

Probability Calculation

Exercise 1

Consider a set of 52 playing cards in which we randomly choose cards with replacement. Calculate the probability to get a queen, a heart, the queen of hearts or the ace of spades, a queen or a spade, neither a queen nor a spade.

Exercise 2

We consider an urn containing 5 white balls, 4 red balls and 2 black balls. We randomly select one ball from this urn. Calculate the probability that it is white, that it is not white, that it is white or red. Now we select 3 balls with replacement. Calculate the probability to get a white ball first, next a red ball, and finally a black ball. Solve the same problem in the case where the balls are randomly selected without replacement.

Exercise 3

During a Poker game, you randomly select 5 cards among 52 playing cards. Calculate the probability of obtaining a pair (2 cards of the same height), three of a kind (3 cards of the same height), a flush (5 cards of the same suit), a full house (three of a kind and a pair), a four of a kind (4 cards of the same height).

Exercise 4

Consider two teams E_1 and E_2 playing football one against the other. The probability that E_1 wins or that the game ends in a draw are $1/2$ and $1/6$, respectively. During a tournament, these two teams play 5 games one against the other. Calculate the probability that E_1 wins all the games, that E_1 does not win at least once, that 2 games end in a draw.

Exercise 5

An urn I contains 2 black balls and 3 white balls, while an urn II contains 4 black balls and 6 white balls. A ball is randomly selected in each urn. Calculate the probability of drawing 2 balls with the same color. Now, we assume that the ball randomly selected in urn I is placed in urn II before proceeding to the second draw. Calculate the probability of getting 2 balls of the same color.

Exercise 6

A person is randomly selected from a population where the proportion of cheaters is equal to p . It is asked someone to draw a card from a set of 52 playing cards. One admits that cheaters always get an ace. Calculate the probability that the selected person gets an ace. Calculate the probability that this person is a cheater if he gets an ace.

Exercise 7

We consider the roll of 2 dices. Let X denote the sum of points, and let Y denote the largest number of points obtained with one of these two dices. Study these two random variables.