Mandatory Exercise: Grammar Compression and Random Access

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1 Character Counting   Let G be an SLP of size n generating a string S of length N over an alphabet Σ. We want a data structure for G that supports the following operation. Given an index i in S and $\alpha \in \Sigma$, define

- CharCount(i, α), Return the number of occurrences of α in the prefix $S[0, i]$ of S.

Give a data structure that uses $O(n|\Sigma|)$ space and supports fast queries.