

Exercise of Algorithms

Problem 1

We have three containers whose sizes are A pints, B pints and C pints, respectively, where A, B, C are all positive integers. In the beginning, the A -pint container has a pints of water, the B -pint container has b pints of water, and the C -pint container has c pints of water, where a, b and c are non-negative integers. (For example, we might have $A = 10, B = 7, C = 4$ and $a = 0, b = 6, c = 4$.) We are allowed one type of operation: pouring the contents of one container into another, stopping only when the source container is empty or the destination container is full. We want to know if there is a sequence of pourings that, in the end, leaves exactly k pints of water in any of the three containers. (So the answer we seek is either YES or NO.)

Your task:

- 1) Model this problem as a graph problem: give a precise definition of the graph involved, and state the specific question about this graph that needs to be answered.
- 2) Design an efficient algorithm to solve the above problem.