Swapping Brackets (bracketswap)

Do you remember Baby Bob? His older brother, Balanced Benjamin would like to give a gift to his brother. He has a string S of length N, where N is even. The string consists of $\frac{N}{2}$ opening brackets ("(") and $\frac{N}{2}$ closing brackets (")"). As Bob likes *valid bracket sequences* [1], Benjamin would like to turn S into a valid bracket sequence by swapping (not necessarily adjacent) characters in S.

Figure 1: Benjamin constructing the gift.

Since he's less mathematically inclined than his younger brother, he asks for *your* help.

Write a program that turns S into a balanced bracket sequence by swapping characters in S using the minimum number of swaps. If there are more than one way to do this, you can output any of them.

> ☞ Among the attachments of this task you may find a template file `bracketswap.*` with a sample incomplete implementation.

Input

The input file consists of:

- a line containing integer N, the length of S.
- a line containing string S, a bracket sequence of length N.

Output

The output file consists of:

- a line containing integer R, the minimum number of swaps necessary.
- R lines, each line contains the indices (0-based) of the two characters to be swapped.

[1] A bracket sequence is valid if "1" and "+" characters can be inserted into it so that it becomes a valid mathematical expression. For example, "(()(()))" is a valid bracket sequence.

Constraints

- $1 \leq N \leq 1\,000\,000$.
- N is even.
- S has length N and only contains characters "`(`" and "`)`".

Scoring

Your program will be tested against several test cases grouped in subtasks. In order to obtain the score of a subtask, your program needs to correctly solve all of its test cases.

– **Subtask 1** (0 points) Examples.

– **Subtask 2** (33 points) $N \leq 16$.

– **Subtask 3** (44 points) $N \leq 5678$.

– **Subtask 4** (23 points) No additional limitations.

Examples

input	output
4)()(	1 0 3
8)))((()(	2 0 5 7 1
10 ()(()(()))	0

Explanation

In the **first sample case** the string after the swap looks like this: "`(())`".

In the **second sample case** the swaps change string S the following way:

`)))((()(` ⇒ `())(())(` ⇒ `((()()))`

In the **third sample case** the bracket sequence is already valid.