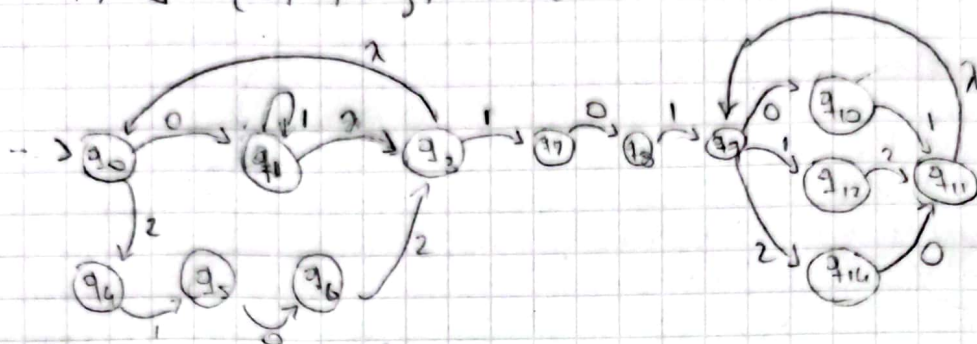
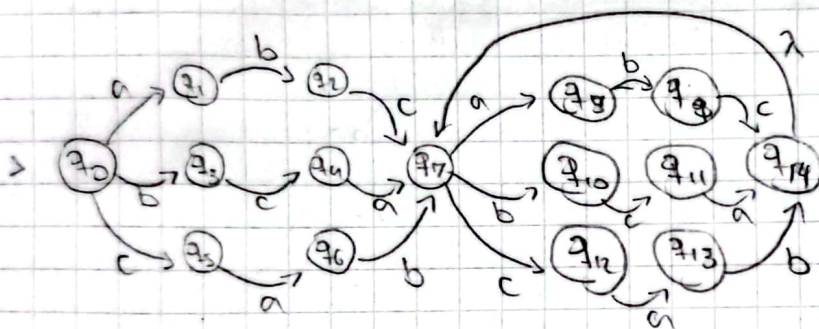


Workshop #1

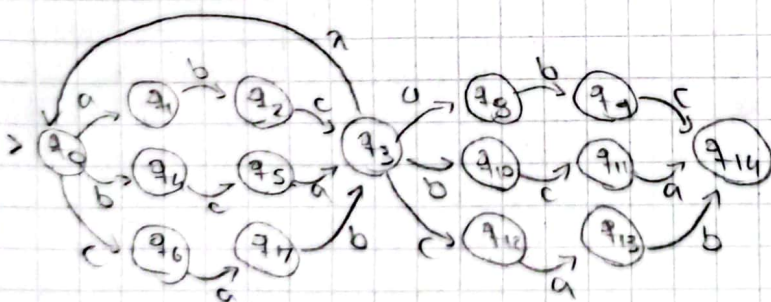
i) $\Sigma = \{0, 1, 2\}$, $L = (01^* \cup 2102)^* 101(01 \cup 12 \cup 20)^*$



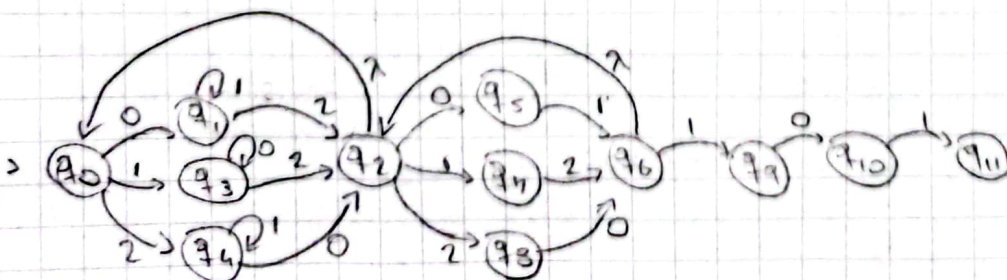
ii) $\Sigma = \{a, b, c\}$, $L = (abc \cup bca \cup cab)(abc \cup bca \cup cab)^*$



iii) $\Sigma = \{a, b, c\}$, $L = (abc \cup bca \cup cab)^*(abc \cup bca \cup cab)$



iv) $\Sigma = \{0, 1, 2\}$, $L = (01^*2 \cup 10^*2 \cup 21^*0)^*(01 \cup 12 \cup 20)^* 101$



