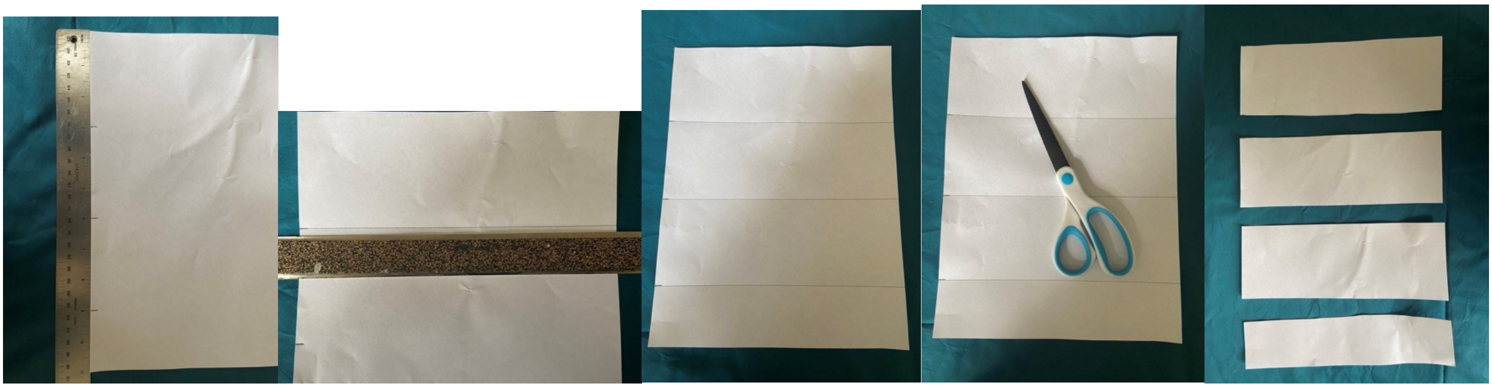
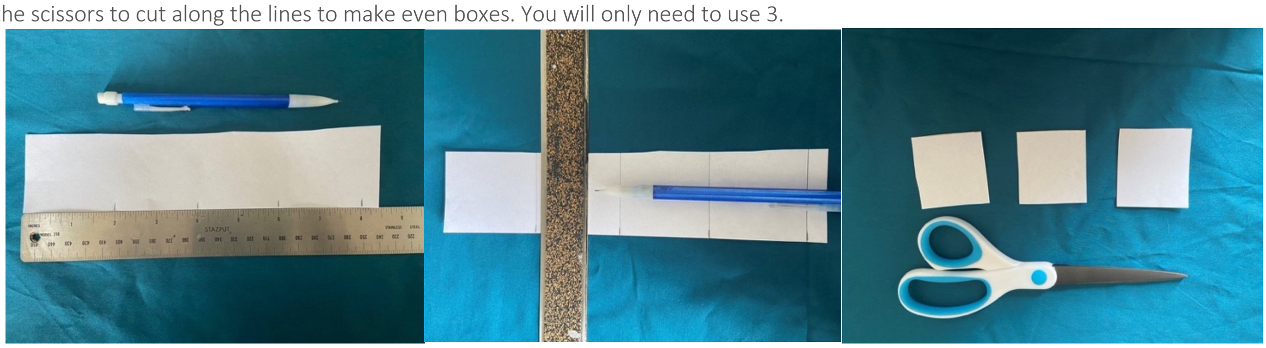
Monty Hall

Step 1: Take the piece of paper and mark the 11 in (28 cm) side every 3 in (approx. 8 cm) with the ruler. Use the back of the ruler as a straight edge to make a line all the way across the paper. With the scissors cut along the lines to create three 3 in (8 cm) wide papers and 1 smaller strip.

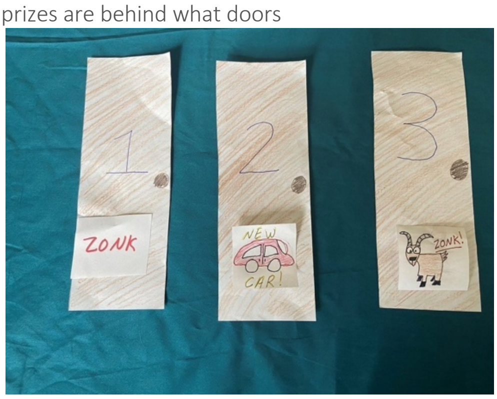


Step 2: On the smaller piece of paper, mark every 2in (5cm) on the 8 ½ in (22 cm) side. Use the back of the ruler as a straight edge to make lines across. Use the scissors to cut along the lines to make even boxes. You will only need to use 3.

