

# Exercise sheet 11

1. There are 150 male students and 40 female students in a class. A delegation of 4 students should be chosen.
  - a) How many ways such a delegation can be chosen?
  - b) How many ways a delegation can be chosen if a delegation must contain three male students and one female student?
  - c) How many ways a delegation and its spokesperson can be chosen?
2. There are 20 red apples, 20 green apples, and 20 yellow apples.
  - a) How many ways we can choose 12 apples if we want to choose each three of each colour? (Assume that the apples of each colour are indistinguishable, so we are only counting the ways how to choose the 12 colours, not the individual apples.)
  - b) How many ways we can choose 12 apples if we do not want to choose a single colour 12 times?
3. Consider numbers  $1, 2, \dots, n$  with  $n \geq 11$ . How many ways are there to choose five different numbers out of them such that the second largest does not exceed 10?
4. In a class, 13 children like to play football, 17 like biking, 8 like hiking. The number of children who like both football and biking is 10, the number of those who like football and hiking is 2, and the number of those who like biking and hiking is 4. Finally, there is one kid, who likes all the activities and two guys who do not like any of these. How many children are there in the class?

## Answers

1. a)  $\binom{190}{4}$ , b)  $\binom{150}{3} + \binom{40}{1}$ , c)  $4\binom{190}{4} = 190\binom{189}{3}$
2. a)  $\binom{3}{3} = \binom{5}{3} = 10$ , b)  $\binom{3}{12} - 3 = \binom{14}{12} - 3 = 88$
3.  $\binom{10}{5} + (n-10)\binom{10}{4}$
4.  $13 + 17 + 8 - 10 - 2 - 4 + 1 + 2 = 25$