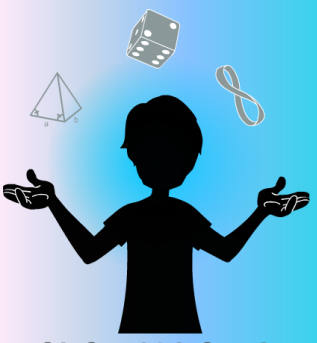


AMAZINGMATHS

MATHEMAGIC

- THE PHONE -

How to do the Magic Trick

Materials:

- Video of the trick
- 1 deck of cards

Goal:

Find the spectator's card.

Trick:

1. From the full deck of cards, the magician makes two piles of 5 cards chosen randomly. He places them, face down, one beside the other.
2. The magician turns around and asks a spectator to choose one of the two piles of cards. The spectator chooses one card among the five in his pile, looks at it, then places it back on top of the pile. This is the card the magician will find.
3. The magician turns around and asks the spectator which pile his card is in. He then places the pile that was not selected on top of the pile chosen by the spectator.
4. The magician does manipulations with the pile of 10 cards. He places the first card on the table, still face down, then he places the second one under the pile. The magician repeats these manipulations until only one card remains in his hands. He removes the remaining card.

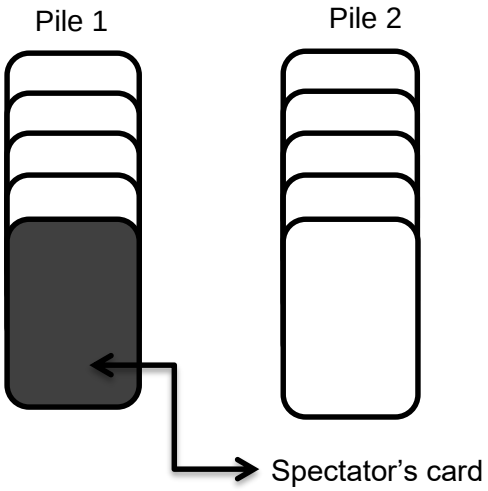
   N.B. This last card will not be useful to the trick anymore.
5. The magician takes in his hands the pile of cards that were set down. He specifies to the spectators that he communicates with the cards. He places the pile of cards close to his ear (*like a cellphone*) and he calls the cards. The magician calls the first card, but it is not the spectator's. So, he places the card underneath the pile. He does the same thing with the second and the third card. He calls the fourth card, which tells him he went looking too far. He takes back the last card under the pile (*the third one*) and shows it to the spectator. This card is truly the card chosen by the spectator!

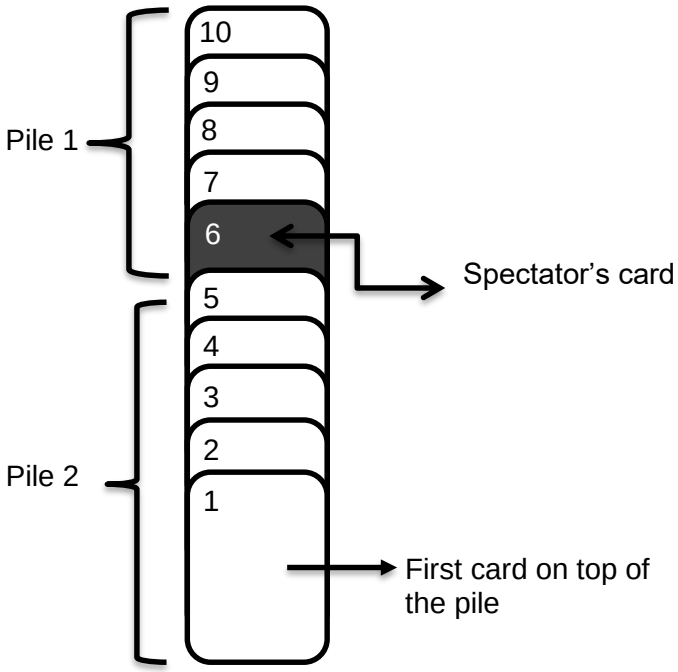
   N.B. It is not obligatory to call the cards. The magician can simply go look at the third card of the pile. However, the acting gives a different aspect to the trick that children really like.

MATHEMATICAL EXPLANATION

Why this trick works.

