

Contest Duration: 2018-03-31(Sat) 23:00 ~ 2018-04-01(Sun) 01:30 (local time) (150 minutes)

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E - Median Replace

Editorial

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Time Limit: 2 sec / Memory Limit: 256 MB

Score : 1600 points

Problem Statement

Taichi thinks a binary string X of odd length N is **beautiful** if it is possible to apply the following operation $\frac{N-1}{2}$ times so that the only character of the resulting string is '1':

- Choose three **consecutive** bits of X and replace them by their median. For example, we can turn '00110' into '010' by applying the operation to the middle three bits.

Taichi has a string S consisting of characters '0', '1' and '?'. Taichi wants to know the number of ways to replace the question marks with '1' or '0' so that the resulting string is beautiful, modulo $10^9 + 7$.

Constraints

- $1 \leq |S| \leq 300000$
- $|S|$ is odd.
- All characters of S are either '0', '1' or '?'.

Input

Input is given from Standard Input in the following format:

S

Output

Print the number of ways to replace the question marks so that the resulting string is beautiful, modulo $10^9 + 7$.

Sample Input 1

Copy

1??00

Copy

Sample Output 1

Copy

2

Copy

There are 4 ways to replace the question marks with '0' or '1':

- '11100': This string is beautiful because we can first perform the operation on the last 3 bits to get '110' and then on the only 3 bits to get '1'.
- '11000': This string is beautiful because we can first perform the operation on the last 3 bits to get '110' and then on the only 3 bits to get '1'.
- '10100': This string is not beautiful because there is no sequence of operations such that the final string is '1'.
- '10000': This string is not beautiful because there is no sequence of operations such that the final string is '1'.

Thus, there are 2 ways to form a beautiful string.

Sample Input 2

Copy

?

Copy

Sample Output 2

Copy

1

Copy

In this case, '1' is the only beautiful string.

Sample Input 3

Copy

?0101???10???00?1?????????????0???????????1????0

Copy

Sample Output 3

Copy

402589311

Copy

Remember to output your answer modulo $10^9 + 7$.

Language

C++ (GCC 9.2.1)

Source Code

1

※ at most 512 KiB
※ Your source code will be saved as Main.extension.

Submit

Open File

Toggle Editor

Auto Height