



AMAZINGMATHS

Materials:

- Video of the trick
- A deck of cards

Math Magic

- 9 Cards -

How to perform the magic trick

GOAL:

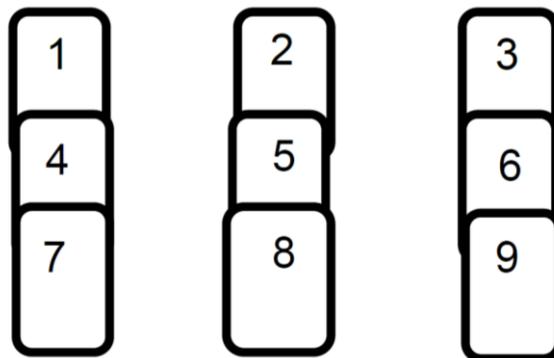
Have the selected card appear at the position of the spectator's favourite number between 1 and 9.

PREPARATION:

Remove 9 cards from the deck. You may leave the others to the side, they will not be used.

PERFORMANCE:

1. Have the spectator pick a card, memorize it, and place it anywhere in the deck.
2. The magician asks the spectator for their favourite number between 1 and 9.
3. The spectator shuffles the cards, then returns them to the magician.
4. The magician deals (first deal) out the cards into three columns face up, as shown in the diagram below. The numbers on the cards show the order that the cards are to be dealt.



5. The spectator indicates to the magician which column their card is in.
6. The magician picks up the three columns in a specific order (first pick-up) depending on the favourite number of the spectator (see the table in the *Why the trick works* section to determine the order).
7. The magician repeats steps 4 (second deal), 5, and 6 (second pick-up).
8. The magician asks again for the spectator's favourite number. The magician deals out the cards face down, counting to the spectator's favourite number. When he reaches the favourite number, he flips the card, showing the spectator's selected card.



Mathematical Explanation



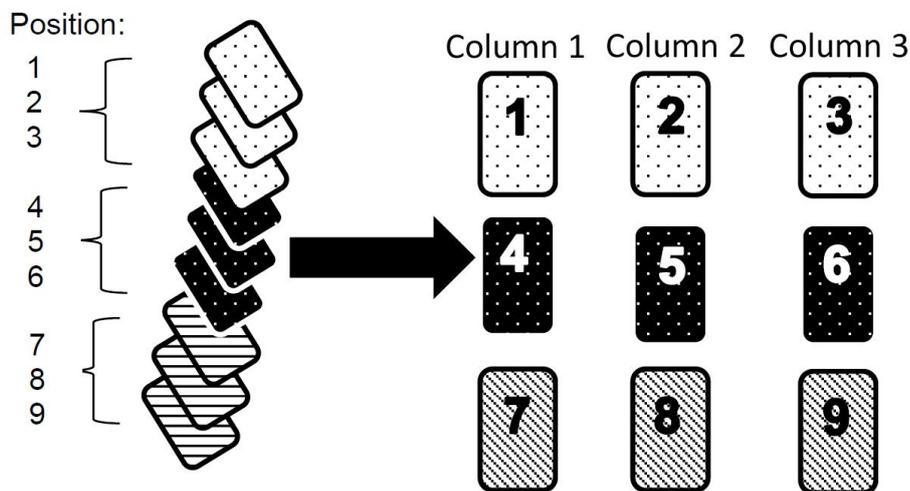
Why the trick works:

The magician has to place the spectator's card in the position of the spectator's favourite number. To do this, the magician has to understand how the cards are dealt and picked up affect the order of the cards.

Note: The magician does not need to know the spectator's card. Using the manipulations outlined below, the card will be placed in the correct position.

Dealing the cards

When the magician deals out the cards, the top 3 cards of the pile become the first card in their respective columns, the fourth to sixth cards become the second card of their columns, and the seventh to ninth cards become the third card of their columns.



Picking up the cards

The magician chooses to pick up the columns in a specific order, essentially deciding where he wants to place the column containing the spectator's card. The magician can place 0, 3, or 6 cards above the column containing the spectator's card.

Putting it all together

The first deal is done the same every time, as explained in the performance steps.

The first pick up determines the position of the card in the second deal. Notice the following:

- If 0 cards are placed above the column with the selected card in it, then the selected card has to be in position 1, 2, or 3 for the second deal. This will place the selected card first in its column after the second deal.
- If 3 cards are placed above the column with the selected card in it, then selected card has to be in position 4, 5, or 6 for the second deal. This will place the selected card second in its column after the second deal.
- If 6 cards are placed above the column with the selected card in it, then the selected card has to be in position 7, 8, or 9 for the second deal. This will place the selected card third in its column after the second deal

With the second pick-up, the magician can place the selected card in the position of the spectator's favourite number. The magician has already chosen the spot of the selected card within its column (1st, 2nd, or 3rd). The magician can now place 0, 3, or 6 cards above the column containing the selected card. With these two choices, the magician can place the card at any position within the deck.



Mathematical Explanation



To determine the order to pick up the columns, you need to do a little arithmetic. First, you divide the spectator's favourite number by 3, e.g., $2 \div 3 = 0$ remainder 2. The remainder is the position within the column on the second pick up that you want the card. Therefore, if the remainder is 1, you will pick up the selected card's column first, if it is 2 you will pick up the column second, and if it is 0 (which is also 3) you will pick it up third. On the second pick up, you decide to place 0, 3, or 6 cards above the selected card's column. The final position of the card will be the number of cards you place above the selected card's column plus the position of the selected card within its column.

For example, let the favourite number be 7.

$$7 \div 3 = 2 \text{ remainder } 1$$

The remainder is 1, so on the first pick-up, the column containing the selected card will be picked up first. This will place the selected card 1st in its column on the second deal. On the second pick-up, the column containing the selected card will be picked up third, placing 6 cards above it.

$$1 \text{ (the position of the card within its column)} + 6 \text{ (the amount of cards placed above the selected column)} = 7 \text{ (the selected number)}$$

The table below summarizes the pick-up order for each favourite number.

Favourite Number	First pick-up			Second pick-up		
	Top of the pack	Middle of the pack	Bottom of the pack	Top of the pack	Middle of the pack	Bottom of the pack
1	X			X		
2		X		X		
3			X	X		
4	X				X	
5		X			X	
6			X		X	
7	X					X
8		X				X
9			X			X