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Senior Group

TASK A2. ABWORDS

We call “word” every string, containing two or more capital letters A and B, starting with A. We define upon each word the following two actions, resulting in another word:

- **R₁**: We keep all the letters untouched, except for the last one, which is changed: A becomes B and vice versa – B becomes A.
- **R₂**: Let’s denote the starting word with w . We form a new word t out of w in the following way:
 - The first letter of t is A, of course.
 - Each next letter at position i ($i > 1$) t_i depends on the letters at positions $i-1$ and i in the original word w , namely: if $w_{i-1} = w_i$, we make $t_i = B$; otherwise $t_i = A$.
 - We replace w by t .

The N -time consecutive applying of actions of type **R₁** and **R₂** in some order, starting with a given word w is called “ N -transformation” of w if:

- After the application of these actions the resulting word tallies with the given one (w);
- All words received in between, in the transformation process, are *different* from one another and differ from the given word, too.

Consider a positive integer N , greater than 1. Write a program **abwords**, which finds out one word with as few letters as possible, which can be a start of an N -transformation, or ascertains that such word does not exist.

Input

One positive integer $N > 1$ is read from the standard input.

Output

The program should write to the standard output:

- Line 1: one word with as few letters as possible, for which an N -transformation exists;
- Line 2: a string of N characters, each 1 or 2 with no delimiters. This should be the string of the rule numbers in the N -transformation. Applying all of them in the output order starting with the word in output line 1 should lead to its first reproduction without repeating words in the meantime.

Or

- One line with the message NO if such word does not exist.

Constraints

- In 20% of the test cases N does not exceed 30;
- In 40% of the test cases N does not exceed 200;
- In 70% of the test cases N does not exceed 10 000;
- $2 \leq N \leq 100\,000$.

Example

Input

6

Output

AABB

221212

Example explanation

There is no word shorter than 4 letters that can start a sequence of 6 actions which reproduce it without repeating words in the meantime. On the other hand, for example, the word AABB with four letters has such sequence of actions (i.e., a 6-transformation for it exists):

AABB —②→ ABAB —②→ AAAA —①→ AAAB —②→ ABBA —①→ ABBA
—②→ AABB

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Grading

- If lack of solution is correctly determined, the test is assigned all provided points;

Or else

- If line 1 does not contain a word as defined, or if the string in the second line is not an N -transformation for the word in line 1 in the described format, the test case is given no points;

Otherwise

- What percent of the provided points will be given to the test case depends on the proximity in length of the word in the first output line to the existing minimal solution.