IOI Training Camp 2011 – Test 1, 11 June, 2011

Problem 1 Zorgian genetics

Research reveals that the genetic code of Zorgians, like that of Earthlings, is constructed from four *bases*, labelled `A`, `B`, `C` and `D`. Like human genes, Zorgian genes are laid out in two parallel rows, following some simple rules.

- Each row of a Zorgian gene contains an even number, $2N$, of bases.
- No two adjacent bases in a row are the same. Similarly, at every position $i \in \{1, 2, \ldots, 2N\}$, the bases at position i in the first and second row are different.
- Further, across both rows, each of the four bases occurs exactly N times.

Specialists in extraterrestrial genetics are downloading data from a Zorgian gene database over the intergalactic internet. Unfortunately, to save space, the database stores only the first row of each gene. Further, this data may be corrupted while it is being transferred. For each sequence of genetic data that the specialists download, they have to determine whether it can be paired with a second row to form a valid Zorgian gene.

For instance, suppose the sequence downloaded is `ABCD`. In this case, a valid second row that completes the gene is `BADC`. Of course, there are also other possibilities, such as `CDBA`. On the other hand, if the sequence downloaded is `ABBDCA`, there is no way to construct a second row that meets the conditions required to form a valid Zorgian gene.

Your task is to write a program that reads one row of Zorgian genetic data and determines whether it can be completed with a second row to form a valid Zorgian gene.

Input format

The first line of input is a single integer N. The second line is a string of $2N$ characters made up of the symbols `A`, `B`, `C` and `D`.

Output format

If it is possible to complete the input to form a Zorgian gene, print out a valid sequence of $2N$ characters consisting of the symbols `A`, `B`, `C` and `D` corresponding to the second row of the gene. If more than one valid sequence exists, print any one.

If there is no way to extend the input to form a valid Zorgian gene, print a single line with the number -1.

Test Data

- *Subtask 1 (20 marks):* $1 \leq N \leq 7$
- *Subtask 2 (20 marks):* $1 \leq N \leq 20$
- *Subtask 3 (60 marks):* $1 \leq N \leq 10^5$

Sample input 1

```
2
ABCD
```

Sample input 2

```
3
ABBDCA
```

Sample output 1

```
BADC
```

Sample output 2

```
-1
```

Time and memory limits

The time limit for this task is 2 seconds. The memory limit is 64 MB