CS302

Assignment 2: Attack of the Matryoshkas

Description

Ah the Matryoshka, the toy that models recursion perfectly by having identical dolls within each doll of smaller size until you reach the smallest doll that cannot be opened any further. The traditional doll contains exactly one subdoll within each doll which contains a subdoll and etc. For this assignment, there can be cases where each subdoll could contain 2 subdolls and the sum of the sizes of the two subdolls cannot exceed the size of the doll that contains them. We can denote this as an augmented Matryoshka.

You will be given a set of lines from an input file that contains a single test case, you need to verify each test case if it is a valid augmented Matryoshka or not. Every doll in the input is represented by (-k...k) (a negative integer matching with its absolute value positive integer), and no dolls within -k to k can be larger or contain two subdolls whose sum is larger than k. For example

```
-7 -5 -3 -2 2 3 5 7
```

Would be an example of a valid Matryoshka, the doll with size 7 contains a doll with size 5 which contains a doll with size 3 that contains a doll with size 2 and the size 2 doll cannot be broken apart any further. And each subdoll's size is not larger than the doll that is contained within it. For the example below

```
-9 -7 -2 2 -3 -2 -1 1 2 3 7 9
```

The doll with size 9 contains a doll with size 7, the doll with size 7 contains a doll with size 2 and 3 (their sum is 5 which is less than 7 thus this works), the doll with size 2 contains no subdolls while the doll with size 3 contains a doll with size 2 which contains a doll with size 1 and that doll contains no more subdolls. The next example shows an invalid case

```
-9 -7 -2 2 -3 -1 -2 2 1 3 7 9
```

The doll with size 9 contains a doll with size 7, that contains two dolls: one with size 2 and the other with size 3 (their sum does not exceed 7), the doll with size 2 contains no subdolls, and the doll with size 3 contains a doll with size 1 that contains a doll with size 2 which would make this invalid since the a size 1 doll cannot contain a size 2 doll.

Contents of main

In main, you need to prompt for an input file from which your program reads the test cases, each line is a single test case with integers separated by a space, each line is terminated by an end of line. You may use a `vector` of type `int` to store the numbers for each test case. You must then use a recursive function to verify each doll/subdoll, you can use a loop to match a negative number with a positive one within the recursive function. For each case output whether the input sequence is valid or invalid, refer to the sample output.

Specifications

- Comment your code and functions
- You must have a recursive function to verify if each test case (augmented matryoshka doll) is valid

Sample Run

```
% g++ main.cpp
% ./a.out < input01.txt
:-) matryoshka!

% ./a.out < input02.txt
:-( Try again.

% ./a.out < input03.txt
:-( Try again.

% ./a.out < input04.txt
:-) matryoshka!

% ./a.out < input05.txt
:-( Try again.

% ./a.out < input06.txt
:-) matryoshka!

% ./a.out < input07.txt
:-( Try again.

% ./a.out < input08.txt
:-) matryoshka!

% ./a.out < input09.txt
:-( Try again.
```

Submission

Submit your source code to the webcampus site by the deadline

References

- Link to the top image can be found at *https* : *//pngimg.com/image/*49502
- Supplemental Video https://youtu.be/Kqx2tfnY7f0