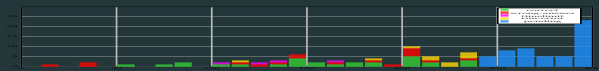


J: Jumbled Packets

Problem author: Yidi Zang

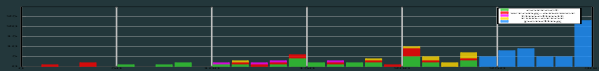


Problem

- This is a multi pass problem.
- You are given a binary string s of length n ($1 \leq n \leq 10^5$).
- Encode it into a ternary string of length n .
- After this string is cyclically rotated by some amount, restore the original string s .

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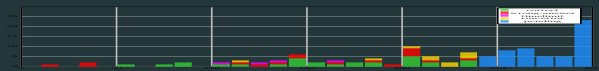
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- If the string s consists of only '0', do nothing.
- Otherwise, find the first '1'.
- Replace everything up to that '1' with '2'.
- For example, replace "00001011" with "22222011".

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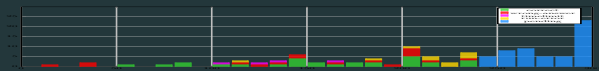
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- If the received ternary string consists of only '0', this is already decoded.

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- Otherwise, find the substring of '2's'.
 - Careful, this might wrap over the end, e.g. "22011222".

Figure 1: Publications per year (1990-2019) by research type. The chart shows a general upward trend in publications over time, with a significant increase in research on specific interventions starting around 2000.

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Encode

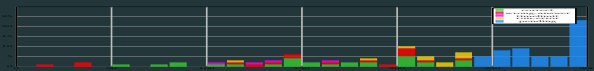
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 - Rotate this substring to the beginning, "22011222" → "2222011".

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Encode

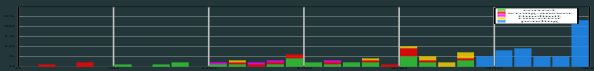
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- Replace the last '2' with '1', all other '2's with '0', "2222011" \rightarrow "00001011".

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Encode

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- Replace the last '2' with '1', all other '2's with '0', "2222011" \rightarrow "00001011".
- Encoding and decoding both take $\mathcal{O}(n)$.