Problem H. Simple Text Editor

OS Linux

Implement a simple text editor. The editor initially contains an empty string, S. Perform Q operations of the following 4 types:

1. *append*(W) - Append string W to the end of S.
2. *delete*(k) - Delete the last k characters of S.
3. *print*(k) - Print the kth character of S.
4. *undo*$()$ - Undo the last (not previously undone) operation of type 1 or 2, reverting S to the state it was in prior to that operation.

Example

$S = \text{'abcde'}$
$ops = \left[\text{'1 fg'}, \text{'3 6'}, \text{'2 5'}, \text{'4'}, \text{'3 7'}, \text{'4'}, \text{'3 4'}\right]$

```
operation
index    S          ops[index]   explanation
-----    ------    ----------    -----------
0        abcde     1 fg          append fg
1        abcdefg   3 6           print the 6th letter - f
2        abcdefg   2 5           delete the last 5 letters
3        ab        4             undo the last operation, index 2
4        abcdefg   3 7           print the 7th characgter - g
5        abcdefg   4             undo the last operation, index 0
6        abcde     3 4           print the 4th character - d
```

The results should be printed as:

```
f
g
d
```

Input Format

The first line contains an integer, Q, denoting the number of operations.
Each line i of the Q subsequent lines (where $0 \le i < Q$) defines an operation to be performed.
Each operation starts with a single integer, t (where $t \in \{1, 2, 3, 4\}$), denoting a type of

operation as defined in the *Problem Statement* above. If the operation requires an argument, t is followed by its space-separated argument. For example, if $t = 1$ and $W = $ ”**abcd**”, line i will be

```
1 abcd .
```

Constraints

- $1 \leq Q \leq 10^6$
- $1 \leq k \leq |S|$
- The sum of the lengths of all W in the input $\leq 10^6$.
- The sum of k over all delete operations $\leq 2 \cdot 10^6$.
- All input characters are lowercase English letters.
- It is guaranteed that the sequence of operations given as input is possible to perform.

Output Format

Each operation of type 3 must print the kth character on a new line.

Sample Input

```
STDIN    Function

-----    --------

8        Q = 8

1 abc    ops[0] = '1 abc'

3 3      ops[1] = '3 3'

2 3      ...

1 xy

3 2

4

4

3 1
```

Sample Output

```
c

y

a
```

Explanation

Initially, S is empty. The following sequence of 8 operations are described below:

1. $S = $ ””. We append abc to S, so $S = $ ”abc”.

2. Print the 3rd character on a new line. Currently, the 3rd character is `c` .

3. Delete the last 3 characters in S (abc), so $S =$ ”".

4. Append xy to S, so $S =$ ”xy”.

5. Print the 2nd character on a new line. Currently, the 2nd character is `y` .

6. Undo the last update to S, making S empty again (i.e., $S =$ ””).

7. Undo the next to last update to S (the deletion of the last 3 characters), making $S =$ ”abc”.

8. Print the 1st character on a new line. Currently, the 1st character is `a` .