The Monte-carlo technique originated during the second world war atomic bomb development. The bomb which was dropped on 06 August, 1945 had around 60 Kg of fissionable mass. Less than one Kg underwent nuclear fission, but it was enough to produce an explosion which released energy equivalent to 15 kilotons of TNT and destroyed a city.

In nuclear fission, a neutron is bombarded to hit a nucleus of an atom (uranium-235 or plutonium-239). When an atom undergoes nuclear fission, a few neutrons (the expected number depends on several factors, usually between 2.5 and 3.0) are ejected from the reaction. These free neutrons will then interact with the surrounding material, and if more fissile fuel is present, some may be absorbed and cause more fissions. Thus, the cycle repeats to give a reaction that is self-sustaining.

The critical mass is the smallest amount of fissile material needed for a sustained nuclear chain reaction. When a nuclear chain reaction in a mass of fissile material is self-sustaining, the mass is said to be in a critical state in which there is no increase or decrease in power, temperature, or neutron population.

Suppose p_i, $i = 0, 1, 2, 3$ are the probabilities that a neutron will result in a fission that produces i new neutrons. The task is to calculate the probability distribution of the number of neutrons produced in the n-th generation of a chain reaction.

This problem is similar to problems like spreading a disease. Also, it is related to family name extinction problem studied during nineteenth century. For the family name extinction problem, $p_0 = 0.4825$ and $p_i = (0.2126)\,(0.5893)^{i-1}$.

Assume $i = 0, 1, 2, 3$ and calculate the probabilities of having 0, 1, 2, 3, 4 number of neutrons in the n-th generation.