Monty Hall Mathematical Analysis

Suppose we have n doors with a prize behind 1 of them. The probability of choosing the door with the prize behind it on your first pick is $\frac{1}{n}$

Host then opens k doors, where $0 \leq k \leq n-2$ (he has to leave your initial choice door and at least one other door to choose if you switch).

The probability of picking the prize if you choose a different door is the chance of not having picked the prize in the first place, which is $\frac{n-1}{n}$, times the probability of picking it now, which is $\frac{1}{n-k-1}$.

This gives us a total probability of $\frac{n-1}{n} \cdot \frac{1}{n-k-1}$ which can also be written as, $\frac{1}{n} \cdot \frac{n-1}{n-k-1}$.

So, we can conclude that,

$Prob\_win\_ticking = \frac{1}{n}$

$Prob\_win\_switch = \frac{1}{n} \cdot \frac{n-1}{n-k-1}$