2. i) $\Sigma = \{0, 1\}$

$$L = (00^*10^*01^*1)^*$$

$$G = \begin{cases} S \rightarrow AS / \lambda \\ A \rightarrow 0B \\ B \rightarrow 0B / 1C \\ C \rightarrow 0C / 0D \\ D \rightarrow 1D / 1 \end{cases}$$

ii) $\Sigma = \{a, b, c\}$

$$L = [((a \cup b)c(a \cup c)^*) \cup ((b \cup c)a(a \cup c)^*)] a (b \cup c)^*$$

$$G = \begin{cases} S \rightarrow x a y \\ x \rightarrow A c z \mid B a z \\ A \rightarrow a b \\ B \rightarrow b c \\ z \rightarrow a z \mid c z \mid \lambda \\ y \rightarrow b y \mid c y \mid \lambda \end{cases}$$

3. i) $\{a^i b^j c^k d^l : i, j \geq 1\}$

$$G = \begin{cases} S \rightarrow a S d \mid a A d \\ A \rightarrow b A c \mid \lambda \end{cases}$$

ii) $\{a^i b^j c^k d^l : i, j \geq 1\}$

$$G = \begin{cases} S \rightarrow A C \\ A \rightarrow a A b \mid a b \\ C \rightarrow c C d \mid c d \mid \lambda \end{cases}$$

iii) $\{a^i b^j c^k d^l : i, j \geq 1\} \cup \{a^i b^j c^k d^l : i, j \geq 1\}$

$$G = \begin{cases} S \rightarrow A \mid E C \\ A \rightarrow a A d \mid a B d \\ B \rightarrow b B c \mid \lambda \\ E \rightarrow a E b \mid a b \\ C \rightarrow c C d \mid c d \mid \lambda \end{cases}$$

$$iv) \{a^i b^j c^{i+j} : i \geq 0, j \geq 1\}$$

$$G = \begin{cases} S \rightarrow AB \\ A \rightarrow aABc \mid \lambda \\ B \rightarrow bBc \mid bc \mid \lambda \end{cases}$$

4.

$$G = \begin{cases} S \rightarrow ABC \mid BaC \mid aB \\ A \rightarrow Aa \mid a \\ B \rightarrow BAB \mid bab \\ C \rightarrow cC \mid \lambda \end{cases}$$

i) $w_1 = abab$

$$\begin{array}{c} S \rightarrow aB \\ \downarrow \\ abab \end{array}$$

ii) $w_2 = babacc$

$$\begin{array}{c} S \\ \downarrow \\ BaC \\ \downarrow \\ babaC \\ \downarrow \\ babaccC \\ \downarrow \\ babaccC \\ \downarrow \\ Babacc\lambda \end{array}$$

iii) $w_3 = ababababc$

$$\begin{array}{c} S \\ \downarrow \\ ABC \\ \downarrow \\ aBC \\ \downarrow \\ aBABC \\ \downarrow \\ aBaBC \\ \downarrow \\ ababaBC \end{array} \rightarrow ababababc$$

$$\begin{array}{c} ababababc\lambda \\ \uparrow \\ ababababcC \\ \uparrow \\ ababababc \end{array}$$

