TDT4171 Artificial Intelligence Methods

# Exercise 1

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## I 5-card Poker Hands

### a Atomic events

The number of different poker hands available, is the combination of 52 cards, choosen 5 at a time. [1]

$\binom{52}{5} = 2598960$

### b The probability of an atomic event

The probability of each atomic event is equal, given the dealer is fear. This means the probability of each event is $1/2598960 = 0.0000038477$

### c The probability of special hands

#### c.1 The probability of a Royal Straight Flush

There are four possible different Royal Straight Flush-hands in poker. Since their probability each are equal to all other possible hands, the probability of one of them, are $0.0000038477 \cdot 4 = 0.00015391$

[1] If we take the order into account, the number would be $52 \cdot 51 \cdot 50 \cdot 49 \cdot 48 = 311875200$.

### c.2 The probability of a Three of a Kind

In order to get Three of a kind, you need to get 3 cards of the same value, and 2 of any other value. First, we need to be given one card of value and color. Then we need to be delt 2 more of this color, that is $\binom{13}{1}\binom{4}{3} = 13 \cdot 4 = 52$. This is the number of ways we can choose 3 cards of same value from a normal deck of cards. We need to multiply this with the number of ways we can choose the rest of the other cards, wich is to choose 2 cards with a different value, both with any color. $\binom{12}{2}\binom{4}{1}\binom{4}{1} = 66 \cdot 4 \cdot 4 = 1056$

The mathematical formula will then be: $\binom{13}{1}\binom{4}{3} \cdot \binom{12}{2}\binom{4}{1}^2 = 52 * 1056 = 54912$