
Mathematical Methods for Computer Science II

Spring 2017

Series 1 – Hand in before Monday, 27.02.2017 - 13.00

1. How many 5-digit numbers built out of distinct integers from the set $\{1, 2, \dots, 9\}$ are there
 - a) ending in 97?
 - b) containing the digit 2?
 - c) containing the digits 2 and 7 in any order?
 - d) containing the digits 2 and 7 as 27?
 - e) not containing the digits 5 and 1?
 - f) containing the digit 5 but not the digit 6?
 - g) * containing 3 even and 2 odd digits?
2. A party has 15 members, with 7 men and 8 women. Find the number of ways to:
 - a) Select a 6-member committee from the members.
 - b) Select a 6-member committee with 3 men and 3 women.
 - c) Elect a president, a vice president, and a treasurer, in such a way that the president and vice president are not of the same sex.
3. **Pigeonhole Principle:** If n pigeonholes are occupied by $n + 1$ or more pigeons, then at least one pigeonhole is occupied by more than one pigeon.
Generalized Pigeonhole Principle: If n pigeonholes are occupied by $kn + 1$ or more pigeons, where k is a positive integer, then at least one pigeonhole is occupied by $k + 1$ or more pigeons.
 - a) Find the minimum number n of elements which need to be taken from the set $S = \{1, 2, 3, \dots, 9\}$ to be sure that
 - i) the sum of two of the n integers is even.
 - ii) two of the n numbers add up to 11.
 - b) Find the minimum number of students in a class to be sure that three of them are born in the same week.
4. How many possibilities are there to place 4 towers, 2 black and 2 white, on a chess board so that they cannot threaten each other?
Remember: a chess board is an 8×8 field. Towers can only move along a horizontal or a vertical line.

* Exercises with a * are intended for Discrete Mathematics II students only. However, MMI II students can gain additional bonus points by attempting them.