

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 $\langle \text{expr} \rangle$ in the BNF (https://en.wikipedia.org/wiki/Backus%E2%80%93Naur_form) below.
- The value of the expression represented by S is N .

```
 $\langle \text{expr} \rangle ::= \langle \text{term} \rangle \mid \langle \text{expr} \rangle "+" \langle \text{term} \rangle$   
 $\langle \text{term} \rangle ::= \langle \text{factor} \rangle \mid \langle \text{term} \rangle "*" \langle \text{factor} \rangle$   
 $\langle \text{factor} \rangle ::= \langle \text{number} \rangle \mid "(" \langle \text{expr} \rangle ")"$   
 $\langle \text{number} \rangle ::= "1" \mid "1" \langle \text{number} \rangle$ 
```

Strings that conform to $\langle \text{expr} \rangle$ include:

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

Strings that do not conform to $\langle \text{expr} \rangle$ include:

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

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](#)

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

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