

Mathemagician II

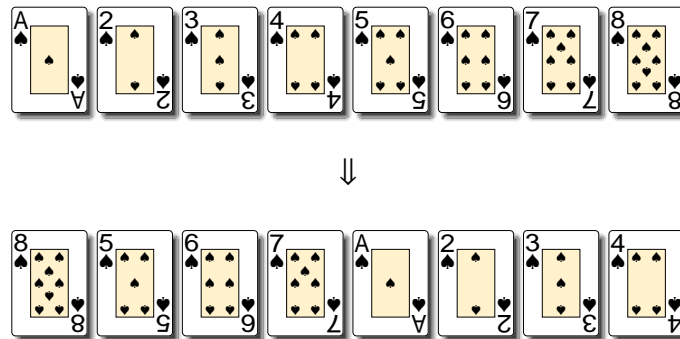
Name:

Date:

Problem

Recall our problem: A magician with extremely fast hands presents a crowd with a challenge. He claims that he can shuffle 8 cards, including one ace, so fast that no person will be able to find the ace when he is done.

Solve the magician's challenge if he repeats the following permutation 100 times



That is,

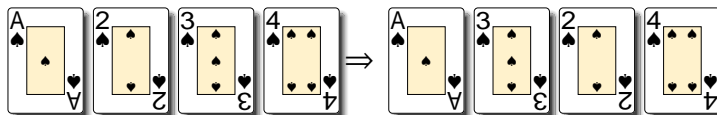
- (1) The card in the 1st position moves to the 5th position.
- (2) The card in the 2nd position moves to the 6th position.
- (3) The card in the 3rd position moves to the 7th position.
- (4) The card in the 4th position moves to the 8th position.
- (5) The card in the 5th position moves to the 2nd position.
- (6) The card in the 6th position moves to the 3rd position.
- (7) The card in the 7th position moves to the 4th position.
- (8) The card in the 8th position moves to the 1st position.

Remember that 1 permutation is made up of (1) – (8) together.

Questions

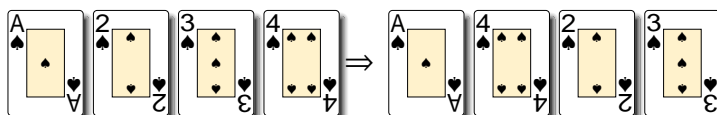
- We have seen that there are 24 possible ways to order four cards. Find all 24 different orderings.
- (a) Starting with $\heartsuit A \heartsuit 2 \heartsuit 3 \heartsuit 4$ interchange the place of the 2nd and 3rd card. Repeat this permutation 5 times and record the results.

Here is the first permutation:



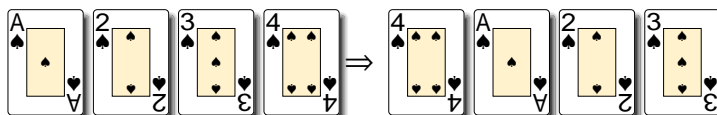
- How many **different** orderings did you find in part (a).
 - If you continued this process 241 times at which order would you end? What about 360 times?
- (a) Starting with $\heartsuit A \heartsuit 2 \heartsuit 3 \heartsuit 4$ move the 2nd card to the 3rd position, move the 3rd card to the 4th position, and move the 4th card to the 2nd position. Repeat this permutation 7 times and record the results.

Here is the first permutation:



- How many **different** orderings did you find in part (a).
 - If you continued this process 149 times at which order would you end? What about 510 times?
- (a) Starting with $\heartsuit A \heartsuit 2 \heartsuit 3 \heartsuit 4$ move the 1st card to the 2nd position, move the 2nd card to the 3rd position, move the 3rd card to the 4th position, and move the 4th card to the 1st position. Repeat this permutation 7 times and record the results.

Here is the first permutation:



- How many **different** orderings did you find in part (a).
- If you continued this process 231 times at which order would you end? What about 463 times?

Bonus

Solve the magician's problem.