

Border Game

Description

Alice and Bob are playing a game. They find a string s consists of only '0', '1' and '?', with a length of n .

They define: If $s[1...len] = s[n - len + 1...n]$, then the prefix of s with a length of len is called a **border**.

The '?' in this string can be replaced by '0' or '1'. If the prefix of s with a length of len can become a **border**, then $f(len) = 1$, else $f(len) = 0$. However, Alice does not want two borders to intersect, so you only need to calculate the borders which $len \leq k = \lfloor \frac{n}{2} \rfloor$.

Now, they want you to calculate the parity value: $(f(1) * 1^2) \text{ xor } (f(2) * 2^2) \text{ xor } \dots \text{ xor } (f(k) * k^2)$.

Input Format

One string s , only contains '0','1','?'.

Output Format

One integer, the parity value of this string.

Sample

Sample Input

```
1?0?1?
```

Sample Output

```
12
```

Hint

For 50% data, $|S| \leq 1000$.

For 100% data, $|s| \leq 5 * 10^5$.