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Poker probability

In the poker game there are some possible hands to win, but what is the probability to get every single one? The question is simple, if you have 5 poker cards what is the probability of getting a pair, two pairs, a trio, a Full or a poker? There are some more examples in the other document.

Pair = two different cards of the same rank

Trio = three different cards of the same rank

Full = a pair and a trio

Poker = four different cards of the same rank

To calculate the probability its possible use a analytical method and simulation method.

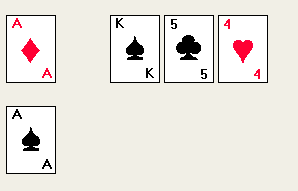
In order to show both, we will show you an analytical answer compared with simulation answer

How many hands could we have?(total)

C52, 5 = 2598960

From 52 cards choose 5.

**1 pair**



 C4, 2 = 6 ways to make a pair of “A”, from 4 possibilities(suite) choose 2 cards.C4, 2

We have 13 ranks and 6 ways to obtain a pair of every rank so

13\*6=78 ways to make a pair of cards(every rank)

C12, 3 = 220 to choose the other three cards we have 12 cards to choose (the 13 card is a pair card so we can choose it) so from 12 possibilities choose 3.C12, 3

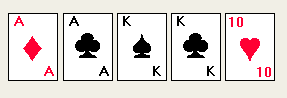
Talking about the last 3 cards every card has 4 possibilities (suite) so 4\*4\*4=64

How many ways to get a pair? 78\*220\*64=1098240 pair hands

Analytical answer 1098240/C52, 5  = 0.42256902761

The simulation answer 

**2 pair**



C4, 2 = 6 ways to make a pair of “A”. From 4 possibilities(suite) choose 2 cards.C4, 2

The same to “k”

6\*6=36 both “A” and “K” 36 possibilities to have 2 pairs of “A” and ”k”

To include the other possibilities(other possible pair) we multiplied by C13, 2 = 78 from 13 cards choose 2 every single one is one pair

To fill the missing space we choose form 44 cards(52-4-4)taking out the two pair ranks

How many ways to get tow pair? 36\*44\*78 = 123552

Analytical answerIMG_256

The simulation answer 

**Trio**



In order to fill the two free position C48, 2 = 1128 possible ways

13 cards to make a trio

C4, 3 = 4  possibilities to choose the rank of the trio, from 4 cards(suite) choose 3

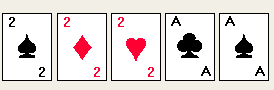
4\*1128\*13=58656 “trios” but we have to take out the full possibilities

FULL=3744

Analytical answer IMG_256

Simulation answer 

**FULL**



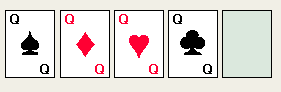
C4, 3 \* 13= 52 possibilities of trio

12 × C4, 2 = 72 possibilities of pair

Analytical answer 

Simulation answer 

**Poker**



Choose the leftover card, 52-4 =48 possibilities

13 ways to choose a rank of the trio

Analytical answer 

Simulation answer 