$$P_E(n,L) = \sum_{k=0}^{n-1} P(Last = k) \times (P_E(k,k) \otimes P_E(n-k-1, L-k-1))$$

$$Where : P_E(A) \otimes P_E(B) = \begin{cases} P_E(A) \times P_E(B) + (1 - P_E(A)) \times (1 - P_E(B)) & k : even \\ P_E(A) \times (1 - P_E(B)) + (1 - P_E(A)) \times P_E(B) & k : odd \end{cases}$$

and $P(Last = k) = \dfrac{L-k}{\sum_{k=0}^{N-1}(L-k)}$

During the recursion we need only to compute 2N terms :

- $P_E(k,k) : k = 0..N$ for the back race
- $P_E(n, L-N+n) : n = 0..N$ for the front race

Remark : In this explanation $L = 1800/40$