5. $\langle \text{real} \rangle \rightarrow \langle \text{digits} \rangle \langle \text{decimal} \rangle \langle \text{exp} \rangle$
 $\langle \text{digits} \rangle \rightarrow \langle \text{digit} \rangle \langle \text{digits} \rangle | \langle \text{digit} \rangle$
 $\langle \text{digit} \rangle \rightarrow 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9$
 $\langle \text{decimal} \rangle \rightarrow \cdot \langle \text{digits} \rangle | \lambda$
 $\langle \text{exp} \rangle \rightarrow [\langle \text{digits} \rangle | + \langle \text{digits} \rangle | - \langle \text{digits} \rangle] \lambda$

i) $w_1 = 47.236$

$\langle \text{real} \rangle \rightarrow$
 $\langle \text{digits} \rangle \langle \text{decimal} \rangle \langle \text{exp} \rangle$
 $\langle \text{digit} \rangle \langle \text{digits} \rangle \langle \text{decimal} \rangle \langle \text{exp} \rangle$
 4 $\langle \text{digit} \rangle \langle \text{decimal} \rangle \langle \text{exp} \rangle$
 7 $\langle \text{decimal} \rangle \langle \text{exp} \rangle$
 • $\langle \text{digits} \rangle \langle \text{exp} \rangle$
 2 $\langle \text{digits} \rangle \langle \text{exp} \rangle$
 3 $\langle \text{digit} \rangle \langle \text{exp} \rangle$
 6 $\langle \text{exp} \rangle$
 7.

ii) $w_2 = 321.25 E + 35$

$\langle \text{real} \rangle$
 $\langle \text{digits} \rangle \langle \text{decimal} \rangle \langle \text{exp} \rangle$
 3 $\langle \text{digits} \rangle \langle \text{decimal} \rangle \langle \text{exp} \rangle$
 2 $\langle \text{digits} \rangle \langle \text{decimal} \rangle \langle \text{exp} \rangle$
 1 $\langle \text{decimal} \rangle \langle \text{exp} \rangle$
 • $\langle \text{digits} \rangle \langle \text{exp} \rangle$
 2 $\langle \text{digits} \rangle \langle \text{exp} \rangle$
 5 $\langle \text{exp} \rangle$
 E + $\langle \text{digits} \rangle$
 3 $\langle \text{digits} \rangle$
 5

iii) $w_3 = 0.8 E 9$

$\langle \text{real} \rangle$
 $\langle \text{digits} \rangle \langle \text{decimal} \rangle \langle \text{exp} \rangle$
 0 $\langle \text{decimal} \rangle \langle \text{exp} \rangle$
 • $\langle \text{digits} \rangle \langle \text{exp} \rangle$
 8 $\langle \text{exp} \rangle$
 E $\langle \text{digits} \rangle$
 9

iv) $w_4 = 0.8 E + 9$

$\langle \text{real} \rangle$
 $\langle \text{digits} \rangle \langle \text{decimal} \rangle \langle \text{exp} \rangle$
 0 $\langle \text{decimal} \rangle \langle \text{exp} \rangle$
 • $\langle \text{digits} \rangle \langle \text{exp} \rangle$
 8 $\langle \text{exp} \rangle$
 E + $\langle \text{digits} \rangle$
 9

6. $\langle \text{identifier} \rangle \rightarrow \langle \text{letter} \rangle \langle \text{ids} \rangle$
 $\langle \text{ids} \rangle \rightarrow \langle \text{letter} \rangle \langle \text{ids} \rangle \mid \langle \text{digit} \rangle \langle \text{ids} \rangle \mid \lambda$
 $\langle \text{letter} \rangle \rightarrow a|b|c|\dots|x|y|z|A|B|C|\dots|x|y|z$
 $\langle \text{digit} \rangle \rightarrow 0|1|2|3|4|5|6|7|8|9$

