

Problem 37: Commutative Combo!

Difficulty: Medium

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Problem Background

The commutative property of addition means that if you are adding numbers together, it doesn't matter what order you add them in. $1 + 2 = 3$, and $2 + 1 = 3$. You will use this special property of addition to show just how many different ways you can sum up numbers.

Problem Description

Given a list of numbers, you must write a program that finds all possible multiset permutations of these numbers that add up to a specified sum. What is a multiset permutation? I'm glad you asked. It is a permutation of a set of objects (in this case digits) where objects of the same type are freely interchangeable. In the example input below, the second test case has two '1' digits. However, the equation $1+1+2$ only appears once in the output. That is because switching the 1s around does not form a new equation, even though they are different instances of the number 1.

Sample Input

The first line of your program's input, received from the standard input channel, will contain a positive integer representing the number of test cases. Each test case will include:

- The first line of each test case will be the sum you need to find in the following format:
FIND SUM=<positive integer>
- The second line of each test case will contain a list of positive integers delimited by a comma.

```
2
FIND SUM=10
2,3,7,1,8
FIND SUM=4
2,1,3,1
```

Sample Output

Your program should output all the possible addition equations you can make from the given numbers for the given sum. You cannot repeat any of the given numbers in your solutions unless the number is repeated in the input list. Your equations should be ordered in an ascending manner by the first number in the equation, then by the second, and so on.

$1+2+7$

$1+7+2$

$2+1+7$

$2+7+1$

$2+8$

$3+7$

$7+1+2$

$7+2+1$

$7+3$

$8+2$

$1+1+2$

$1+2+1$

$1+3$

$2+1+1$

$3+1$