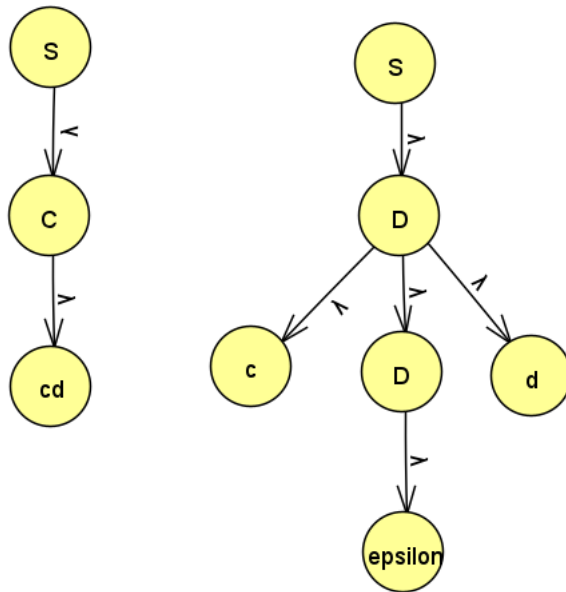


1. This grammar defines the language consisting of N a's followed by N b's where $N \geq 1$.

2.

cd



3.

Leftmost Derivation	Rightmost Derivation
$\langle S \rangle$ $a \langle A \rangle \langle S \rangle$ $a \langle S \rangle b \langle A \rangle \langle S \rangle$ $aab \langle A \rangle \langle S \rangle$ $aabb a \langle S \rangle$ $aabb aa$	$\langle S \rangle$ $a \langle A \rangle \langle S \rangle$ $a \langle A \rangle a$ $a \langle S \rangle b \langle A \rangle a$ $a \langle S \rangle bba a$ $aabb aa$

4. Grammar

$S \rightarrow A$

$A \rightarrow BA \mid B$

$B \rightarrow a \mid b \mid c \mid d$

Left Derivation of abcd	Left Derivation of accc
$\langle S \rangle$ $\langle A \rangle$ $\langle B \rangle \langle A \rangle$ $a \langle A \rangle$ $a \langle B \rangle \langle A \rangle$ $ab \langle A \rangle$ $ab \langle B \rangle \langle A \rangle$ $abc \langle A \rangle$ $abc \langle B \rangle$ $abcd$	$\langle S \rangle$ $\langle A \rangle$ $\langle B \rangle \langle A \rangle$ $a \langle A \rangle$ $a \langle B \rangle \langle A \rangle$ $ac \langle A \rangle$ $ac \langle B \rangle \langle A \rangle$ $acc \langle A \rangle$ $acc \langle B \rangle$ $accc$

5. $\langle id \rangle \rightarrow A \mid B \mid C$

$\langle expr \rangle \rightarrow \langle expr \rangle + \langle term \rangle \mid \langle term \rangle$

$\langle term \rangle \rightarrow \langle term \rangle * \langle factor \rangle \mid \langle factor \rangle$

$\langle factor \rangle \rightarrow (\langle expr \rangle) \mid \langle unary \rangle \mid \langle id \rangle$

$\langle unary \rangle \rightarrow \langle id \rangle ++ \mid \langle id \rangle -- \mid ++ \langle id \rangle \mid -- \langle id \rangle$