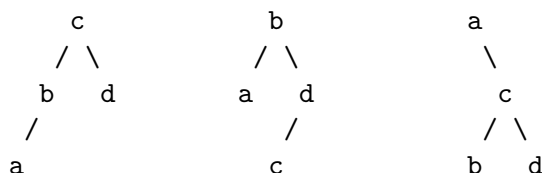## Preorder Your Tree

A binary tree is either empty or it consists of a root node and two binary trees, called the left subtree and the right subtree of the root node. We consider binary trees in which each node contains one lowercase letter. We say that such a binary tree is a binary search tree (BST) if and only if the following conditions hold for each node.

(i) All letters in the left subtree of the node occur strictly earlier in the alphabet than the letter in the node.

(ii) All letters in the right subtree of the node occur strictly later in the alphabet than the letter in the node.

Note that if a tree is a BST, then each subtree of this tree is also a BST. As a consequence, if the tree is non-empty, then both subtrees of the root node are BSTs again.

Here are some examples of BSTs with 4 nodes:

```
     c             b            a
    / \           / \            \
   b   d         a   d            c
  /                 /            / \
 a                 c           b   d
```

A pre-order representation of a BST is a string obtained in the following way:

(i) The pre-order code of an empty BST is an empty string.

(ii) The pre-order code of a non-empty BST is obtained in the following way. Let L and R be the pre-order codes of the left and right subtree, respectively. Then the pre-order code of the whole BST is the concatenation of the letter in its root node, L and R (in this order).

The pre-order codes for the trees above are `cbad`, `badc` and `acbd`, respectively.

Consider all BSTs with exactly N nodes containing the first N lowercase letters of the English alphabet. Order these trees alphabetically by their pre-order representations. We number our sequences starting with 1—i.e., the index of the first tree in this sequence is 1.

You will be given a index K. Your task is to output the pre-order representation of the BST of the Kth tree in this sequence. If K is larger than the number of BSTs with exactly N nodes, output `-1`.

Input format

A single line, with 2 space-separated integers, N and K.

Output format

A single line containing the required string, or `-1` if K is an invalid index.

Test data

In all testcases, $1 \le N \le 19$ and $1 \le K \le 2,000,000,000$. You may assume that the number of BSTs with 19 nodes does not exceed $2,000,000,000$.

There is only one subtask in this problem, worth 100 marks.

Sample input 1

```
2 2
```

Sample output 1

```
ba
```

Sample input 2

```
15 14023
```

Sample output 2

```
abcdeohgfniljkm
```

Explanation for 1

There are 2 BSTs with 2 nodes. The first of them is

```
a
 \
  b
```

The second one is

```
  b
 /
a
```

The pre-order of the second one is `ba`, so we output that.

Limits

- *Memory limit* : 128 MB
- *Time limit* : 4s