Problem 1: Rumour spreading

Rumour spreading is one of the basic mechanisms for information dissemination in networks. For simplicity, assume that rumour can be spread by either male or female person. Female person can spread the rumour by disseminating the information to other two female people and one male person, where as when male person can spread the rumour by disseminating the information to one female person and one male person. Assume that the spreading of rumour is clocked, that is, each spreading happens at the beginning of a microsecond (our unit of time in this exercise). At t = 0, we start the rumour spreading just by staring with a single female person.

Let H_n denote the number of female person and L_n the number of male person at time t = n. We have:

$H_0 = 1$,

$L_0 = 0$,

$H_n = 2H_{n-1} + L_{n-1}$ for n > 1,

$L_n = H_{n-1} + L_{n-1}$ for n > 1

Use a floating-point representation (preferably double) for H_n and L_n. These counts are integers but grow so rapidly that except for small values of n, **int** variables encounter overflow for storing them. Given an integer n ≥ 0, we want to compute H_n and L_n. Three ways of doing this are explained below.

Method 0: Individual computation of H_n and L_n

Write a function *hirec(n)* that returns H_n (and nothing else). Likewise, write a function *lorec(n)* to return L_n (and nothing else). The only parameter that may be passed to each of these functions is n.

Method 1: Simultaneous computation of H_n and L_n

Write a function *hilorec(n)* to return the pair (H_n,L_n) (in a structure or a two-element array). Again, the only parameter allowed to be passed to the function is n.

Method 2: Use of Explicit formulas

Using techniques (slightly) beyond the scope of this course, we can obtain the following closed-form formulas valid for all n >= 0.

$$H_n = \left(\frac{5+\sqrt{5}}{10}\right)\left(\frac{3-\sqrt{5}}{2}\right)^{n+1} + \left(\frac{5-\sqrt{5}}{10}\right)\left(\frac{3+\sqrt{5}}{2}\right)^{n+1},$$

$$L_n = \left(\frac{-5-3\sqrt{5}}{10}\right)\left(\frac{3-\sqrt{5}}{2}\right)^{n+1} + \left(\frac{-5+3\sqrt{5}}{10}\right)\left(\frac{3+\sqrt{5}}{2}\right)^{n+1}.$$

Write a function hiloformula(n) that uses these formulas to compute and return the pair (H_n, L_n)