Problem 1: Solve the recurrence $P_n = -P_{n-1} + 12P_{n-2}$, with initial conditions $P_0 = 3$ and $P_1 = 2$. Show your work, clearly marking all steps of the solution.

Problem 2: Find a general solution for the following recurrence equation:

$$Q_n \;=\; Q_{n-1} + 5Q_{n-2} + 3Q_{n-3} + 3^n.$$

Show your work, clearly marking all steps of the solution.
Hint: The characteristic polynomial factors into $(x+1)^2(x-3)$.

Problem 3: Let R_n be the number of strings of `A`'s, `B`'s and `C`'s that do not contain `AA` or `BA`. Give a complete recurrence for R_n and justify it. (Do not solve it.)