Abstract Data Types (ADT's)

Assignment 1
Data Structures and Algorithms
Due date: 10 March, 2021

1.1 Complex Number ADT: The goal is to define and implement an ADT for n-dimensional complex numbers. A n-dimensional complex number is of the form $a_1 + ia_2 + ja_3 + ka_4 + ...$ upto n terms.

The code must consist of three files as follows :

1. *complex.h* - Which defines the ADT using the header files.
2. *complex.c* - Which implements the functions defined later.
3. *main.c* - Which must use the ADT and perform various operations on input and produce output as specified later.

The functions to be implemented are as follows :

1. Addition: (ADD) - $a_t + b_t \ \forall t \in \{1, 2, ..., n\}$
2. Subtract (SUB) - $a_t - b_t \ \forall t \in \{1, 2, ..., n\}$
3. Mod (MOD) - $\sqrt{\sum_{t=1}^{n} a_t^2}$
4. Dot product (DOT) - $\sum_{t=1}^{n} a_t b_t$

Input
The first line contains a string TYPE and an integer N, denoting the type of the operation that you are supposed to make and the dimension of the complex numbers respectively.
If the TYPE is MOD, then the next line contains N integers, denoting the complex number.
Else, the next 2 lines contain N integers each, denoting the complex numbers on which you are supposed to make the operations.

Output
If the TYPE is DOT, then print a single integer denoting the output of the Dot Product operation.
If the TYPE is MOD, then print a single floating point denoting the output of the Mod operation, rounded off to exactly 2 decimal places.
Else, print N integers, denoting the final complex number you get after doing the operations.

Constraints
$1 \leq N \leq 10^6$
$-10^5 \leq$ Each of the N integers $\leq 10^5$

Sample Test Cases

Input	Output
ADD 4 1 2 3 4 9 7 6 5	10 9 9 9
MOD 4 2 0 1 2	3.00

Note
There is no automated evaluation for this problem. TAs will evaluate each code manually.

1.2 Music Player ADT: Create a *musicplayer.h* that will contain the basic functionalities of a music player. You DO NOT have to implement the functions, just state them.

Note
This question is open-ended on purpose and you are free to design the music player as you want. Also note that one ADT can contain another ADT. Again, there is no automated evaluation and codes will be evaluated manually.

Submission Instructions
You need to submit this assignment on the Courses Portal. Your submission is expected to be a <RollNumber>.zip file.

NOTE: Strict actions would be taken against anyone found involved in any kind of plagiarism either from the internet or from other students.