Famous Logic Problems (maybe a bit altered)

Presenter Name
You are in a room with 7 (or any other number greater than 3) friends. Soon, I will place a hat on each of your heads. There are 7 (same as the number of people) possible hat colors. You know the seven possible colors. I may place any number of each color (e.g., there may be multiple of one color and no hats of another color). You will be able to see everyone else’s hat, but not your own. At the exact same time (no communication after your hats are on) you will guess the color of your hat. If any of you get it right, you all win. If you all get it wrong, you all lose. You now have time to come up with a strategy before I place the hats.

- How do you ensure that you win?
We assign each color a number from 0-6

Now we can say that the prisoners are essentially getting a number, c0,c1,c2,c3,c4,c5,c6.

\[ S = (c0 + c1 + c2 + c3 + c4 + c5 + c6) \mod 7 \]

S has seven possible values, 0-6

At this point, what each prisoner is doing is trying to guess what S is, and solving for their own number to match S.

Prisoner 0 assumes S = 0, and solves the equation \( c0 = S - (c1+c2+c3+c4+c5+c6) \)
Prisoner 1 assumes S = 1, and solves the equation \( c1 = S - (c0+c2+c3+c4+c5+c6) \)
and so on..

At least one of the 7 prisoners will assume the correct S value. That prisoner will be able to guess the correct number for their own hat.
8 Queens problem

- Can you place 8 queens on a chessboard such that no queen is on the same row, column, or diagonal as another queen?
The goat, the wolf and the carrots

- A farmer with a wolf, a goat, and a bunch of carrots must cross a river by boat. The boat can carry only the farmer and a single item. If left unattended together, the wolf would eat the goat, or the goat would eat the carrots. How can they cross the river without anything being eaten?
The Poison Pill Problem

• There are 8 pills. They are all the same size and color. One pill weighs slightly more and is poisonous. You have a balanced scale and can only use it twice. How can you find the poisonous pill?