

CS111 ASSIGNMENT 3

Problem 1: We want to tile an $n \times 1$ strip with tiles of three types: 1×1 tiles that are dark-blue, light-blue, and red, 2×1 green and 3×1 sky-blue tiles. a) Give a formula for the number of tilings A_n . b) Now give a formula for the number of tilings T_n , considering that blue tiles cannot be next to each other. Your solution must include a recurrence equation (with initial conditions!), and a full justification. You do not need to solve it.

Problem 2: Find the general solution of the following recurrence equation:

$$f_n = 4f_{n-9}$$

Show your work.

Problem 3: Solve the following recurrence equation:

$$\begin{aligned}f_n &= f_{n-1} + 4f_{n-2} + 2f_{n-3} \\f_0 &= 0 \\f_1 &= 1 \\f_2 &= 2\end{aligned}$$

Show your work (all steps: the characteristic polynomial and its roots, the general solution, using the initial conditions to compute the final solution.)

Problem 4: Find a particular solution of the recurrence equation:

$$t_n = 4t_{n-1} - 4t_{n-2} + 3 \cdot 2^n$$

Show your work.

Problem 5: Solve the following recurrence equation:

$$\begin{aligned}f_n &= 13f_{n-2} + 12f_{n-3} + 2n + 1 \\f_0 &= 0 \\f_1 &= 1 \\f_2 &= 1\end{aligned}$$

Show your work (all steps: the associated homogeneous equation, the characteristic polynomial and its roots, the general solution of the homogeneous equation, computing a particular solution, the general solution of the non-homogeneous equation, using the initial conditions to compute the final solution.)