Four cards are drawn at random from a pack of 52 cards. Find the probability that this consists of:

a.   a king, a queen, a jack and an ace.
b.   two kings and two ace all diamonds.
c.   two red and two blacks.
d.   two clubs and two diamonds

Solution

The classic definition of probability claims, that the probability of some random event A is equal to a rate of all favorable outcomes for this event to all possible outcomes.

a) The probability of 1st card is a king is 4/52, the probability of the second card is a queen is 4/51, jack – 4/50, ace – 4/49.

This is 4 independent events, and the probability of their occasion at the same time is a product of values above:

$$P = \frac{4}{52}\frac{4}{51}\frac{4}{50}\frac{4}{49} = 0.0000394003755348293163419213839381 91$$

b) The probability of two kings and two ace – all diamonds – is equal to 0, as in a card pack there is only one king is diamond and only one ace.

c) The probability of drawing 2 red cards is equal to:

$$\frac{26}{52}\frac{25}{51}$$

The probability of drawing 2 black cards after first and second were red is equal to:

$$\frac{26}{50}\frac{25}{49}$$

The probability of 2 red and 2 blacks:

$$P = \frac{26}{52}\frac{25}{51}\frac{26}{50}\frac{25}{49} = 0,0650260104041616646665866346538615$$

d) The probability of 2 clubs is:

$$\frac{13}{52}\frac{12}{51}$$

The probability of 2 diamonds after first and second were clubs is:

$$\frac{13}{50}\frac{12}{49}$$

The probability of 2 clubs and 2 diamonds is:

$$P = \frac{13}{52}\frac{12}{51}\frac{13}{50}\frac{12}{49} = 0{,}0037454981992797118847539015606242$$