

Contest Duration: 2025-04-27(Sun) 22:00 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250427T2100&p1=248>) - 2025-04-27(Sun) 23:40 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250427T2240&p1=248>) (local time) (100 minutes)

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## F - Shortest One Formula

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Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 500 points

### Problem Statement

You are given a positive integer  $N$ .

Among all valid arithmetic expressions consisting of the characters 1, +, \*, (, and ), find one of the minimum length whose value is  $N$ .

More formally, among the strings  $S$  satisfying all of the following conditions, find one of the minimum length:

- $S$  conforms to the symbol `<expr>` in the BNF ([https://en.wikipedia.org/wiki/Backus%E2%80%93Naur\\_form](https://en.wikipedia.org/wiki/Backus%E2%80%93Naur_form)) below.
- The value of the expression represented by  $S$  is  $N$ .

```
<expr> ::= <term> | <expr> "+" <term>
<term> ::= <factor> | <term> "*" <factor>
<factor> ::= <number> | "(" <expr> ")"
<number> ::= "1" | "1" <number>
```

Strings that conform to `<expr>` include:

- 1111+111 representing  $1111 + 111$ .
- (1+1)\*(1+1) representing  $(1 + 1) \times (1 + 1)$ .
- (11+(1+1)\*(1+1))+1 representing  $(11 + (1 + 1) \times (1 + 1)) + 1$ .

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Strings that do not conform to `<expr>` include:

- $(1+1)(1+1)$
- $1+2$
- $1-1$
- $1/1$
- $)1($
- $1++1$
- $+1$
- $(+1)$
- $1^*+1$

## Constraints

- $1 \leq N \leq 2000$
  - All input values are integers.
- 

## Input

The input is given from Standard Input in the following format:

```
N
```

## Output

Print a solution.

---

### Sample Input 1

Copy

```
9
```

Copy

### Sample Output 1

Copy

```
(1+1+1)*(1+1+1)
```

Copy

Expressions whose value is 9 include:

- $(1+1+1)*(1+1+1)$
- $1+1+1+1+1+1+1+1+1$
- $(1+1)*(1+1)*(1+1)+1$

Among them, a shortest is  $(1+1+1)*(1+1+1)$ .

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## Sample Input 2

Copy

11

Copy

## Sample Output 2

Copy

11

Copy

## Sample Input 3

Copy

403

Copy

## Sample Output 3

Copy

$1+(1+1+1)*(1+11+11+111)$

Copy

/#telegram)

#url=https%3A%2F%2Fatcoder.jp%2Fcontests%2Fabc403%2Ftasks%2Fabc403\_f%3Flang%3Den&title=F%20- )

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