Problem F. "The Lyuboyn" code

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

The "Lyuboyn" team — Small boy Askhat, middle boy Sanzhar, and big boy Nurbakyt — have decided to broaden their knowledge and study a bit of electronics. They came up with a weird electromechanical switch that modifies the analogue signal it receives in a special way. Happy with their invention, they proudly named it "The Lyuboyn switch".

To be precise, a signal may be represented as a sequence of N bits, and "The Lyuboyn switch" is such that the output signal it produces differs from the input in exactly K bits and no two input signals produce the same output signal. To make their invention even more gorgeous, the boys added the final feature: if the binary parameter T is set to 1, the linked sequence of outputs will be looped, i.e. if you start with a signal, replace it with its output from the switch and repeat the procedure enough times, at some point you will come back to the signal you originally started with. This, however, will not hold true if the parameter T is set to 0.

In this task, you are required to repeat the team's achivement and generate "The Lyuboyn code" — the mapping of output signals to given input signals the switch produces. To make things easier, you only need to output the linked sequence of outputs as described above, starting with a signal S.

Formally, you need to find a sequence f of length 2^N consisting of binary numbers of length N (including leading zeroes), such that:

1. $f_0 = S$
2. For every i and j $(i \neq j)$, $f_i \neq f_j$
3. For any i $(0 \leq i < 2^N - 1)$, f_i differs from f_{i+1} in exactly K digits in binary representation. Also, if the parameter T equals to 1, then the sequence must be looped, i.e. f_{2^N-1} should also differ from f_0 in exactly K digits in binary representation.

Input

The first line of the input contains three integer numbers N, K, and T $(2 \leq N \leq 18,\ 1 \leq K < N,\ 0 \leq T \leq 1)$.

The second line contains the binary representation of the starting number S.

Output

If no such sequence exists, print a single line containing -1.

Otherwise, the first line of the output should contain the number of values in the linked sequence — 2^N. The lines numbered from 2 to $2^N + 2$ should contain a single binary number each — the value of f_{i-2}.

If there are multiple valid solutions, you may output any of them.

Scoring

This task contains eight sub-tasks:

1. Sample test. Scored 0 points.
2. $N = 4,\ K = 3,\ T = 1,\ S = 0$. Scored 5 points.
3. $2 \le N \le 18,\ K$ is even, $T \le 1,\ S < 2^N$. Scored 3 points.
4. $2 \le N \le 18,\ K = 1,\ T = 1,\ S = 0$. Scored 11 points.
5. $2 \le N \le 18,\ K = 3,\ T = 0,\ S = 0$. Scored 15 points.
6. $2 \le N \le 18,\ K \cdot 2 < N,\ T = 0,\ S < 2^N$. Scored 18 points.
7. $2 \le N \le 18,\ K < N,\ T = 0,\ S < 2^N$. Scored 31 points.
8. $2 \le N \le 18,\ K < N,\ T = 1,\ S < 2^N$. Original constraints. Scored 17 points.

Example

standard input	standard output
2 1 1 10	4 10 11 01 00