Assignment 1 – Basic Probability, Computing and Statistics 2015

To be submitted on Monday, September 7th, 9 a.m.

Guidelines The starred exercises are relatively easy exercises for you to practice. No points are awarded for them. You may pick and choose four out of the numbered exercises for submission. Each numbered exercise is worth 2.5 points. Numbered exercises with an exclamation mark are supposed to be a bit harder and you may challenge yourself by trying to solve them.

In the directory of your private url there is folder called theory. Please upload your submission there. Your submission should be a pdf document (use a scanner for handwritten documents!) entitled *AssignmentX_yourStudentNumber.pdf*, where X is the number of the assignment and *yourStudentNumber* is self-explanatory. If your submission does not comply with this format, we will deduct 1 point. For each day that your submission is late, we deduct 2 points.

If you have any question about the homework or if you need help, do not hesitate to contact Thomas.

Exercises

1. If you flip a fair coin 6 times, what is the probability of getting exactly 4 tails?
2. There are 11 students in a class: 4 boys and 7 girls. If you pick a group of 5 at random, what is the probability that everyone in the group is a girl?
3. You have 6 friends, and want to pick and order 5 of them in a single line. In how many ways can you arrange them?
4. How many functions defined on n points are possible if each function can take a value from a set V?
5. Ten students are to be divided into two cohorts of 5 students each. How many different divisions are possible?
6. How many different signals, each consisting of 9 colored dots on a pole, can be made from a set of 4 orange dots, 3 purple dots, and 2 cyan dots if all poles of the same color are identical?
7. In how many unique ways can the letters of a word with n letters be arranged if it contains repetitions of one letter p times, and repetitions of another letter q times?
8. A program committee of 3 men and 3 women is to be formed from a group of 8 women and 6 men How many different committee are possible if 2 of the men refuse to serve together?
9. You have 3 books on complexity theory, 2 on probability theory, and 1 novel. In how many ways can these books be arranged on a bookshelf if the books on complexity theory must be together but the other books can be arranged in any order?
10. A restaurant is testing a new menu. They have prepared 3 tables with 2 distinct dishes for each table. If 3 sets of partners are to be assigned to these 6 dishes so that each partner tastes a different dish at the same table, how many assignments are possible?
11. How many functions are there from $\{0,1\}^n$ to $\{0,1\}^n$ for $n \in \mathbb{N}$?

12. A committee with 10 members has to be formed out of 15 men and 8 women. How many different committees are possible which have at least 5 female members?

13! Assuming that each year has 365 days and assuming that each day is equally likely to be a person's birthday, what is the probability that in a population of n people, at least 2 will have the same birthday?

* In how many unique ways can the letters in the word 'error' be arranged?

* Jouke is packing his bags to go on vacation. He has 6 unique shirts, but only 5 fit in his bag. How many different groups of shirts does he have to chose from?

* You got a free ticket for a guided bike tour to Bloemendal, and you can bring along 3 friends! Unfortunately, you have 7 who want to tag along on this exciting adventure. How many different groups of friends could you take with you?

* How many functions defined on n points are possible if each functional value is either 0 or 1?

* A programme committee of 3 is to be formed from a group of 20 reluctant researchers. How many different committees are possible?