

## The Princess or the Tiger

from: Raymond Smullyan

The King of Indrahabad had heard of a story where a prisoner had to choose between two doors: behind one there was a princess, behind the other a tiger. If the prisoner chose the princess, he could marry her; if he chose the tiger, he would probably be eaten.

The King thought this was a nice idea for his prisoners. But he didn't want to leave things completely to chance, so he decided that he would put some signs up on the doors. The signs would give some clues as to what was behind the doors. A clever prisoner who can reason logically would be able to save his own life. And, of course, in that way the King could ensure that the husbands for all his daughters would be smart!

To make it a bit more difficult the King decided that it would also be possible that there are princesses behind both doors or tigers behind both doors. But there will never be more than one princess per room or one tiger per room.

### CASE 1

The following two signs were put up on the doors:

I

*In one of these rooms, there is a princess and, in the other, there is a tiger.*

II

*In this room, there is a princess and, in the other room, there is a tiger.*

The prisoner asked: "Is it true, what the signs say?"

The King said: "One is true and one is false".

Which door would you take if you were the prisoner? Why?

### CASE II

So happily the first prisoner succeeded in saving his life and ran away with his bride.

For the second prisoner the following signs were put up:

I

*In the other room, there is a tiger.*

II

*In at least one of these rooms, there is a princess.*

"Are they true or not?" asked the prisoner.

"They are either both true or both false," said the King.

Which room should the prisoner choose now?

The King decided to make it a bit more difficult because he was tired of the prisoners running away with the princesses. He made a new rule for the next 3 cases:

1. If there is a princess in room I then the sign of room one would be true. If there is a tiger in room I, then the sign will be false.
2. For room two it's just the opposite: if there is a princess in room II, the sign is false and if there is a tiger in room II the sign is true

### CASE 3

I

*In both rooms, there is a princess.*

II

*In both rooms, there is a princess.*

Which room should the prisoner choose and why?

### CASE 4

I

*In at least one room, there is a princess.*

II

*The princess is in the other room.*

Which room would you choose and why?

### CASE 5

The King was very proud of these puzzles, and also of this next one:

I

*Whichever room you take, it makes no difference.*

II

*In the other room, there is a princess.*

Which room should he take and why?

The King was very unhappy because all his prisoners left with one of his daughters. He decided to change his strategy. He would work with three doors. Behind two doors, there would be a tiger, and only one room would have a princess. Now that should make it harder!

CASE 6

I

*There is a tiger in room II.*

II

*In this room, there is a princess.*

III

*In this room, there is a tiger.*

The king told the prisoner that at most one of the signs was true. Which room should the prisoner choose and why?

CASE 7

I

*There is a tiger in room II.*

II

*There is a tiger in this room.*

III

*There is a tiger in room I.*

The King told the prisoner that the sign on the room of the princess was true, and that at least one of the other signs was not true.

What should the prisoner do and why?

## Two More Puzzles about Hats and Very Smart Women

### CASE 1

Three very smart women are standing in a line, and all of them are facing the same direction. The Mad Hatter has three blue hats and two red hats and he randomly puts one hat on each woman's head. The women knew that the Mad Hatter started with three blue hats and two red hats, but they do not know which two hats were left over. The woman in the back of the line can see the hats of the two women in front of her, but she cannot see her own hat. The second woman in line can see the hat of the woman in front of her, but she cannot see her own hat or the hat of the woman behind her. The woman in front of the line cannot see any hats.

First, the woman in the back of the line was asked if she could determine what color hat she was wearing, and she said she could not. Next, the second woman in line was asked if she could determine what color hat she was wearing, and she also said she could not. Finally, the woman in the front of the line, who had heard what the last two women had said, said that she knew what color hat she was wearing. What color was it and how did she know?

### CASE 2

Three women are sitting in a circle, all facing one another. Once again, the Mad Hatter has three blue hats and two red hats. The Mad Hatter shows the women the hats and then blindfolds them. He randomly puts one hat on each woman's head, and takes the last two hats out of the room. Then women are told that the first one who can identify the color of her own hat will win one million dollars, but if a woman guesses the wrong color hat, she will have to pay one million dollars. The blindfolds are then removed, and the women sit, staring at one another. Finally, after a bit, one of the women exclaims "I know what color my hat is!" What color was it, and how did she know?