Poker Exercises 1

- A poker hand contains 5 out of 52 cards. The cards are 13 kinds (1-Ace, 2,..,10,J,Q,K) and 4 suites (spades, hearts, clubs, diamonds)
- What is the probability that a hand contains the Ace of Spades and the King of Spades?
- I need to compute the number of pokers hands that contain AoS and KoS. Since these 2 cards are fixed, I have C(50,3) choices for the remaining 3 cards.
- Probability is: C(50,3)/C(52,5)
- What is the probability that a hand contains exactly 1 Ace?
- There are 4 ways to choose the Ace. Once the Ace is selected, there are C(48,4) ways to choose the remaining four cards.
- Probability is: $4 \cdot C(48,4) / C(52,5)$
- What is the probability that a hand contains 5 different kinds?
- There are C(13,5) ways to choose the 5 kinds. For each card there are 4 choices of suit.
- Probability is: $4^5 \cdot C(13,5) / C(52,5)$

Poker Exercises 2

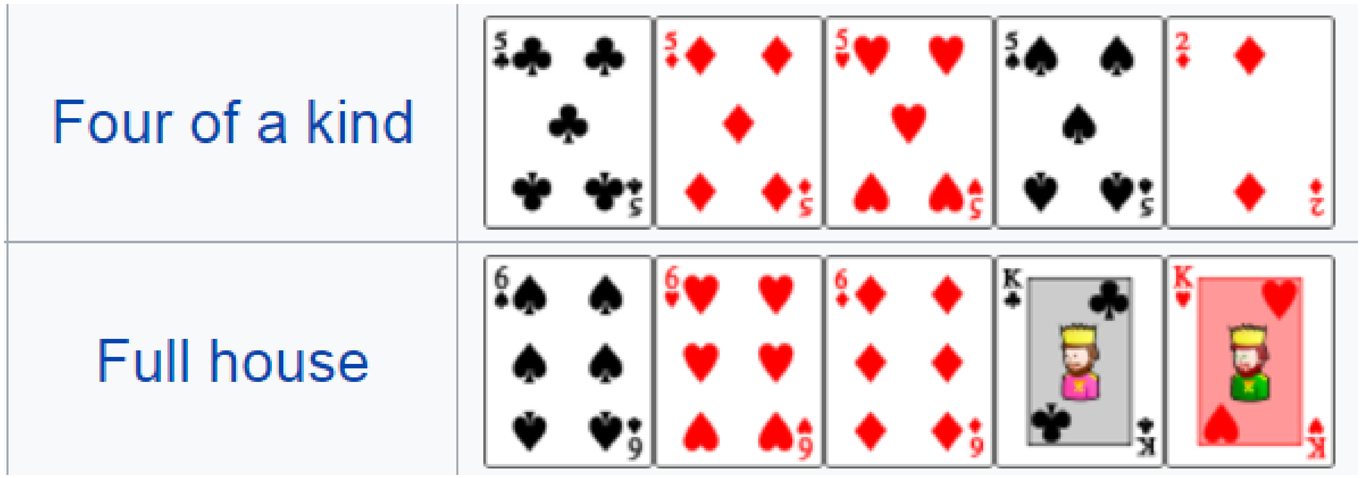
- A poker hand contains 5 out of 52 cards. The cards are 13 kinds (1-Ace, 2,..,10,J,Q,K) and 4 suites (spades, hearts, clubs, diamonds)
- What is the probability that a hand is a royal flush? Royal flush is {10,J,Q,K,Ace} of the same suit. This is the strongest card in poker.
- There are 4 royal flushes/one per suit
- Probability is: 4/ C(52,5)
- What is the probability that a hand is a straight flush? A straight flush is a hand with all five cards of the same suit in sequential order starting at 1,2,….,9. 10 is excluded because it would lead to a Royal flush.
- I have C(9,1)=9 options for the beginning of straight flush, and 4 options for the suit, yielding a total of $4 \cdot 9=36$. There is a single option for each of the remaining cards.
- Probability is: 36/C(52,5)
- What is the probability that a hand is a straight? A straight is a hand with all five cards in sequential order. At least two cards are of different suit; otherwise it would be a royal or straight flush.
- I will first count all straights including straight and royal flushes.
- I have C(10,1)=10 options for the beginning of the straight. For each of the five cards, there are 4 suite options. Therefore, total number of straights is: $10 \cdot 4^5$.
- If I exclude the straight and royal flushes, the number becomes: $10 \cdot 4^5 - 40$.
- Probability is: $(10 \cdot 4^5 - 40)/ C(52,5)$

Poker Exercises 3

- A poker hand contains 5 out of 52 cards. The cards are 13 kinds (1-Ace, 2,..,10,J,Q,K) and 4 suites (spades, hearts, clubs, diamonds)
- What is the probability that a hand is flush, i.e., it consists of 5 card of the same suit, excluding the cases of royal and straight flush.
- The flush is a combination of 5 out of 13 cards of the same suit. Thus, there are 4·C(13,5) flushes. After excluding the straight and the royal flashed the number is 4·C(13,5)-40
- Probability is: (4·C(13,5)-40) / C(52,5)
- What is the probability that a hand contains 3-of a kind (e.g., 3 aces - the 4th and 5th card must be different because otherwise we would have stronger hands, to be discussed later):
- Number of ways to select the kind of the 3-of a kind C(13,1).
- Number of ways to select the suites of the 3-of a kind C(4,3).
- Number of ways to select the kind of the 4th and 5th card: C(12,2).
- Number of ways to select the suit of the 4th and 5th card: C(4,1)·C(4,1)
- Probability is: C(13,1)·C(4,3)·C(12,2)· C(4,1)·C(4,1)/ C(52,5)
- What is the probability that a hand contains 2 pairs (e.g., 2 aces and 2 kings - the 5th card be different):
- Number of ways to select the 2 pairs is C(13,2).
- Number of ways to select the suites of the 2 pairs C(4,2)·C(4,2).
- Number of ways to select the fifth card: 52-8=44.
- Probability is: C(13,2)·C(4,2)·C(4,2)·44 / C(52,5)

Poker

Exercises 4



- What is the probability that a hand contains 4-of a kind?
- Number of ways to select the kind of the 4-of a kind C(13,1).
- Number of ways to select the 5^{th} card: 48 (12 for the rank times 4 for the suit).
- Probability is: 13·48 / C(52,5)
- What is the probability that a hand is a full house?
- Number of ways to select the 2 kinds C(13,2).
- Number of ways to select the kind for the 3-of a kind C(2,1).
- Number of ways to select the suits for the 3-of a kind C(4,3)
- Number of ways to select the suits for the pair C(4,2).
- Probability is: C(13,2)·C(2,1)·C(4,3) ·C(2,2) / C(52,5)
- Poker Hands: Royal Flush > Straight Flush > 4-of a kind > Full house > Flush > Straight > 3-of a kind > 2 pairs > 1 pair