

2023 Canadian Computing Olympiad

Day 2, Problem 1

Flip it and Stick it

Time Limit: 1 second

Problem Description

Finn is playing a game of “Flip it and Stick it” which is abbreviated as FiSi. FiSi is a one-player game played on two strings, S and T , of 0s and 1s. Finn is allowed to make moves of the following form:

- Select a substring of S and reverse it, gluing the pieces of the string back together in their original order to form the new string S .

For example, Finn may take the string $S = 101100$, take the substring 011 starting at index 2 (assuming 1-based string indexing), and create the string $S = 111000$ in one move.

Finn wins the game if S does **not** contain T as a substring. Your task is to help Finn determine the length of the shortest winning sequence of moves or tell him that the game cannot be won.

Input Specification

The first line of input contains the string S ($1 \leq |S| \leq 200\,000$).

The second line of input contains the string T ($1 \leq |T| \leq 3$).

In the table below, T_1 is the first bit in T , T_2 is the second bit in T , and T_3 is the third bit in T , when reading from left-to-right.

Marks Awarded	Bounds on T
1 mark	$ T = 1$
3 marks	$ T = 2, T_1 \neq T_2$
4 marks	$ T = 2$
5 marks	$ T = 3, T_1 \neq T_3$
5 marks	$ T = 3, T_1 \neq T_2$
7 marks	$ T = 3$

Output Specification

Output the minimum number of moves needed or -1 if it is impossible to win the game.

Sample Input 1

100110

10

Output for Sample Input 1

2

Explanation of Output for Sample Input 1

Finn starts with the string 100110. He cannot avoid 10 as a substring in one move, but he can in two moves.

For example, his first move could be to reverse the substring from index 4 to index 6 (110) to get 100011. Then, his second move can be to reverse the substring from index 1 to index 4 (1000) to get 000111, which does not have 10 as a substring.

Sample Input 2

000

00

Output for Sample Input 2

-1

Explanation of Output for Sample Input 2

No matter how many moves Finn makes, the string S will always contain T as a substring.