

Maximum Valid DNA Helix

What's this
doing here?

Dna strands can form valid dna helices when two complementary strands, or two strands where each nucleotide of one strand is paired with the complementary nucleotide of another strand (Adenine is paired with Thymine, and Cytosine is paired with Guanine and vice versa). A scientist in the year 2040 has gained 3 abilities :

- the ability to cut apart a DNA strand,
- the ability to fold a dna strand in half (in between a nucleotide and even on a nucleotide),
- and the ability to form the bonds between corresponding nucleotides in a folded dna strand into a makeshift DNA helix as long as all nucleotides (except sometimes the middle one) are matching.



Unfortunately this scientist is broke and cannot afford to buy multiple dna strands and only has access to one dna strand.

Given this dna strand and this scientist's abilities, find the longest possible strand (in terms of nucleotides) that when folded in the middle,

can form a valid dna helix. Include the nucleotide on the bend if the scientist decides to bend a strand on a nucleotide.

<https://balatrogame.fandom.com/wiki/DNA>

If given multiple possible longest valid dna helices, return the first one.

Input

The user will be given one line of input (a string) representing one DNA strand. Each nucleotide of the DNA strand will be represented with the letter corresponding to their base : Ex Adenine is represented with the letter A, Thymine with T, Cytosine with C, and Guanine with G. The input is a string that has a length of 0 to 1000000 characters and will only contain the capitalized letters of A, T, C, G.

Output

Given an input representing the DNA strand, print out a string representing a DNA strand that can make the longest possible DNA helix in the terms of number of nucleotides. It can be returned in pre folded form.

Languages

We have written a python, c++, and java solution that all meets time constraints.

Examples

Sample Input =
GTACCGTT

Sample Output
ACCGT

Explanation: ACCGT is the longest possible valid dna strand that could be turned into a dna helix where the scientist bends the strand on the nucleotide C, the other C is paired with G, and A is paired with T.