

Materials:

- Video of the trick
- 1 deck of cards per group
- Paper and pencils

MATH MAGIQ

-MAKING 10-

How to perform the trick

- 1. Use only all the red (or black) cards from 1 to 9 from a deck of cards. Lay the rest aside.
- 2. The spectator selects 2 cards at random and keeps them hidden. The goal of the magician is to guess the sum of these 2 cards, and maybe even the exact value of each card.
- 3. The magician deals one by one the cards onto the table in separate piles. If two cards showing sum to 10, the magician flips these two cards and deals new cards on top of the facedown cards. If there are two pairs of cards that sum to 10, the magician simply covers one pair and then the other. This is continued until all the cards are dealt.

ATTENTION: If there is only one card left to be dealt, and there is a pair of cards that sum to 10 on the table, the magician starts a new pile with the last card.

4. When all the cards are dealt, the magician removes the piles whose top cards sum to ten. When this is done, there should be either 2 or 0 piles left. If there are no cards left, then the magician declares that the two cards originally selected by the spectator sum to 10. If there are 2 piles left, then the magician declares the values of the two selected cards.

To know what the values of the selected cards are, the magician has to subtract each of the values of the remaining cards from 10. The two results are the values of the spectator's cards. For example, if a 4 and a 7 are showing on the remaining piles then the spectator has a 6 and a 3.







MATHEMATICAL EXPLANATION



Why the trick works

The sum of all the cards used can be written as: 1+1+2+2+3+3+4+4+5+5+6+6+7+7+8+8+9+9 = 90.

This can be rewritten as: (1+9) + (1+9) + (2+8) + (2+8) + (3+7) + (3+7) + (4+6) + (4+6) + (5+5) = 90

Which can be simplified to: 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 = 90

When the spectator removes 2 cards, 2 numbers are removed from the sum. For example, if an ace and an 8 are taken, the sum becomes: (9) + (1+9) + (2) + (2+8) + (3+7) + (3+7) + (4+6) + (4+6) + (5+5)

This is equal to: 10+10+10+10+10+10+10+9+2 = 81

We are missing a 1 and an 8 if we want to get: 10 + 10 + 10 + 10 + 10 + 10 + (9+1) + (2+8) = 90

In this case, a 9 and a 2 would be the two cards remaining at the end of the trick. 10 - 9 = 1, and 10 - 2 = 8.

In the case where there are no piles of cards left at the end of the trick, that means that the sum of the cards the spectator chose is 10.

Detailed Explanation

All the cards in this trick have a complement that will always sum to 10. These are shown below.

1	2	3	4	5	6	7	8	9
+9	+8	+7	+6	+5	+4	+3	+2	+1
=10	=10	=10	=10	=10	=10	=10	=10	=10

Because only the red cards are used, there is two of every number from 1 to 9. Therefore, every card has a complement that sums to 10. When the spectator takes two cards there are 2 possibilities: The two cards either sum to 10 or they don't.

If the selected cards sum is not ten

When the magician deals out the cards, cards that sum to 10 are covered. This removes a card and its complement. Removing the piles whose top cards sum to 10 also removes a card and its complement. When there are only two cards left that don't sum to 10, this means that their complements are the cards selected by the spectator. Therefore:

Value of the card on the table + Value of the selected card = 10

This means:

10 - Value of the card on the table = Value of the selected card

With this the magician can compute the values of the selected cards

If the selected cards sum to 10

In this case, the two selected cards don't have their complements left on the table because the cards are the complements of each other. The magician can then make the conclusion that the sum of the 2 cards selected is 10.