

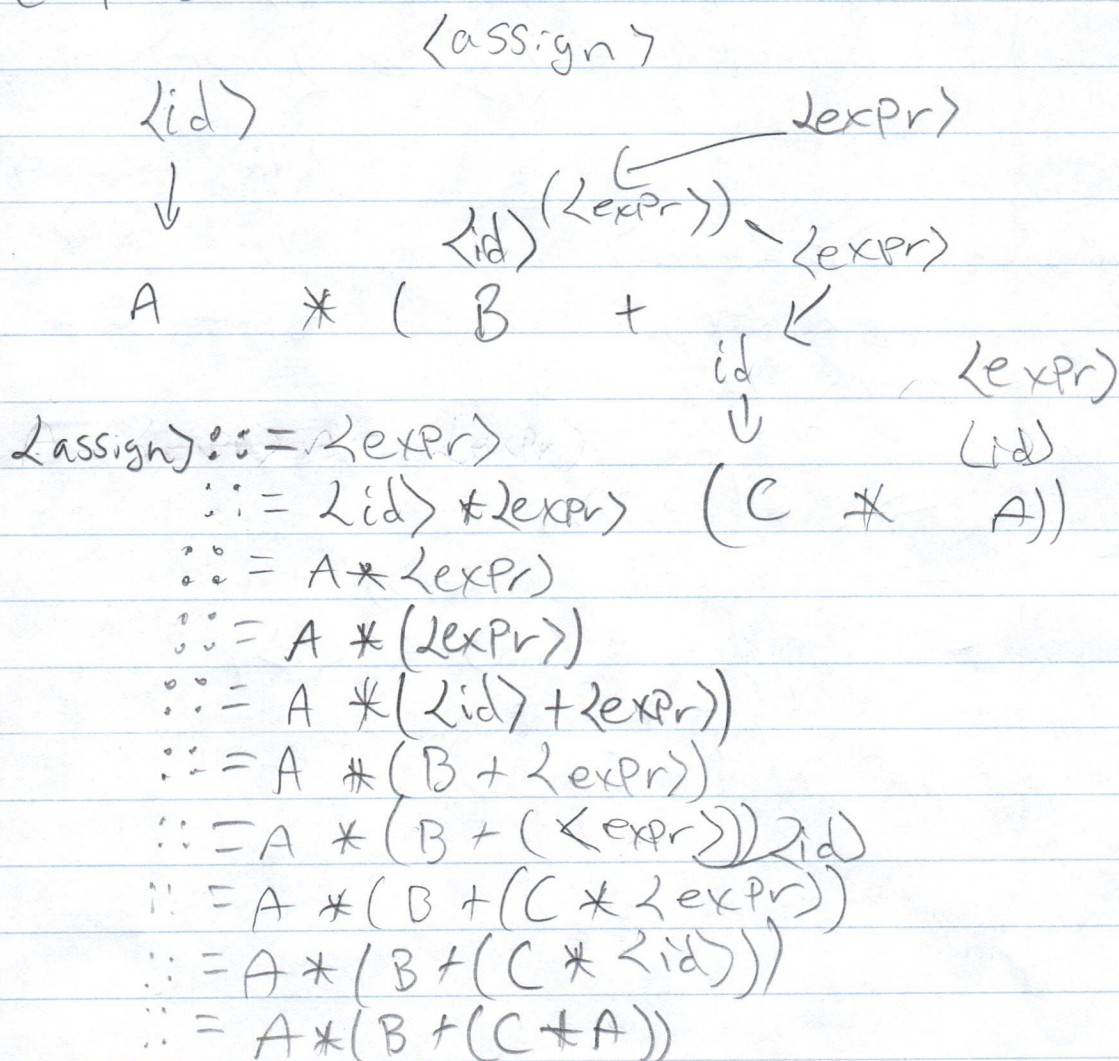
1 Grammar

$\langle \text{assign} \rangle ::= \langle \text{id} \rangle = \langle \text{expr} \rangle$

$\langle \text{id} \rangle ::= A | B | C$

$\langle \text{expr} \rangle ::= \langle \text{id} \rangle + \langle \text{expr} \rangle | \langle \text{id} \rangle * \langle \text{expr} \rangle | (\langle \text{expr} \rangle) | \langle \text{id} \rangle$

c Parse tree:



$$b) B = C * (A * C + B)$$

$$\langle id \rangle ::= \langle expr \rangle$$

$$\langle id \rangle ::= A | B | C$$

$$\langle expr \rangle ::= \langle id \rangle | (\langle expr \rangle) | \langle id \rangle * \langle expr \rangle | \langle id \rangle + \langle expr \rangle$$

