

Problem A. Bracket-and-bar Sequences

Input file: *standard input*
Output file: *standard output*
Time limit: 2 seconds
Memory limit: 512 mebibytes

Let us define the set of *regular bracket-and-bar sequences* R recursively. It is the set of strings that can be obtained following only the rules below:

- $\varepsilon \in R$ (empty string)
- $A, B \in R \Rightarrow AB \in R$ (concatenation)
- $A, B \in R \Rightarrow (A|B) \in R$

For example, the sequences containing two triples “(|)” look as follows: “((|)|)”, “(|(|))”, “(|)(|)”.

Establish a correspondence between regular bracket-and-bar sequences of certain length and integers, and implement that correspondence.

Interaction Protocol

In this problem, your solution will be run twice on each test. Each line of input is terminated by an end-of-line character.

First Run

During the first run, the solution encodes bracket-and-bar sequences as integers. The first line contains the word “**encode**”. The second line contains an integer t : the number of test cases ($1 \leq t \leq 1000$). Each test case is given on two lines: the first line contains an integer n which is the number of “(|)” triples in the sequence ($1 \leq n \leq 25$), and the second line contains $3n$ characters without spaces, constituting a regular bracket-and-bar sequence with n triples.

Print t lines, one for each test case. On the i -th line, print an integer x_i which you chose to encode the i -th sequence from the input ($0 \leq x_i \leq 2 \cdot 10^{18}$).

Second Run

During the second run, the solution decodes bracket-and-bar sequences from integers. The first line contains the word “**decode**”. The second line contains an integer t : the number of test cases ($1 \leq t \leq 1000$). Each test case is given on two lines: the first line contains an integer n which is the number of “(|)” triples in the sequence ($1 \leq n \leq 25$), and the second line contains the integer printed by your solution for this test case during the first run.

Print t lines, one for each test case. On the i -th line, print the bracket-and-bar sequence from the i -th test case.

Example

For each test, the input during the second run depends on the solution’s output during the first run.

Below we show two runs of a certain solution on the first test. It can be seen that this solution encodes the characters by digits 1, 2, and 3, and just prints the resulting string of digits as the encoding integer. Unfortunately, for large n , the strings will become too long.

<i>standard input</i>	<i>standard output</i>
encode 3 1 () 4 (((()))) 5 (())((()))	123 111123232323 121233112123323

<i>standard input</i>	<i>standard output</i>
decode 3 1 123 4 111123232323 5 121233112123323	() (((()))) (())((()))