Mandatory Exercise: Level Ancestor

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Substring repetition Let $S$ be a string of length $n$. Given a suffix $i$ and an integer $k$, the substring repetition query is defined as follows.

- substring-repetition($i$, $k$): return the length of the longest prefix of $S[i, n]$ that appears at least $k$ times in $S$.

Given a string $S$, the substring repetition problem is to preprocess $S$ into a compact data structure that supports substring repetition queries.

Give a compact data structure for the substring repetition problem with query time logarithmic in the length of the suffix, $\ell = n - i + 1$, i.e., the query time should be $O(\log \ell)$. Ignore preprocessing.