Swallow Messaging

Kosie van der Merwe

Introduction

Bruce and Carl live in the same area and constantly send each other messages. However, recently the local internet exchange went down and both have lost internet access.

But all is not lost, as both have a large reserve of messenger swallows (African, specifically) and coconuts! Unfortunately, the length of messages one can write on a coconut is severely limited. Therefore, they wish to compress the messages they send.

Thankfully, foreseeing this eventuality, both Bruce and Carl have agreed on a compression algorithm (described below). Your task (other than carving the messages on the coconuts) is to come up with a program to optimally compress the messages.

Compression Algorithm

The messages you will be compressing consist purely of uppercase letters (from A to Z). The compression algorithm works by encoding repeated subsequences as a number (indicating the number of repetitions) and the subsequence. For instance, 'TESTTESTTESTTEST' would get encoded as '4(TEST)'.

But due to the notation we have chosen, we can recursively encode subsequences. For instance, CATDOGDOGCATDOGDOG could be compressed as 2(CAT2(DOG)).

More formally, the decompression algorithm is, where S is a compressed string:

- If S consists of a single uppercase letter, then it decompresses to S.

- If S can be split into two compressed strings T and Q, which decompress to T' and Q' respectively, then S decompresses to $T'Q'$ (T' followed by Q').

- If S is a compressed string in the form $k(Q)$, where k is a decimal encoded integer and Q is a compressed string, then S decompresses to k repetitions of Q', where Q' is the decompression of Q.

Task

Given N and a message of length N, you have to output the shortest possible encoding of the message in the compression format.

If there are multiple possible ways of encoding the message you can output any one of them.

Example

Input (stdin)

The first line contains a single integer, N. The next line contains N uppercase letters.

Sample input

```
18
CATDOGDOGCATDOGDOG
```

Output (stdout)

A single line containing the shortest compression.

Sample output

```
2(CATDOGDOG)
```

Constraints

- $1 \le N \le 100$

  Additionally, in 50% of the test cases:

- $1 \le N \le 13$

Time limit

1 second.

Scoring

A correct solution will score 100% while an incorrect solution will score 0%.