Homework 1: Exhaustive search

A sequence of n natural numbers $C = \langle c_1, c_2, \ldots, c_n \rangle$ is said to be a ***mixture*** of a sequence of n natural numbers $A = \langle a_1, a_2, \ldots, a_n \rangle$ and another sequence of n natural numbers $B = \langle b_1, b_2, \ldots, b_n \rangle$ if and only if for every $1 \leq i \leq n$ we have $c_i = a_i$ or $c_i = b_i$. In other words, for i from 1 to n, we pick either a_i or b_i and make it c_i. We say $\sum_{1 \leq i \leq n} c_i$ is a ***mixture sum*** of A and B.

Write a program that can do the following things:

- read two sequences of n natural numbers of $A = \langle a_1, a_2, \ldots, a_n \rangle$ and $B = \langle b_1, b_2, \ldots, b_n \rangle$ where n is given by the user during the runtime,
- ask for a natural number m given by the user during the runtime,
- determine whether there exists a mixture C of A and B such that the the mixture sum of C equals m, and
- if such a mixture sequence does exist print out the mixture sequence; otherwise print out a message saying there is no such mixture sequence.

For this programming assignment, just conduct an exhaustive search to examine all 2^n possible mixture sequences of A and B to see whether there is one with a mixture sum equals m. You can use dynamically allocate a vector of n integers to simulate an n-bit binary counter counting from $\langle 0, 0, \ldots, 0 \rangle$ to $\langle 1, 1, \ldots, 1 \rangle$ increased by one in each step. In each step, the value of the n-bit binary counter represents a unique mixture sequence $C = \langle c_1, c_2, \ldots, c_n \rangle$ where $c_i = a_i$ if the ith bit of the binary counter is 0 and $c_i = b_i$ if the ith bit of the binary counter is 1.

You can either write a single loop to simulate the n-bit binary counter counting from $\langle 0, 0, \ldots, 0 \rangle$ to $\langle 1, 1, \ldots, 1 \rangle$ increased by one in each step, or alternatively, you may also write a recursive version to accomplish the same task.