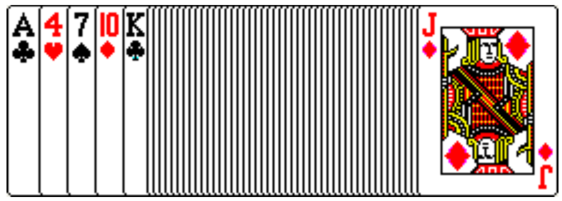
Stacked Deck (Si Stebbins, 1898)
A predictable deck of cards that *looks* disordered.

This was first published by *Horatio Galasso* in 1593.



The ordering illustrated above and presented at right is also *revealed* at the end of a video posted by Furrukh Jamal presenting two related magic tricks.

Such a deck can be *cut* many times, but not shuffled (seasoned illusionists could use *false shuffling*).

The value of the N^{th} card from the top (face down) is:

$$x \;=\; B + 3N \quad (\text{mod } 13)$$

Here, B is the value of the *bottom card*. The following numerical convention is used (*modulo* 13):

1	2	3	4	5	6	7	8	9	10	11	12	0
A	2	3	4	5	6	7	8	9	10	**J**	**Q**	**K**

CHaSeD			
C ♣	**H** ♥	**S** ♠	**D** ♦
A	4	7	10
K	3	6	9
Q	2	5	8
J	A	4	7
10	K	3	6
9	Q	2	5
8	J	A	4
7	10	K	3
6	9	Q	2
5	8	J	A
4	7	10	K
3	6	9	Q
2	5	8	J
♣ **1**	♥ **2**	♠ **3**	♦ **0**

With the numerical code for suits given at the bottom of our main table, if S is the suit of the bottom card, then the suit of the N^{th} card is simply:

$$y \;=\; S + N \quad (\text{mod } 4)$$

For example, if the bottom card is the jack of diamonds (B=11, S=0) then the tenth card (N=10) is a *deuce* (since 11+3.10 is 41, which is equal to 2 modulo 13). It's the deuce of *hearts* because 0+10 is equal to 2 modulo 4.

One trick is to have a spectator cut the deck. You secretly look at the bottom card and call the card 3 units higher in the next suit (from the "CHaSeD" sequence Clubs, Hearts, Spades, Diamonds) before revealing the *top* card.

Find a Specific Card by Counting :

Conversely, the position N of the card x of suit y can be obtained from the Chinese Remainder Theorem (a result N=0 would denote the bottom card). Since 3N is x-B modulo 13, N is -4(x-B) modulo 13 (HINT: -4x3 is -12 or +1 modulo 13). With that value of N modulo 13 and the value of N modulo 4 (namely y-S) we may apply our explicit formula to solve the *Chinese Remainder Problem* and obtain N modulo 52 = 4x13, namely:

$$N \;=\; 13\ \textit{bezout}\,(13,4)\,(y-S) \;-\; 4\ \textit{bezout}\,(4,13)\,4\,(x-B)$$

Since *bezout* (13,4) = 1 (mod 4) and *bezout* (4,13) 4 = 1 (mod 13) , that expression boils down to the following easy-to-memorize formula:

$$\boxed{N \;=\; 13\,(y-S) \;-\; 4\,(x-B) \quad (\text{modulo } 52)}$$

The existence of such a formula makes the above far more flexible than other stacking schemes which lack arithmetic regularity (including the infamous "Eight Kings CHaSeD" stack, which is merely based on the mnemonic sentence: "Eight Kings threa-tened to save nine fair ladies for one sick knave" standing for the order 8K3T2795Q4A7J).

For example, if the bottom card is the jack of diamonds (B=11, S=0) then the queen of hearts (x=12, y=2) is at the following position (modulo 52):

$$N \;=\; 13\,(2-0) \;-\; 4\,(12-11) \;=\; 22$$

The king of spades is at $N \;=\; 13\,(3-0) \;-\; 4\,(13-11) \;=\; 31$

The queen of diamonds is at $N \;=\; 13\,(0-0) \;-\; 4\,(12-11) \;=\; -4 \;=\; 48$

The ace of clubs is at $N \;=\; 13\,(1-0) \;-\; 4\,(1-11) \;=\; 53 \;=\; 1$ (Isn't it?)

Preparation : Here's a quick method to arrange the deck as above :

1. Sort separately the 13 cards of each suit face up, highest on top.
2. Cut the 4 heaps so their respective top cards are: A♣, 4♥, 7♠ 10♦
3. Build the whole deck (face up) from top cards in the order: ♣□♥□♠□♦