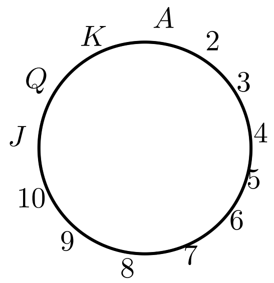
Amazing Card Trick Problems — Math 1102

1. Recall that each set of three cards can be arranged in six different orders. If we designate an ordering on the cards themselves, this means that we can define six numbers. Equate $123, 132, 213, 231, 312, 321$ with $lmh, lhm, mlh, mhl, hlm, hml$, where l means the least of the three values, m the middle one, and h the highest value. Now among the five cards you are given, find two of the same suit. Why can you always do this? If these are cards U and V, locate U and V on the circle with the numbers $A, 2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, K$ written clockwise around the circle. Now one of the cards U or V is within six steps of the other. Choose this as the *hidden card*. The other becomes the *anchor card*. Then figure the 'distance' from the anchor card to the hidden card. Finally arrange the three remaining cards in the order that determines the number of steps to take to get from the first card to the hidden card. For each set of five cards, tell which one you'd hide and put the other four in the right order, with the anchor first.



For example, if the five cards are $2\clubsuit, 3\diamondsuit, 6\heartsuit, 8\heartsuit, J\spadesuit$, you would hide the $8\heartsuit$ and arrange the other four cards as follows: $6\heartsuit, 2\clubsuit, J\spadesuit, 3\diamondsuit$. The final three cards are in the order lhm which corresponds to 2 steps, so we take two steps from the $6\heartsuit$ to get to the $8\heartsuit$. What do you do when the three cards you have to order have two or more on the same value? You put those of the same value in alphabetical order, so $2\clubsuit < 2\diamondsuit, < 2\heartsuit < 2\spadesuit$.

(a) $K\clubsuit, 3\diamondsuit, 6\heartsuit, 8\heartsuit, J\spadesuit$

(b) $7\clubsuit, 7\diamondsuit, 7\heartsuit, J\diamondsuit, 7\spadesuit$

(c) $J\clubsuit, Q\diamondsuit, K\heartsuit, A\spadesuit, 7\spadesuit$

(d) $5\clubsuit, 8\diamondsuit, 10\spadesuit, Q\heartsuit, K\clubsuit$

(e) $2\diamondsuit, 5\diamondsuit, 6\heartsuit, 8\spadesuit, J\clubsuit$

(f) $J\clubsuit, 9\diamondsuit, 6\heartsuit, Q\heartsuit, J\spadesuit$

(g) $2\clubsuit, 8\diamondsuit, 8\heartsuit, 8\spadesuit, J\spadesuit$