

Day 4 (July 6, 2012)

Private think time:

What mathematical questions are on your mind?

What insights have you enjoyed making?

Share at your tables *after* private think time.

Your responses:

- For 12 cards, one more than that is 13. Powers of 2 in mod 13 relates to the Thursday-type shuffle.
- We're using powers of 2 to cycle through things. But, when we use 43, 109 and some other numbers they don't seem to fit the pattern that we've been predicting.
- What happens when you split the deck into n partitions instead of only two partitions?
- For 52 cards, the largest multiple of your mod number (51) is 17, and 17 goes into 51 four times. Card 17 (when you number the cards from 0) has the shortest cycle.
- The cycle length and number of cycles there are, that adds to up to the number of cards. For 20 cards, there is are cycles 6, 3, 6, 2, 3 and $6+3+6+2+3 = 20$.
- For 52 cards Thursday-style: there are cycles of length 1, 2, 4, 8 and somehow they add up to 52. But, we were surprised that for 52 cards there were no cycles of 4.
- There is a connection between repeating decimals $1/7$, $2/7$, etc in different bases and the cards but we're not sure what.
- So far, everything we've done is iterative. Is there a non-iterative solution for this? For example, is there a way to know for 107 cards how many shuffles are required without iterating?
- Closed-form equation that works, but we don't have a non-iterative method to solve it yet.
- Squares of numbers in mod land: what'supwiththat?