

D - Balanced Parentheses

Time limit : 2sec / Stack limit : 256MB / Memory limit : 256MB

Question

The string s is called a balanced parentheses string (hereinafter referred to as “BP”) when it satisfies one of the following conditions:

- s is an empty string.
- There is a string x that would make a BP, and s is a string consisting of ' (' and x and ') ' in sequence, expressed as ' (' x ') '.
- There are the strings x, y that would make a BP, and s consists of strings x and y in sequence, expressed as xy .

Takahashi wants to make the string S of length N a BP. Inserting an arbitrary character into the $i_{th}(0 < i < N)$ position of the original S costs A_i . A specific example where S is ') ((' is shown below. For ease of understanding, ' (' that has been inserted is shown as ' < , ' and ') ' that has been inserted is shown as ' > '. The total cost of inserting characters to convert S into ' <) ((> ' is $A_0 + A_3 + A_3$ irrespective of the order of inserting characters.

Find the lowest total cost to make S a BP.

Constrains

- $1 \leq N \leq 300,000$
- S consists of ' (' and ') '.
- $1 \leq A_i \leq 10^9$

Partial Credit

30 points will be given to test cases satisfying $A_i = i + 1$.

Input

Inputs are provided from standard inputs in the following form.

```
N
S
A_0 A_1 ... A_N
```

Output

Output the lowest total cost in one line.

Sample Input 1

```
4
() ) (
10 1 4 8 5
```

Sample Output 1

```
6
```

When inserted ' (' and ') ' are shown as ' < ' and ' > ' respectively, inserting characters to result in ' <) ((> ' is optimal, with a total cost of six.

Sample Input 2

```
8
```

```
)) ( ) ( ( )  
1 2 3 4 5 6 7 8 9
```

Sample Output 2

```
10
```