i) $w_1 = \text{My Variable}$

$\langle \text{identifier} \rangle$

\downarrow
 $\langle \text{letter} \rangle \langle \text{ids} \rangle$

\downarrow
 $M \langle \text{letter} \rangle \langle \text{ids} \rangle$
 \downarrow
 $y \langle \text{letter} \rangle \langle \text{ids} \rangle$
 \downarrow
 $V \langle \text{letter} \rangle \langle \text{ids} \rangle$
 \downarrow
 $a \langle \text{letter} \rangle \langle \text{ids} \rangle$
 \downarrow
 $r \langle \text{letter} \rangle \langle \text{ids} \rangle$
 \downarrow
 $l \langle \text{letter} \rangle \langle \text{ids} \rangle$
 \downarrow
 $a \langle \text{letter} \rangle \langle \text{ids} \rangle$
 \downarrow
 $b \langle \text{letter} \rangle \langle \text{ids} \rangle$
 \downarrow
 $l \langle \text{letter} \rangle \langle \text{ids} \rangle$
 \downarrow
 $e \langle \text{ids} \rangle$
 \downarrow
 λ

ii) $w_2 = \text{temp2}$

$\langle \text{identifier} \rangle$

$\langle \text{letter} \rangle \langle \text{ids} \rangle$

\downarrow
 $t \langle \text{letter} \rangle \langle \text{ids} \rangle$

\downarrow
 $e \langle \text{letter} \rangle \langle \text{ids} \rangle$

\downarrow
 $m \langle \text{letter} \rangle \langle \text{ids} \rangle$

\downarrow
 $p \langle \text{digit} \rangle \langle \text{ids} \rangle$

\downarrow
 $2 \langle \text{ids} \rangle$

\downarrow
 λ

iii) $w_3 = \text{string2int}$

$\langle \text{identifier} \rangle$

$\langle \text{letter} \rangle \langle \text{ids} \rangle$

\downarrow
 $s \langle \text{letter} \rangle \langle \text{ids} \rangle$

\downarrow
 $t \langle \text{letter} \rangle \langle \text{ids} \rangle$

\downarrow
 $r \langle \text{letter} \rangle \langle \text{ids} \rangle$

\downarrow
 $l \langle \text{letter} \rangle \langle \text{ids} \rangle$

\downarrow
 $n \langle \text{letter} \rangle \langle \text{ids} \rangle$

\downarrow
 $g \langle \text{digit} \rangle \langle \text{ids} \rangle$

\downarrow
 $2 \langle \text{letter} \rangle \langle \text{ids} \rangle$

\downarrow
 $l \langle \text{letter} \rangle \langle \text{ids} \rangle$

\downarrow
 $n \langle \text{letter} \rangle \langle \text{ids} \rangle$

\downarrow
 $t \langle \text{ids} \rangle$

\downarrow
 λ

IV) $w4 = 2$ Not A Variable

No se puede porque $\langle \text{identifier} \rangle \rightarrow \underline{\langle \text{letter} \rangle} \langle \text{letters} \rangle$
obliga a empezar con un $\langle \text{letter} \rangle$

