristic equation: $r^2 - r - 6 = 0$. It has two roots: $r_1 = -2$ and $r_2 = 3$. Thus, the general solution for the (linear and homogeneous) recurrence relation is given in the form $a_n = \alpha_1(-2)^n + \alpha_2 3^n$. We use the initial conditions to compute α_1 and α_2 :

$$\begin{cases} a_0 = 3 & = \alpha_1 + \alpha_2 \\ a_1 = -1 & = -2\alpha_1 + 3\alpha_2 \end{cases} .$$

Solving this system of equations, we obtain: $\alpha_1 = 2$, $\alpha_2 = 1$.

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