Basic Math in Fitch Cheney 5-Card Trick

1. Encoding Theory
2. Pigeon Hole Principle
3. Combinations
4. Permutations
5. Function/Relation Combinations to Permutations
6. Modular Arithmetic

Advanced Math from the Extended Fitch Cheney Card Trick

1. Upper Bounds
2. Information Theory
3. Binary Arithmetic
4. Combinations
5. Permutations
6. Functions
7. Relations
8. Graph Theory
9. Bipartite Graphs
10. Perfect Matchings
11. Hall’s Marriage Lemma
12. Matrices
13. Doubly Stochastic Matrices
14. Permutation Matrices
15. Birkhoff - von Neumann Theorem (on convex hull of permutations matrices)
16. Factorial Base

A Question to think about For the Basic Fitch Cheney 5-Card Card trick, Kleber (et al) asked “what is the largest size” the trick works for?”. He answered the question with Deck Size = 124. He also abstracted to the N-Card Trick and obtained the upper bound $D = N! + N - 1$. Thus the Fitch Cheney 4-Card trick works only for a deck of size $D = 4! + 4 - 1 = 27$. Colm Mulcahy came up with a different method of doing the trick resulting in a 4-card trick which works for a standard deck of size $D = 52$.

What is the largest deck size that Mulcahy’s method works for?