7. I) Identifier

$r'[a-zA-Z_][a-zA-Z0-9_]*'$

II) Integer Literal

$r'[+-]?\d{1}'$

III) Floating Point Literal

$r'[+-]?(\d+ \. \d* | \. \d+) ([eE][+-]?\d+)?'$

IV) String Literal

$r'\"([^\"]|\\.)\"*'$

V) Single-line Comment

$r'//.*'$

VI) Multi-line Comment

$r'/\/*.*?/*/'$

VII) White space

$r'\s{1}'$

VIII) Operators

$r'[=|!|=|<|=|>|=|<|>|\+|-|*|/|=|'$

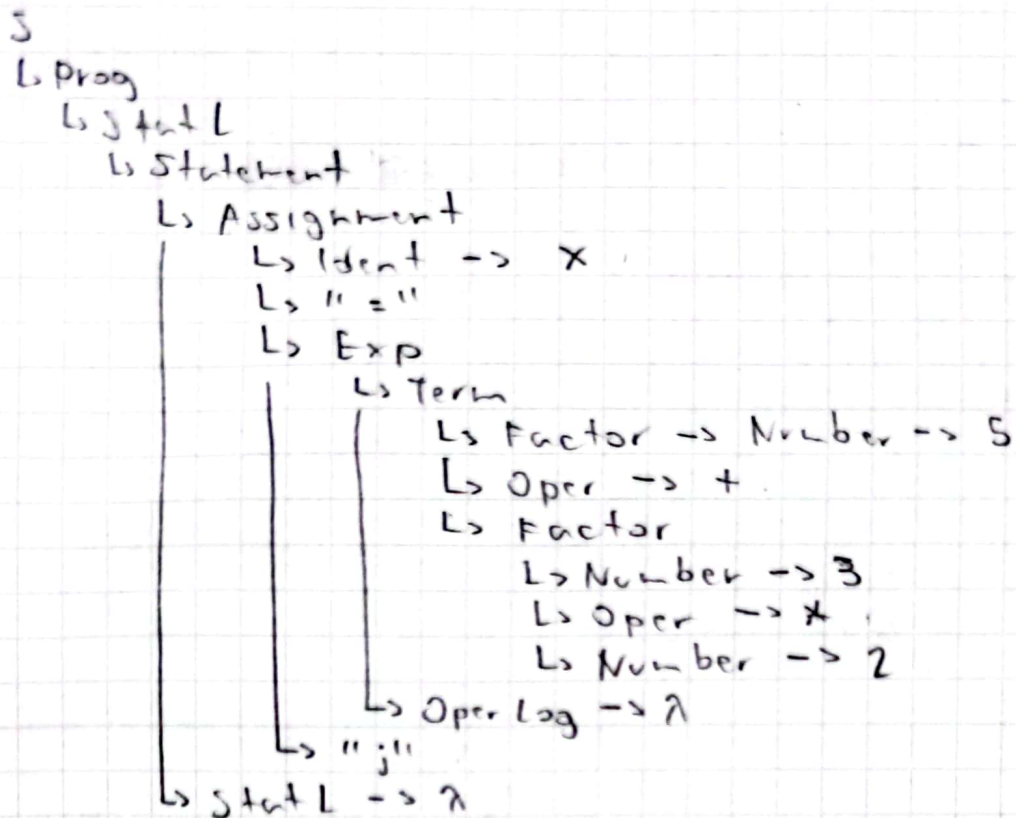
IX) Keywords

$r'\b{if|else|while|return}\b'$

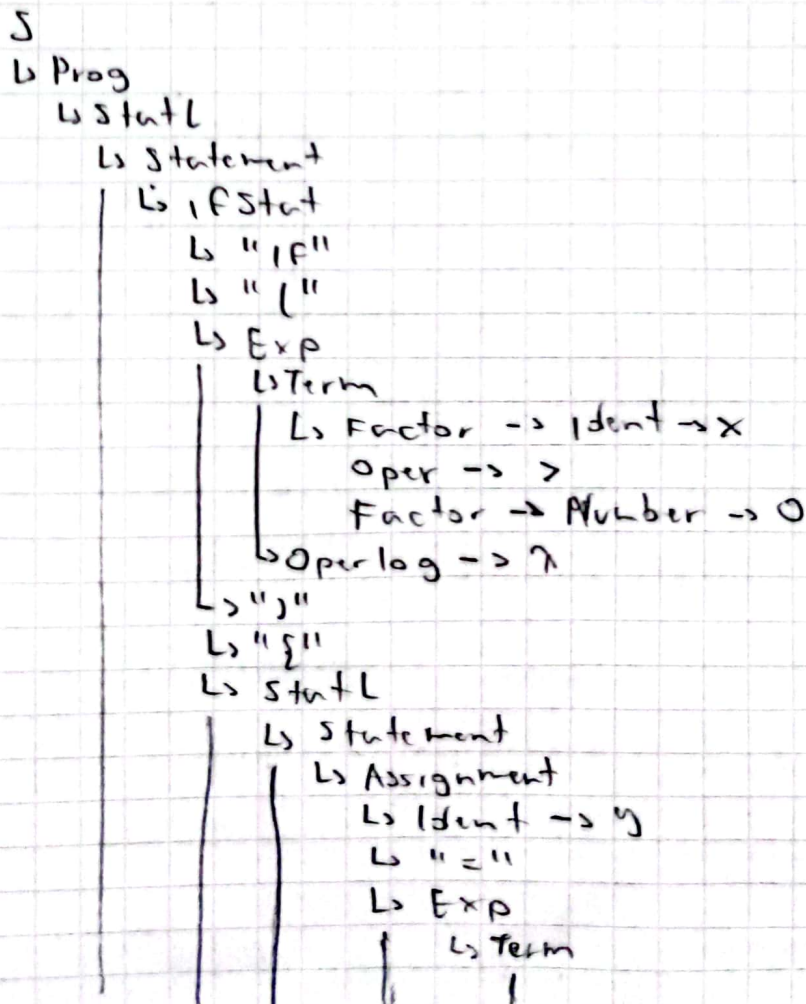
X) Hexadecimal Literal

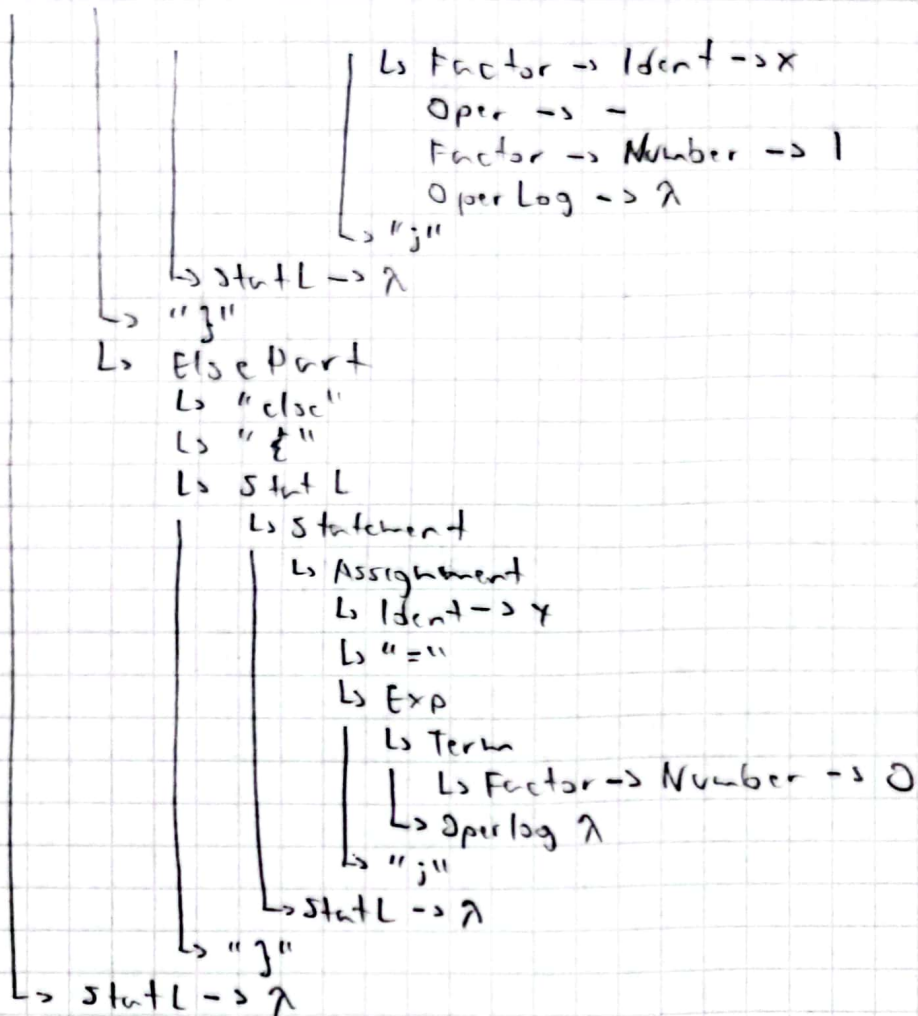
$r'0[xX][0-9a-fA-F]{1}''$

3. a) $x = 5 + 3 * 2;$

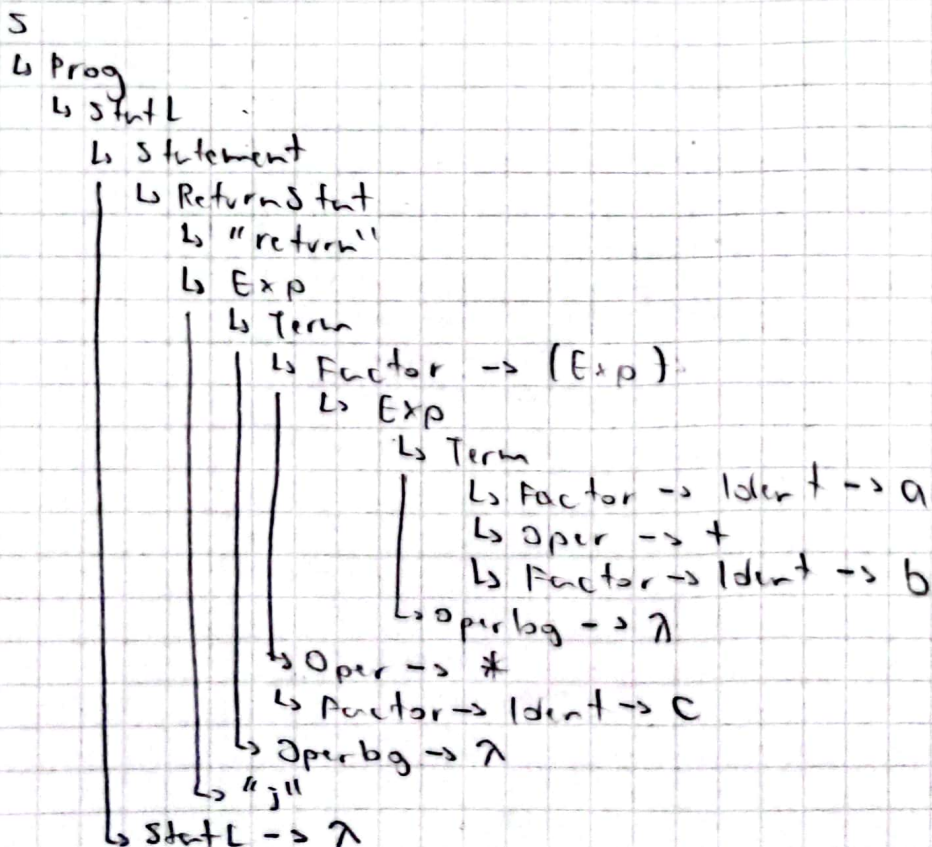


b) $\text{if}(x > 0) \{ y = x - 1; \} \text{else} \{ y = 0; \}$





d) return (a+b) * C ;



c) while (x < 10) { x = x + 1 ; }

S

↳ Prog

↳ StatL

↳ Statement

↳ While stat

↳ "while"

↳ "("

↳ Exp

↳ Term

↳ Factor -> Ident -> x

Oper -> <

Factor -> Number -> 10

↳ Oper log -> ^

↳ ")"

↳ "{"

↳ StatL

↳ Statement

↳ Assignment

↳ Ident -> x

↳ "="

↳ Exp

↳ Term

↳ Factor -> Ident -> x

Oper -> +

Factor -> Number -> 1

↳ Oper log -> ^

↳ ";"

↳ StatL -> ^

↳ "}"

↳ StatL -> ^