$$(s+q)\sin(\beta) = (s+p)\sin(\alpha)$$

$$as\ SP_1 = s+p\ and\ CP_1 = s+q$$

$$\beta(s+q) = \alpha(s+p) + k\pi$$

$$where\ k \in \{1, 2, ..., s+p-1\}$$

$$Sizes = (Smax, \frac{s+p}{2\pi}, \frac{s+q}{2\pi})$$

$$\alpha_{max}, \beta_{max}\ and\ k_{max} = \lfloor \beta_{max}(s+q) + \alpha_{max}(s+p) \rfloor$$

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 $L = 1800/40$