Problem 1: The Die Hard 3 jug problem

This assignment should be done individually

- To do so, create a mooshak account with your ualg login (without @ ualg.pt) in mooshak. Example: the student with the number 123456 uses a123456. NB: do not use your name in the login id.
- Submit your code to mooshak http://deei-mooshak.ualg.pt/~jvo/ Problem B up to:

  November 2, 2021 – 17h30
- A submission will remain *pending* until validated by the Instructor during the lab class. Only *final* submissions will be considered for evaluation. Deadline for validation:

  November 16, 2021 – 17h30

Problem

"I am a bomb and you have just armed me" that's the sentence appearing in a sequence of the action movie *Die Hard 3: with a Vengeance* where a solution for a jug problem is asked as the key for disarming the bomb.

Fig. 1 – The Die Hard 3 jug problem scene

Task

In our version of the problem you are given three jugs of 8, 5, and 3 litres of capacity respectively; a configuration, i.e., a certain amount of water in each jug, that can be zero, and a simple rule: At any given time, you can only move the existing water in one jug to any of the other jugs, provided that it is not full. Notice that no water can be wasted. Also, there is no other way of measuring water except

by the size of the jugs, i.e., one can either empty a jug into another or fill another jug to its brim. The goal is to achieve a given final configuration.

There are many approaches to address this problem. However, your task is to write a program that, based on the approach followed in Tutorial 1, returns the successive configurations required for achieving the final configuration starting from the initial one, along the shortest path, i.e., along the path with the minimum number of movements.

At this time, only three jugs are considered and for comparing configurations we will assume that the three jugs are presented by descending order of their capacity. Also, we assume that first we try to move water from the first (8 litre) jug, then the second, and only afterwards the third.

Please note that any other approach, however meritorious it may be, will be quoted with 0 (zero).

Input
The input has two lines. The first line represents the initial configuration while the second line denotes the goal configuration. In both lines, there are three space separated non negative integers representing the current quantity of the water in the jug 8, 5, and 3, respectively. For example the line
7 0 1
represents 7 litres of water in the 8 litre jug, zero in the 5 litre jug, and 1 litre in the 3 litre jug.

All given instances of the problem will have a (unique) solution.

Output
The sequence of configurations starting from the initial to the final one (both *inclusivé*), one per line. These configurations have the above described format. At the end of this sequence, a non negative integer with the length of the shortest path found should be also presented.

Sample Input 1
8 0 0
0 5 3

Sample output 1
8 0 0
3 5 0
0 5 3
2

Sample input 2
8 0 0
4 1 3

Sample output 2
8 0 0
5 0 3
5 3 0
2 3 3
2 5 1
7 0 1
7 1 0
4 1 3
7