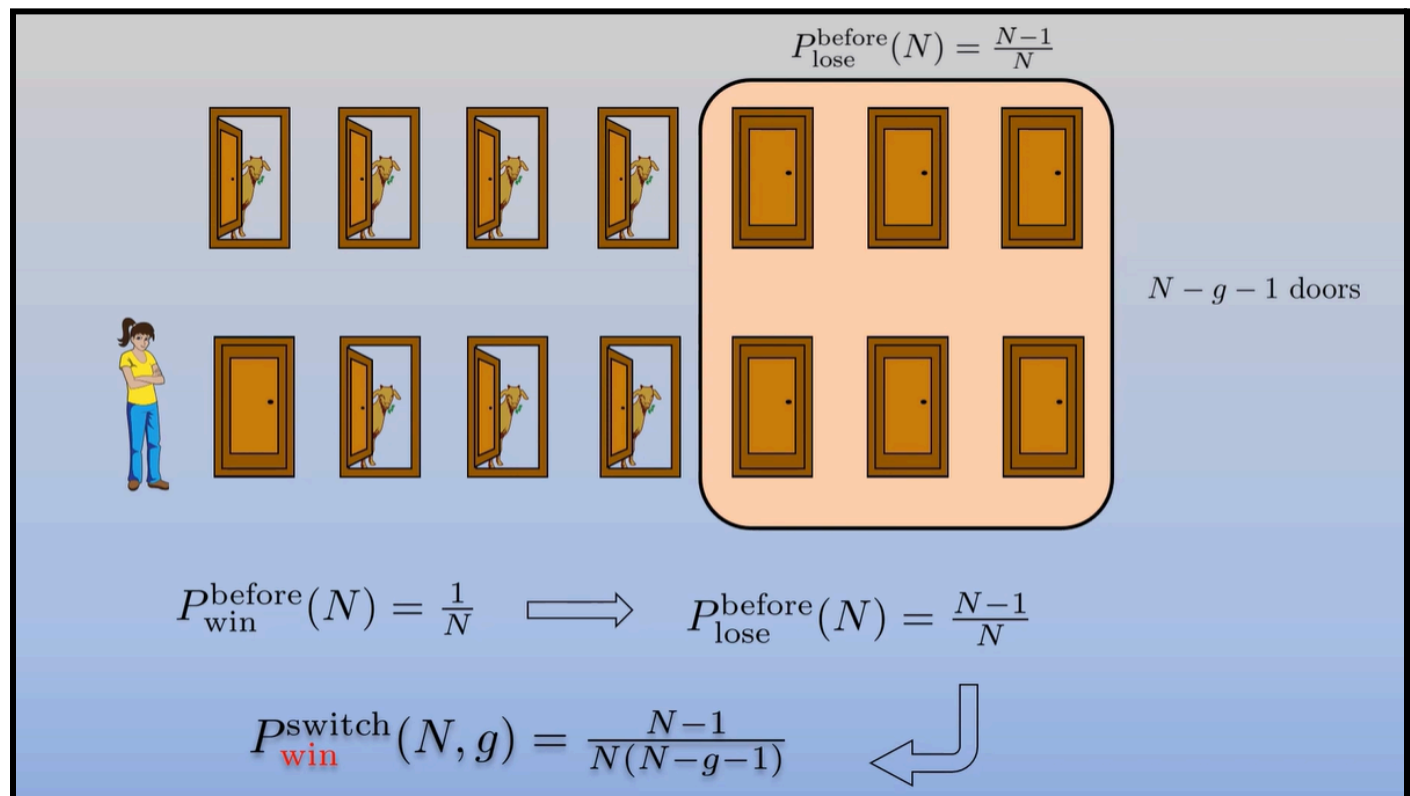


Monty Hall Simulator (Extended to n doors)

Probability Formula (Diagram + Derivation)



- Let the number of doors be N .
- Let the number of doors opened after choice 1 be g .
- Let $P(Ws)$ be the probability of winning if he stays.

$P(Ws)$ -

The initial probability of making the correct pick out of N doors should be $\frac{1}{N}$. If the player keeps his initial pick, then he must have picked the car to win. Hence probability of winning the game stays the same.

$$\Rightarrow P(Ws) = \frac{1}{N}$$

- Let $P(Wc)$ be the probability of winning if he switches.

$P(Wc)$ -

To win after switch, the intersection of 2 events should happen.

Event 1:

The player must make an incorrect initial pick. The probability of that is $P(E1) = \frac{N-1}{N}$.

Event 2:

Following an incorrect pick in event 1, the number of doors to pick from are now reduced to $(N - g - 1)$. Now, the player must be lucky enough to pick the correct door out of these doors if he wants to win on a switch.

$$P(E2) = \frac{1}{N-g-1}.$$

Taking the intersection of 2 events.

$$\Rightarrow P(E1 \cap E2) = P(E1).P(E2 | E1) = \frac{N-1}{N} \times \frac{1}{N-g-1}.$$

$$\Rightarrow P(Wc) = \frac{N-1}{N \times (N-g-1)}$$

Hence we have derived the probabilities of winning if the player stays with his initial pick and winning if the player switches to a new pick. As asked in the question, the probabilities in terms of n and k would be.

Stays

$$P(Ws) = \frac{1}{n}$$

Switches

$$P(Wc) = \frac{N-1}{N \times (N-g-1)}$$