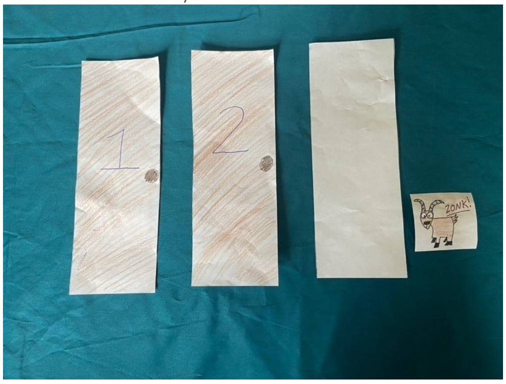


Step 3 Decorate the large pieces to look like doors and label them “1”, “2”, and “3”. On 2 of the small pieces, label them as a “ZONK” and the other as the prize of your choice. Feel free to be as simple or complex in your decorations as you desire.

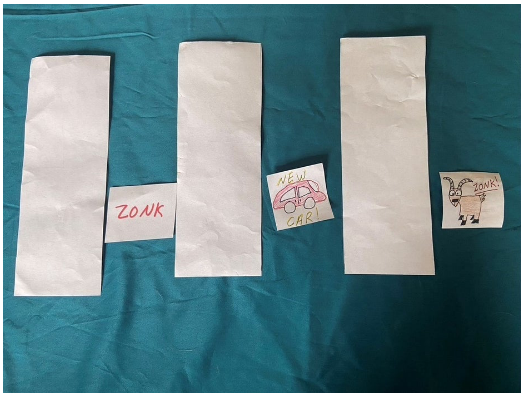
Step 4: Choose one person in your family to be the host (Monty Hall). This person will hide the prizes behind the doors without the other person knowing. The host must be able to remember what prizes are behind what doors



Step 5: Now you should choose one door as "Your Door". Have the Host open one of the doors with a ZONK behind it that is not the player's chosen door. The host will then offer to for the player to switch doors if they choose.



Step 6: The Host can now show the other doors and their prizes to reveal if the player won or lost. Repeat this experiment over a different number of times (10, 20, 30, etc.) and see how many times the person wins after switching and after not switching. Work out the probability of winning after switching for 10 times, 20 times, 30 times etc.



Question: Do you win more by switching or keeping your original door and why?

Answer

By switching. The trick is based on the $\frac{2}{3}$ chance. You should change doors, but the $\frac{2}{3}$ chance will only work for the long term.

This seems like it can't be correct, doesn't it? When Marilyn Vos Savant wrote the (correct) solution to this problem, her mailbag was swamped with furious but well-meant comments from top mathematicians.

Let's explain further.
If you plan on switching doors after the reveal, you only lose if you pick the car first $\frac{1}{3}$. Otherwise, you win $\frac{2}{3}$.

Edit: If you plan on switching doors after the reveal, you're basically saying you want both doors other than your original choice (one of which will be opened to reveal a goat). With a switching strategy, the basic effect is that your first choice is what you don't want and you do want the other 2.

Here's an intuitive way to understand it:
Assuming it is nothing, nothing, something.
Person selects door b.
Before door b is opened, person is asked "do you want to stick with b, or get what's behind both doors a and c"
If you stick with b, you only win if the car is behind door b, which happens 33% of the time. However, because the host always opens a "nothing" door, by switching you only lose if the car is behind door b (which again happens 33% of the time). Thus, it's easy to see why you win 67% of the time.

The key is that Monty Hall always opens a door which has a goat, leaving one door with a goat and one door with the car. One of those doors you've already chosen. The other you haven't chosen. One has the car, one has the goat. But ,the trick is this: you chose before the reveal. So initially, you had a $\frac{1}{3}$ chance of picking a car and $\frac{2}{3}$ chance of picking a goat/zonk. So, after the reveal, you still have a $\frac{1}{3}$ chance that you initially picked the car, which means there's a $\frac{2}{3}$ chance that the other door is the car.