

- 1) $\text{num} \rightarrow [0-9] \text{ num}'$
 $\text{num}' \rightarrow \text{num num}'$
 $\quad \quad \quad | \epsilon$
- 2) $\text{letter} \rightarrow [a-zA-Z] \text{ letter}'$
 $\text{letter}' \rightarrow \text{letter letter}'$
 $\quad \quad \quad | \epsilon$
- 3) $\text{numOrletter} \rightarrow \text{num} \mid \text{letter} \mid \epsilon$
- 4) $\text{program} \rightarrow \text{list}$
- 5) $\text{list} \rightarrow \text{declaration list}'$
 $\text{list}' \rightarrow \text{declaration list}'$
 $\quad \quad \quad | \epsilon$
- 6) $\text{declaration} \rightarrow \text{function} \mid \text{varDeclaration}$
- 7) $\text{varDeclaration} \rightarrow \text{type variableList ;}$
- 8) $\text{scopedVariableDec} \rightarrow \text{scopedSpecifier variableList ;}$
- 9) $\text{variableList} \rightarrow \text{varInitialization variableList}'$
 $\text{variableList}' \rightarrow , \text{ varInitialization variableList}'$
 $\quad \quad \quad | \epsilon$
- 10) $\text{varInitialization} \rightarrow \text{varForm varInitialization}'$
 $\text{varInitialization}' \rightarrow \epsilon$
 $\quad \quad \quad \mid : (\text{ eachExpression })$
- 11) $\text{varForm} \rightarrow \text{letter numOrletter varForm}'$
 $\text{varForm}' \rightarrow [\text{ num }]$
 $\quad \quad \quad | \epsilon$
- 12) $\text{scopedSpecifier} \rightarrow \text{static type} \mid \text{type}$
- 13) $\text{type} \rightarrow \text{Boolean} \mid \text{character} \mid \text{integer} \mid \text{char} \mid \text{bool} \mid \text{int}$
- 14) $\text{function} \rightarrow \text{void numOrletter} (\text{ parameter }) \{ \text{ statement } \}$
 $\quad \quad \quad \mid \text{ type letter numOrletter} (\text{ parameter }) \text{ statement}$
- 15) $\text{parameter} \rightarrow \text{listOfParameters} \mid \epsilon$
- 16) $\text{listOfParameters} \rightarrow \text{paramTypeList listOfParameters}'$
 $\text{listOfParameters}' \rightarrow ; \text{ paramTypeList listOfParameters}'$

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17) paramTypeList \rightarrow type paramList

18) paramList \rightarrow paramId paramList'
 paramList' \rightarrow , paramId paramList'

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19) localDeclarations \rightarrow localDeclarations'
 localDeclarations' \rightarrow ScopedVariableDec localDeclarations'

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20) paramId \rightarrow letter numOrletter paramId'
 paramId' \rightarrow ϵ

| []

21) statement \rightarrow phrase | compoundPhrase | selectPhrase |
 iterationPhrase | returnPhrase | continue

22) compoundPhrase \rightarrow { localDeclarations statementList }

23) statementList \rightarrow statementList'
 statementList' \rightarrow statement statementList'

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24) phrase \rightarrow allExpression ; | ;

25) selectPhrase \rightarrow if (eachExpression) selectPhrase'
 selectPhrase' \rightarrow ifBody
 | { ifBody ifBody }

26) ifBody \rightarrow statement ifBody'
 | ;
 ifBody' \rightarrow ϵ
 | other statement

27) iterationPhrase \rightarrow till (eachExpression) statement

28) returnPhrase \rightarrow comeback; | giveback allExpression ; | giveBack
 numOrlette ;

29) continue \rightarrow continue ;

30) allExpression \rightarrow alterable allExpression''
 | eachExpression
 allExpression' \rightarrow allExpression
 | alterable

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allExpression'' -> mathOp allExpression'
                | ++
                | --
31) eachExpression -> logicOp eachExpression eachExpression'
                | relExpression eachExpression'
eachExpression' -> logicOp eachExpression''
                | ∈
eachExpression'' -> eachExpression eachExpression'
                | then eachExpression eachExpression'
                | else eachExpression eachExpression'
32) relExpression -> mathEXP relExpression'
    relExpression' -> compareType mathEXP
                | ∈
33) compareType -> equal | nonEqual
34) equal -> <= | >= | ==
35) nonEqual -> < | > | !=
36) mathEXP -> unaryExpression mathEXP'
    mathEXP' -> op mathEXP mathEXP'
                | ∈
37) op -> + | - | * | / | %
38) unaryExpression -> unaryop unaryExpression | factor
39) unaryop -> - | * | ?
40) factor -> inalterable | alterable
41) alterable -> letter numOrletter alterable''
    alterable'' -> alterable' alterable''
                | ∈
    alterable' -> [ allExpression ]
                | . letter numOrletter
42) inalterable -> ( allExpression ) | constant | letter numOrletter
    ( args )
43) args -> arguments | ∈
44) arguments -> allExpression arguments'
    arguments' -> , allExpression arguments'

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| \in

45) constant \rightarrow CONST | true | false

46) logicOp \rightarrow && | || | ~| and| or