

CSC 345 Lab – Grammar

Overview

In this lab you will show string derivations for a given grammar. You will also write a grammar when given a language description.

Problem 1

Derive the string aaa.

$G = (N, T, P, S)$

- $N = \{ S \}$
- $T = \{ a \}$
- $P = \{ S \rightarrow Sa, S \rightarrow \epsilon \}$
- $S = \{ S \}$

Problem 2

Derive the string 8+5. Use a left-most derivation.

$G = (N, T, P, S)$

- $N = \{ E, S, T, V \}, T = \{ 0, 1, +, * \}, S = \{ E \}$
- $P = \{ E \rightarrow S, S \rightarrow T + S, S \rightarrow T, T \rightarrow V * T, T \rightarrow V, V \rightarrow 0, V \rightarrow 1, V \rightarrow 2, V \rightarrow 3, V \rightarrow 4, V \rightarrow 5, V \rightarrow 6, V \rightarrow 7, V \rightarrow 8, V \rightarrow 9 \}$

Problem 3

Derive the string 8+5. Use a right-most derivation.

$G = (N, T, P, S)$

- $N = \{ E, S, T, V \}, T = \{ 0, 1, +, * \}, S = \{ E \}$
- $P = \{ E \rightarrow S, S \rightarrow T + S, S \rightarrow T, T \rightarrow V * T, T \rightarrow V, V \rightarrow 0, V \rightarrow 1, V \rightarrow 2, V \rightarrow 3, V \rightarrow 4, V \rightarrow 5, V \rightarrow 6, V \rightarrow 7, V \rightarrow 8, V \rightarrow 9 \}$

$$\begin{aligned} &V \rightarrow 0, V \rightarrow 1, V \rightarrow 2, V \rightarrow 3, V \rightarrow 4, V \rightarrow 5, V \rightarrow 6, V \rightarrow 7, V \rightarrow 8, V \rightarrow 9 \} \\ &\} \end{aligned}$$

Problem 4

Derive the string $3+4*6$. Use a left-most derivation.

$G = (N, T, P, S)$

- $N = \{ E, S, T, V \}, T = \{ 0, 1, +, * \}, S = \{ E \}$
- $P = \{ E \rightarrow S,$
 $S \rightarrow T + S,$
 $S \rightarrow T,$
 $T \rightarrow V * T,$
 $T \rightarrow V,$
 $V \rightarrow 0, V \rightarrow 1, V \rightarrow 2, V \rightarrow 3, V \rightarrow 4, V \rightarrow 5, V \rightarrow 6, V \rightarrow 7, V \rightarrow 8, V \rightarrow 9 \}$
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Problem 5

Do the following:

- Write a grammar for the language $L = \{ a, ab, abb, abbb, abbbb, \dots \}$.
- After you write the grammar derive the string $abbbb$.

Problem 6

Derive the string $(3+4)*6$. Use a left-most derivation.

$G = (N, T, P, S)$

- $N = \{ E, S, T, V \}, T = \{ 0, 1, +, *, (,) \}, S = \{ E \}$
- $P = \{ E \rightarrow S,$
 $S \rightarrow T + S,$
 $S \rightarrow T,$
 $T \rightarrow F * T,$
 $T \rightarrow F,$
 $F \rightarrow (S),$
 $F \rightarrow V,$
 $V \rightarrow 0, V \rightarrow 1, V \rightarrow 2, V \rightarrow 3, V \rightarrow 4, V \rightarrow 5, V \rightarrow 6, V \rightarrow 7, V \rightarrow 8, V \rightarrow 9 \}$
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Problem 7

Derive the string $((1+2)*(3+4))$. Use a left-most derivation.

$G = (N, T, P, S)$

- $N = \{ E, S, T, V \}, T = \{ 0, 1, +, *, (,) \}, S = \{ E \}$
- $P = \{ E \rightarrow S,$
 $S \rightarrow T + S,$
 $S \rightarrow T,$
 $T \rightarrow F * T,$
 $T \rightarrow F,$
 $F \rightarrow (S),$
 $F \rightarrow V,$
 $V \rightarrow 0, V \rightarrow 1, V \rightarrow 2, V \rightarrow 3, V \rightarrow 4, V \rightarrow 5, V \rightarrow 6, V \rightarrow 7, V \rightarrow 8, V \rightarrow 9 \}$
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