

## Exercise 1

Solutions for exercises marked with a '\*' will be made available online, usually in the following week. Only if needed will these exercises be discussed during the tutorial. All other exercises are to be prepared at home and presented by the participants during the tutorial session.

### 1.1 Linear Problem

Pirates are on a raid and rob three merchant ships on three consecutive days: 8 pirates participate in the first raid, 5 in the second and 20 in the last. The first ship is carrying 3 sacks of corn and 7 bottles of whisky. After selling the goods and paying the crew, the first raid earns the pirate organization a net profit of 33 gold coins. On the second raid, the pirates obtain 5 bottles of whisky and 8 corn sacks. This yields a net profit of 36 gold coins. Unfortunately, on the third raid, 3 whisky bottles are all they can find, leading to a net loss of 5 gold coins.

Solve the problem by hand, i.e. do not write a computer program:

- What is the price of 1 bottle of whisky?
- What is the price of 1 sack of corn?
- How many gold coins does a pirate earn on a raid?

### 1.2 \*Properties of the solution to a linear $(m, n)$ -system $Ax = c$

For a linear system  $Ax = c$  with  $c \neq 0$  state the conditions under which there is/are

- exactly one solution.
- no solution.
- infinitely many solutions.

### 1.3 Solving ex. 1.1 with Python

Write a Python program to solve ex. 1.1. Send the code/notebook to [sebastianmathias.keller@unibas.ch](mailto:sebastianmathias.keller@unibas.ch) sometime *before* Friday, 4<sup>th</sup> of October. During the next tutorial we will have a look at some of those code submissions.