

# Midterm / CO1

Summer, 2022

July 12, 2022

1. In how many ways can we choose 8 bottles of soda if there are 12 brands available, if
  - (a) order counts and repetition is allowed?
  - (b) order does not count and repetition is allowed?
  - (c) order counts and repetition is not allowed?
  - (d) order does not count and repetition is not allowed?
2. How many  $m \times n$  matrices do you have ( $m$  rows and  $n$  columns) whose entries are only 0's and 1's and all rows are different?
3. How many ways are there to select 60 balls if we have to choose at least 5 and at most 25 red balls, at least 10, at most 15 blue and at least 15 and at most 32 yellow balls. The order does not count.
4. Find the number of ways to split off 12 police officers into patrols of size three if two of the officers hate each other and may not be in the same patrol. (Order of officers in the patrol and order of the patrols do not count)
5. How many codewords of length  $n$  from alphabet  $\{a, b, c, d, e\}$  are there that contain even number consonants?
6. How many permutations of the numbers  $1, 2, \dots, 9$  are there that do not contain any of the following patterns: 12, 24 and 27?

Each exercise is 8 points.