Discrete Mathematics DSBA

Seminar 15. Probability I

1. A sample space consists of sequences (x_1, x_2) of length 2 consisting of numbers from 1 to 6. All outcomes have the same probability (uniform probability space) («Throwing two dices»). Find the probability of the event «$x_1 + x_2 = 5$».

2. A uniform probability space consists of sequences (x_1, x_2, x_3, x_4) of length for 4 consisting of numbers from 1 to 6. («Throwing four dices»). Find the probability of the event «The number $x_1 + x_2 + x_3 + x_4$ is even».

3. A uniform probability space consists of sequences of length 6, consisting of numbers from 0 to 1. («Tossing six coins»). Find the probability of the event «Exactly three elements of the sequence are equal to one».

4. A uniform probability space consists of permutations $(a_1, a_2, \ldots, a_n)$ of numbers from 1 to n. The distribution is uniform. Find the probability of the event «$a_2 > a_1 > a_3$».

5. A uniform probability space consists of sequences of length 3 consisting of numbers from 0 to 9. The distribution is uniform. Find the probability of the event «The sequence contains 1».

6. A probability space consists of sequences of length 3, consisting of distinct numbers from 0 to 9. The distribution is uniform. Find the probability of the event «The sequence contains 1».

7. A probability space consists of 3-subsets of the set $\{0, 1, \ldots, 9\}$. The distribution is uniform. Find the probability of the event «The set contains 1».

8. Compare the answers in the three previous problems.

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Home Assignment 15

You shall give a numerical answer for all the problems: a simple fraction or a decimal fraction.

1. A uniform probability space consists of sequences (x_1, x_2) of length 2 consisting of numbers from 1 to 6. Find the probability of the event «$x_1 = x_2$».

2. A uniform probability space consists of numbers from 1 to 100. Find the probability of the event «The sum of digits equals 9».

3. A uniform probability space consists of permutations of numbers from 1 to 24. Find the probability of the event «The greatest number of the first 12 numbers in the permutation is bigger than the greatest number of the last 12 numbers in the permutation».

4. A uniform probability space consists of numbers from 0 to 48. Find the probability of the event «The quotient after devision of the outcome number by 7 is greater then the remainder (after the same devision)»

5. A uniform probability space consists of decreasing sequences of length 5 consisting of numbers from 1 to 36 (each next element of the sequence is smaller then the previous one). Find the probability of the event «The last element of the sequence equals 1».

6. A uniform probability space consists of non-decreasing sequences of length 5 consisting of numbers from 1 to 36 (each next element of the sequence is greater or equal to the previous one). Find the probability of the event «The first element of the sequence equals 1».

7. A uniform probability space consists of 3×3 matrices with elements that equal to 0 or 1. Find the probability of the event «At least one of the border lines consists of zeroes» (Borders line are the first and the third column, and the first and the third raw).

8. A uniform probability space consists of binary words of length 21. Find the probability of the event «The number of ones on the first 10 positions is smaller then the number of ones on the last 11 positions».