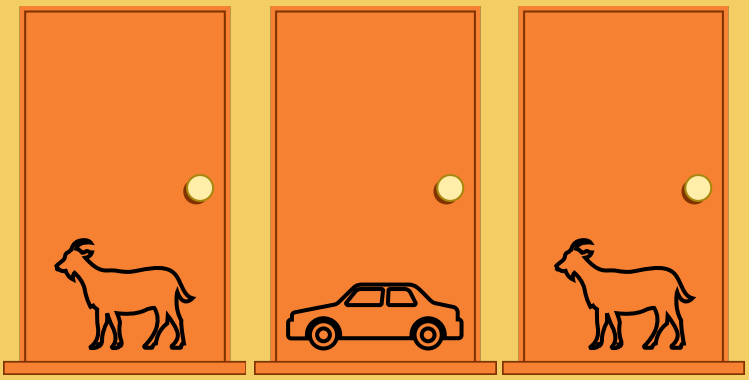
The Monty Hall Problem



- In this problem, you get to pick a door first
- Monty Hall will open one of the other two doors that has a goat.
- Then you have the choice to stay on your chosen door, or switch to another. (You're trying to get the car obviously)
- So the question is, do you stick with your chosen door or switch to one of the others?

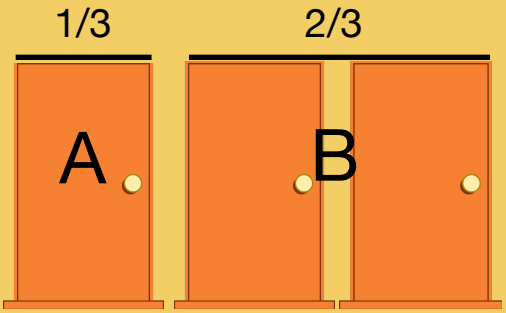
This problem is a bit counter-intuitive, because surprisingly, the odds aren't 50-50, so there is a choice which is better than the other.

From now on I'll refer to your first chosen door as door A, and the rest of the doors you can switch to as group B.

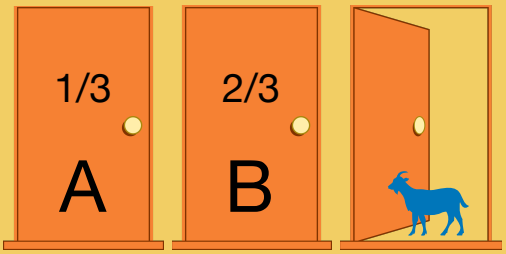
It's a lot simpler when thinking about 1000 doors. So at first you make a random choice of the 1000 doors, and that has a 1 out of a 1000 chance of being right, and every other door collectively has a 999 out of 1000 chance of being right. Now Monty Hall will show you 998 goats from group B, and then asks you what you want to do.

So when you have to decide, Monty Hall has eliminated 998 wrong options out of group B, and the door that you originally chose odds has to stay at 1/1000, because when you chose that door the choice was out of 1000 doors, and that doesn't change if you take away doors from group B (by revealing the doors you don't want). So that 99.9% chance has been taken from being spread out over 999 doors, to just one door. And that door now has a 99.9% chance of being right, while your door still has a 0.01% chance of being wrong. So obviously you want to switch doors.

{If you wanted to get the choice to swap or stay every time (though you only get to choose a second door once), it'd still be better to stay and then swap at the last two doors, because if you swap when there's more than 1 door in group B, you automatically have a lower chance. Such as when swapping when there are three doors left in total, group B has only been condensed to 2 doors so you would have a 1/2 of a 999/1000 chance of being right; and the more doors you leave in group B the lower your chances of winning when you swap.}



Now you can take this theory down to three doors. You choose a door, which has a 1/3 chance of being right. And the other two doors have a collective 2/3 chance of being right. If you swapped now each of the doors would have a 1/2 of a 2/3 chance of being the right one, because each door is half of the total of doors, which makes it a 1/3 chance for each of the doors, and since you can only choose one when swapping, swapping at this point gives you a 1/3 chance of winning.



Then Monty Hall will take away one of the doors from the second group of doors (by showing you one of the options you don't want), so that door that's left has the 2/3 chance of being right, while the door you chose originally still has a 1/3 chance of being right.

If you still don't believe me, here is a table of all the possible results. So you can see that you're definitely wrong.

Door 1 (Original choice)	Door 2	Door 3	Result staying with door 1	Result switching to the door which hasn't been revealed
Car	Goat	Goat	Win	Loss
Goat	Car	Goat	Loss	Win
Goat	Goat	Car	Loss	Win
	Door which has been revealed	Door which hasn't been revealed	1/3 chance of winning	2/3 chance of winning

So basically, switch doors.