

A Mathematical Card Trick

This card trick will be shown as a video, but here is a description of it, and why it works. Here are the steps:

- (1) Start with a deck of 52 cards, no Jokers. Shuffle the deck and then deal out about seven piles of cards face up, by using the following the technique: as the first card goes down say its value and start counting from that number until you get to 13. A Jack would be stated as “11”, a Queen would have a value of “12” and a king would have a value of “13”. An ACE = 1. Here are some examples (what you say is in brackets):
 - 6 (six), Q (seven), 4 (eight), 10 (nine), 5 (ten), 6 (eleven), J (twelve), A (thirteen)
 - J, (eleven), 3 (twelve), 9 (thirteen)
 - 8 (eight), 10 (nine), 5 (ten), 6 (eleven), J (twelve), A (thirteen)
 - 4 (four), 9 (five), A (six), Q (seven), 4 (eight), 10 (nine), 5 (ten), 6 (eleven), J (twelve), A (thirteen)
- (2) When the seven piles are counted out, then turn them all over face down. So each pile will have a top card that was the card that you started counting from for each pile. Ask a person to move the piles around WITHOUT moving cards from pile to pile. While they are moving the piles around, turn your back and do NOT look.
- (3) Now turn back and ask a person to give back to you any four of the piles, leaving only three piles face down. Attach these four piles to the pile of remaining cards you had from step (1). Keep these remaining cards in your hand.
- (4) Now ask a person to turn over the top card on TWO of the piles. Tell them the pile of cards that you have in your hand will tell you what the top card on the remaining pile’s value is. Remember, it is currently FACE DOWN.
- (5) Count out, from your hand, TEN CARDS. Then count out a number of cards for each of the FACE UP cards on the TWO decks. So, if the face up cards are a THREE and a NINE, I would count out THREE cards and then NINE cards on top of the TEN cards that I have already counted out.
- (6) Count, out loud, the number of cards that you have in your hand now. Let’s say this works out to SIX. Then turn over the top card on the remaining pile and you will see that it is the same as the number of cards you have left in your hand. So in this case, it would be a SIX !!

Here is why it works.

Observe the following table:

Top Card (from step 1)	Your count	Number of cards in the pile	Pattern to Observe
3	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13	11	$14 - 3 = 11$
9	9, 10, 11, 12, 13	5	$14 - 9 = 5$
6	6, 7, 8, 9, 10, 11, 12, 13	8	$14 - 8 = 6$
A (pile 1)			$14 - A$
B (pile 2)			$14 - B$
C (pile 3)			$14 - C$

So the top card in each pile determines how many cards there are in that pile using the formula:

Number of Cards in a Pile = $14 - \text{Number on the top card}$ (with Jack = 11, Queen = 12, and King = 13)

Therefore, the number of cards you have in total in your hand, after the four piles have been handed back to you is: 52 cards in the original deck Minus Number of cards in Pile One Minus Number of cards in Pile Two Minus Number of cards in Pile Three. So using the table above we get:

Number of cards you have in total in your hand = $52 - (14 - A) - (14 - B) - (14 - C)$

Clearing the brackets, remember a negative sign in front of a bracket changes ALL the signs in the bracket:

$$\text{Number of cards you have in total in your hand} = 52 - 14 + A - 14 + B - 14 + C$$

Simplifying we get:

$$\text{Number of cards you have in total in your hand} = 10 + A + B + C$$

So if you know $A = 3$ (using our example above), and $B = 9$, then after you have counted out 10 and 3 and 9 cards, then number of cards you have left in your hand is ~~$10 + 3 + 9$~~ + C. **And what is “C”, it is the top card on pile 3 !! Since this is currently face down, you can flip it over and sure enough, using our example above, it is a SIX.**

Obviously, you will have different values for the top cards, but the number of cards that you have left in your hand will be 10 plus the value of the top card in pile “A” plus the value of the top card in pile “B” plus the value of the top card in pile “C”. Since they then flip over the top card in pile “A” and “B”, you count those out and you are left with “C”, the value of the top card in pile “C”

Video to follow.