

M. Cosmic Noise Channel Recovery

Standard I/O | Time Limit: 1.0s | Memory Limit: 512MB

During an emergency planetary ascent in Sector 2026, outpost operative Alice must transmit an n -bit binary command string to Bob's command module through an unstable cosmic radiation channel. The channel suffers from particle interference and may flip at most 2 bits (changing '0' to '1' or '1' to '0').

To safeguard mission instructions, Alice encodes the original n -bit string S into a codeword T of length m ($n \leq 1000, m \leq 1024$) before broadcasting. The channel introduces k bit flips ($k \in \{0, 1, 2\}$), delivering corrupted codeword T' to Bob.

Upon intercepting T' , Bob must accomplish the following objectives:

1. Correctly identify the exact number of flipped bits $k \in \{0, 1, 2\}$.
2. If $k = 0$ or $k = 1$, reconstruct the exact original binary message S of length n .

Your program will be executed twice within each testcase to simulate the Encoder (Alice) and Decoder (Bob) via stdin and stdout.

Input

Run 1: Alice's Role (Encoder)

- Line 1 contains the string "first".
- Line 2 contains an integer n — the length of the original binary string.
- Line 3 contains the binary string S of length n ($S_i \in \{0, 1\}$).

Run 2: Bob's Role (Decoder)

- Line 1 contains the string "second".
- Line 2 contains an integer n .
- Line 3 contains the binary string T' of length m received after k bit flips ($0 \leq k \leq 2$).

Output

Run 1 (Alice):

- Print exactly one line containing the encoded binary codeword T of length m ($m \leq 1024$).

Run 2 (Bob):

- Line 1: Print an integer $k \in \{0, 1, 2\}$ representing the detected number of bit flips.
- Line 2 (Only if $k = 0$ or $k = 1$): Print the reconstructed original binary string S of length n .

Constraints

$1 \leq n \leq 1000, 1 \leq m \leq 1024$ (Alice's codeword length m must not exceed 1024), The channel flips $k \in \{0, 1, 2\}$ random bits in T . All characters in all binary strings are strictly '0' or '1'.

Sample Interaction

Standard Input	Standard Output
Run 1 (Alice - Encoder): first 4 1011	Run 1 Output: 10110101 (Alice encodes 4 bits into 8 bits)
Run 2 (Bob - 1 flip): second 4 10110111	Run 2 Output: 1 1011
Run 2 (Bob - 2 flips):	Run 2 Output:

second 4 10110011	2
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Explanation: Full points for a testcase are awarded if and only if Bob correctly identifies k , and when $k \leq 1$ correctly recovers S .