

Example.

$$\langle \text{Expression} \rangle \rightarrow \langle \text{Expression} \rangle + \langle \text{Term} \rangle \mid \langle \text{Term} \rangle$$
$$\langle \text{Term} \rangle \rightarrow \langle \text{Term} \rangle \times \langle \text{Factor} \rangle \mid \langle \text{Factor} \rangle$$
$$\langle \text{Factor} \rangle \rightarrow (\langle \text{Expression} \rangle) \mid a$$
$$\Sigma = \{a, +, \times, (,)\}$$

Example.

$$\langle \text{Sentence} \rangle \rightarrow \langle \text{Noun-phrase} \rangle \langle \text{Verb-phrase} \rangle$$
$$\langle \text{Noun-phrase} \rangle \rightarrow \langle \text{Complex-Noun} \rangle \mid$$
$$\langle \text{Complex-Noun} \rangle \langle \text{Prep-phrase} \rangle$$
$$\langle \text{Verb-phrase} \rangle \rightarrow \langle \text{Complex-Verb} \rangle \mid$$
$$\langle \text{Complex-Verb} \rangle \langle \text{Prep-phrase} \rangle$$
$$\langle \text{Prep-phrase} \rangle \rightarrow \langle \text{Prep} \rangle \langle \text{Complex-Noun} \rangle$$
$$\langle \text{Complex-Verb} \rangle \rightarrow \langle \text{Verb} \rangle \mid \langle \text{Verb} \rangle \langle \text{Noun-phrase} \rangle$$
$$\langle \text{Complex-Noun} \rangle \rightarrow \langle \text{Article} \rangle \langle \text{Noun} \rangle$$
$$\langle \text{Article} \rangle \rightarrow a \mid the$$
$$\langle \text{Noun} \rangle \rightarrow boy \mid girl \mid flower$$
$$\langle \text{Verb} \rangle \rightarrow beats \mid likes \mid sees$$
$$\langle \text{Prep} \rangle \rightarrow with$$

Definition.

A Context-free grammar is a 4-tuple $\langle V, \Sigma, R, S \rangle$ Such that

1. V is a finite set of variables.
2. Σ is a finite set of terminals,
 $V \cap \Sigma = \phi$.
3. R is a finite set of rules.
4. $S \in V$ is the start variable.

Example.

$$S \rightarrow 0A1$$

$$A \rightarrow B$$

$$B \rightarrow \lambda$$

$$V = \{S, A, B\}, \Sigma = \{0, 1, \lambda\}$$

$$V \cap \Sigma = \phi$$