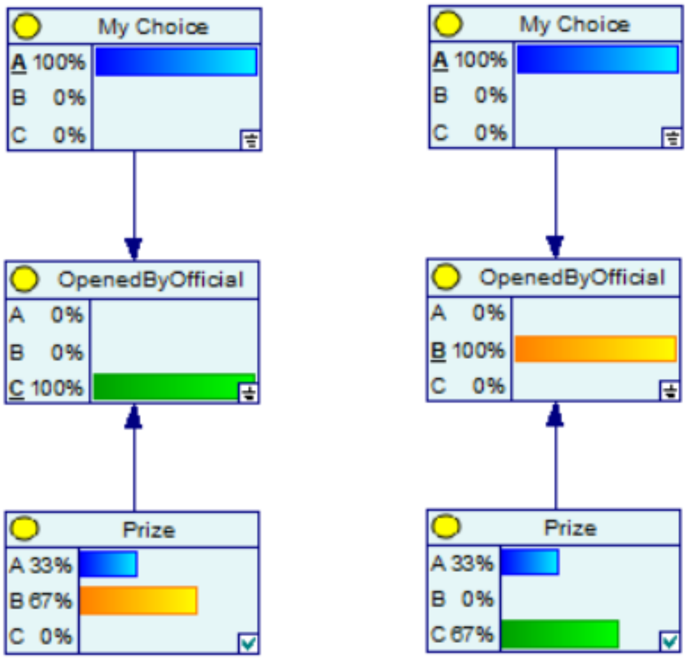
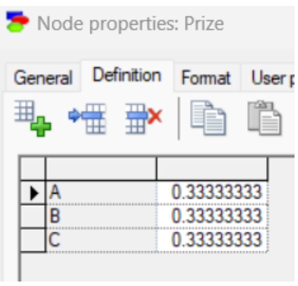
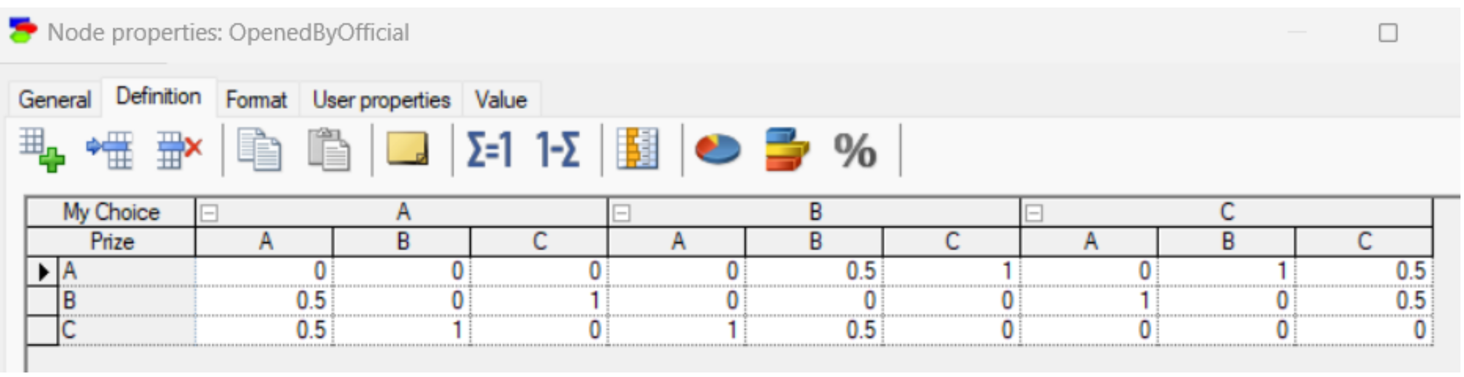
Assignment 2; The Monty Hall Problem

Screenshots from GeNIe;





A	0.33333333
B	0.33333333
C	0.33333333



My Choice	A			B			C		
Prize	A	B	C	A	B	C	A	B	C
A	0	0	0	0	0.5	1	0	1	0.5
B	0.5	0	1	0	0	0	1	0	0.5
C	0.5	1	0	1	0.5	0	0	0	0

I tried using GeNIe to show how to solve this problem, as shown above. I will try to explain it with words as well. When we first make our choice of door, there is an equal probability of 0.33 for prize for any given door. Since the official cannot open the door we have chosen, the probability of the prize beeing in the door that we initially choose is unaffected by the official opening a door since he would be able to open a door without a prize independent of our initial choice. This means that when the official opens one of the other doors without a price, the chance of the prize beeing in the door he did not open, increases from 0.33 to 0.66. We naturally want to choose the door which makes us most likely to win a prize, hence we should change our choise from the initial choise to the other unopened door.

Attempt at manual calculation;

A: Prize is behind door A
$\bar{B}$: Door B is opened and there is no prize

Let's choose A initially (choice does not matter)

$P(A) = \frac{1}{3}$

$P(\bar{B}|A) = \frac{1}{2}$

$P(\bar{B}) = \frac{1}{3} \times \frac{1}{2} + \frac{1}{3} \times 0 + \frac{2}{3} \times 1 = \frac{1}{2}$

$\rightarrow P(A|\bar{B}) = \dfrac{P(\bar{B}|A) \times P(A)}{P(\bar{B})} = \dfrac{\frac{1}{2} \times \frac{1}{3}}{\frac{1}{2}} = \dfrac{1}{3}$

$\Rightarrow \quad P(C|\bar{B}) = 1 - P(A|\bar{B}) = \frac{2}{3}$

(Such that $P(C|\bar{B}) + P(A|\bar{B}) = 1$)