MATHEMAGIC

- KEY TO THE PREDICTION-

Materials:

- Video of the trick
- Several small objects (approximately 15)
- Sheets of paper
- Pencils

How to do the Magic Trick

1. The magician asks the spectator to choose as many objects as he likes among different small objects. While the spectator does that, he discreetly counts the number of objects and note if this number is even or odd.
2. The magician then chooses the object that will remain at the end of the trick and writes it down on a paper, without the spectator seeing what he is writing.
3. For the next step, the magician will use the parity of the number of objects chosen by the spectator.
    a. **If it is an odd number:** the magician chooses two objects on the table and asks the spectator to eliminate one. The magician must never choose the object he predicted.
    b. **If it is an even number:** the magician asks the spectator to choose two objects on the table and the magician eliminates one. The magician must never eliminate the object he predicted.
4. The magician and the spectator alternate to choose and eliminate the objects until there is only one left. This object always corresponds to the magician's prediction.

MATHEMATICAL EXPLANATION

Why this trick works.

By pointing out objects, the magician never chooses the predicted object, so it cannot be eliminated by the spectator. When it is the spectator who points out two objects, if the predicted object is among the two choices, the magician eliminates the other one. The trick is to make sure that the last person to point out is the spectator, so that the last one to choose the object to eliminate is the magician.

Detailed explanations

The magician must necessarily eliminate the last object for his prediction to be true every time. If there are only two objects, the spectator points out and the magician eliminates. If there are three objects, the magician begins by selecting two objects for it to be the spectator's turn to point out objects when there are only two left and the magician to choose the right one. We must always maintain the same reasoning for bigger quantities of objects.

It is all about parity. If the initial number of objects is even, it is the spectator that has to begin by pointing out the objects and the magician that has to begin by eliminating an object. If the initial number is odd, it is the magician that has to begin by pointing out the objects, and the spectator that eliminates first.

So, right at the start, the magician has to count the number of objects chosen by the spectator. If the number is even, he lets the spectator begin, and if this number is odd, he begins, and there you have it!