

More Grammars from Languages

For each of the following languages, find (if possible) a grammar that generates it.

$$L_6 = \{0^m 1^n \mid m, n \geq 0 \text{ and } m \neq n\}$$

$$L_7 = \{w \in \{(,)\} \mid w \text{ is a balanced string of parentheses}\}$$

$$L_8 = \{0, 1\}^+$$

For L_8 , give a grammar that has every oriented tree with outdegree at most 2 as a derivation tree.

Regular Grammar

A **regular grammar** is a CFG where every rule has one of these forms:

1. $A \longrightarrow a$

2. $A \longrightarrow aB$

3. $A \longrightarrow \lambda$

EXAMPLE. A regular grammar:

$$\begin{aligned}G_3 : \quad S &\longrightarrow aA \mid \lambda \\A &\longrightarrow bB \mid cC \\B &\longrightarrow bB \mid bS \\C &\longrightarrow cC \mid cS\end{aligned}$$

Give a regular expression for $L(G_3)$

?

Regular Language

A **regular language** is one generated by a regular grammar.

We prove much later that the regular sets and the regular languages are identical.

In the meantime, we can practice using both regular expressions and regular grammars to represent regular languages.

Regular Grammars from Regular Expressions

For each of the following regular expressions, find a regular grammar that generates the language it represents.

$$r_1 = \underline{(a \cup b)^*}$$

$$r_2 = \underline{((ab)^*(bc)^*)^*}$$

$$r_3 = \underline{(a^*b) \cup (b^+ab)}$$