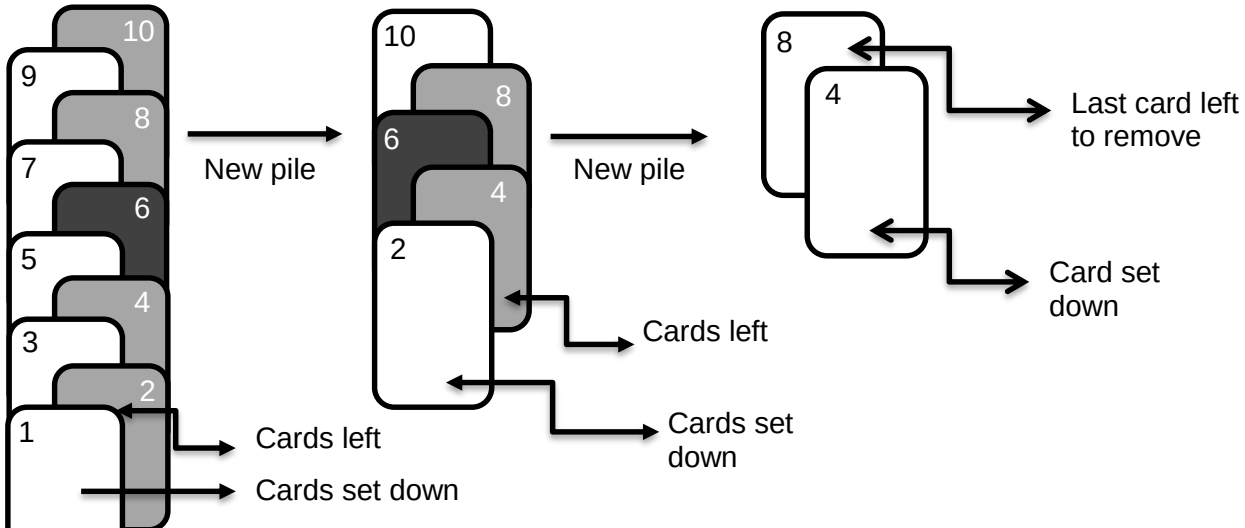
For the trick, the spectator must select a card in one of the piles and then put it back **on top of the chosen pile**. When the magician places the second pile on the spectator's pile, he knows that he places **5 cards on top of the chosen one. The spectator's card ends up in the 6th position from the top.**





When the magician does the manipulations, he **places** the cards that are **in the odd positions starting from the top of the pile** (the 1st, the 3rd, the 5th, the 7th and the 9th) et he **places back under the pile** the cards **in the even positions** (the 2nd, the 4th, the 6th, the 8th and the 10th). That way, he eliminates half of the cards that formed his pile. Since the spectator's card was the 6th one (even number), it always ends up in his hands in the 3rd position, because half of the cards that were on top was placed on the table.

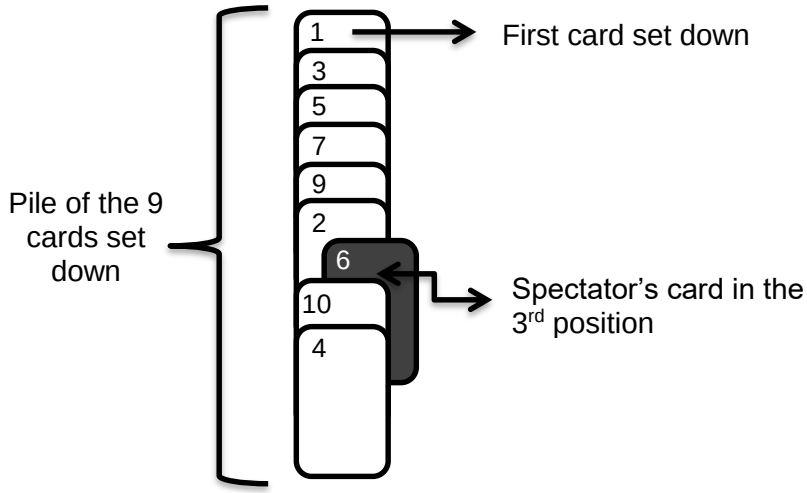
For the second series of manipulations, there are now 5 cards set aside and 5 cards in the magician's hands. With these manipulations, the magician sets down 3 new cards and puts 2 back underneath the pile. Then, he repeats the manipulations with the two cards left, which makes a total of 7 manipulations.



MATHEMATICAL EXPLANATION

P.S. Since 7 is an odd number, the number of cards cannot be divided in two. This is why the magician removes one card at the end of the manipulations.

Since the spectator's card is now the 3rd one in the pile, it is in an odd position. So, during the manipulations, it will be set down on top of the cards already set aside. This card will be the second one to be set down on the 5 cards that we already had. Therefore, it will be the 7th one from the bottom of the pile. Continuing these manipulations until the end, two new cards will be placed on the spectator's card.



When the magician takes back the 9 cards on the table, he knows that the card chosen by the spectator is the 3rd one from the top of the pile (or the 7th from the bottom). When he communicates with the cards, he simply gets to the 3rd card to reveal it to the spectator.

It is possible to do the trick again and place the card in the position of our choice. We simply need to remember that the cards in the odd positions are set down and that the cards in the even positions are placed underneath the pile. So, the magician has to determine when the card will be set down and how many other cards will be placed on top of the chosen card. It is also possible to do the trick with more than 10 cards.