CS 278
Lab assignment: Subsets of a Set

Due: Thursday 9/27 by 11:30pm

Subsets of a set can be generated using a mask. A good description of the method is presented at http://compprog.wordpress.com/2007/10/10/generating-subsets/. The page also contains a link to the code in C (sub.c)

We will use subset generation in order to solve the following problem. Given a set of integers S and a number N, find all nonempty subsets of S whose sum is N. For example, given the set S={1, 2, -1, 3} and the number N=3, there are three subsets of S whose sum is 3. The subsets are {1, 2} (since 1+2 = 3), {1, -1, 3} (since 1+(-1)+3 = 3), and {3}.

Your program should do the following:

1) Prompt the user to enter the size of set S, elements of S, and the number N. Assume that the size of S is no more than 10. Store the elements of S in an array.
2) Generate all subsets of S using a mask.
3) For each nonempty subset generated in 2), compute the sum of elements in the subset. If the sum of elements in the subset is equal to N then output the subset.
4) Output total number of subsets of S that have the sum of elements equal to N. If none of the subsets of S have sum N, then output that they do not exist.

Dialog with the user may look like the following:

> *Please enter the size of S: 3*
> *Please enter S: 5 2 3*
> *Please enter the number N: 5*
> *Subsets with sum 5:*
> *{ 2 3 }*
> *{ 5 }*
> *There are 2 subsets with sum 5.*

Another example of Dialog with the user:

> *Please enter the size of S: 4*
> *Please enter S: 10 20 30 40*
> *Please enter the number N: 5*
> *Subsets with sum 5:*
> *do not exist*

Implementation details:

Your program must work correctly for sets with 10 or less elements. It must use array to store the elements of set S. It must use a mask to generate all subsets of S.

What to submit:

- Submit the source code of your program using Canvas.
- If you write your program in a programming language other than Java, then submit instructions on how to compile and run your program on CS machines.