$\langle assign \rangle$

$\langle id \rangle$

\downarrow

$B =$

$\langle expr \rangle$

$\langle id \rangle$
 \downarrow
 C

$*$

$\langle expr \rangle$

$\langle id \rangle$

$\langle expr \rangle$
 $\langle id \rangle$

$+$

A

$*$

C

$+$

$\langle expr \rangle$

\downarrow

$\langle id \rangle$

B

$$\langle assign \rangle ::= \langle id \rangle = \langle expr \rangle$$

$$B \rightarrow \langle expr \rangle$$

$$\rightarrow \langle id \rangle * \langle expr \rangle$$

$$\rightarrow C * \langle expr \rangle$$

$$\rightarrow C * (\langle expr \rangle)$$

$$\rightarrow C * (\langle id \rangle * \langle expr \rangle)$$

$$\rightarrow C * (A * \langle id \rangle + \langle expr \rangle)$$

$$\rightarrow C * (A * C + \langle id \rangle)$$

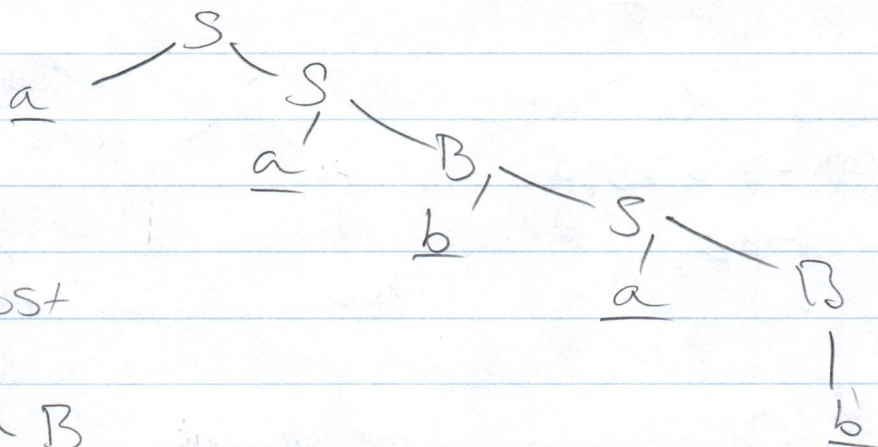
$$\rightarrow C * (A * C + B)$$

$w = aabab$

$S \rightarrow aB \mid bA$

$S \rightarrow aS \mid bAA \mid a$

$B \rightarrow bS \mid aB \mid b$



right most

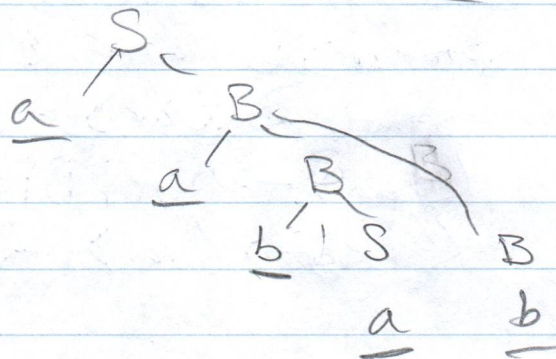
$S \rightarrow aS$

$\rightarrow a a B$

$\rightarrow a a b S$

$\rightarrow a a b a B$

$\rightarrow a a b a b$



left most

$S \rightarrow aB$

$\rightarrow a a B B$

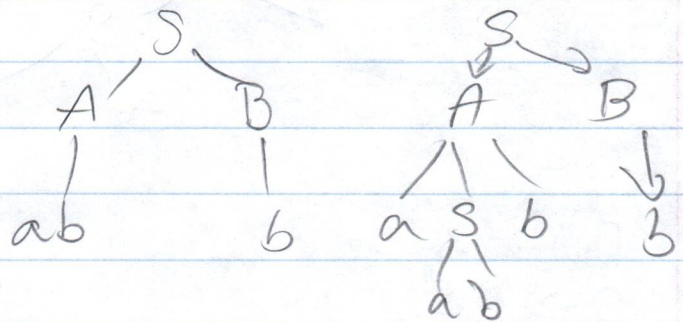
$\rightarrow a a b S B$

$\rightarrow a a b a B$

$\rightarrow a a b a b$

3 Contains strings with char a & b
 ≥ 1 char each with char 'c' being the
 terminating char

4 $\langle S \rangle \rightarrow \langle A \rangle \langle B \rangle$
 $\langle A \rangle \rightarrow aSb | ab$
 $\langle B \rangle \rightarrow b$



5 $\langle Prog \rangle \rightarrow begin \langle stmt arr \rangle end$
 $\langle stmt arr \rangle \rightarrow stmt \{ ; \langle stmt arr \rangle \}$
 $\langle stmt \rangle \rightarrow \langle Var \rangle = \langle expr \rangle$
 $\langle Var \rangle \rightarrow A | B | C$
 $\langle expr \rangle \rightarrow \langle Var \rangle | \langle Var \rangle (+|-) \langle Var \rangle$

6 $S \rightarrow AB$
 $B \rightarrow bAB | bA$
 $A \rightarrow aA | abA$