

## \* Language Grammar \*

$\langle \text{Program} \rangle \rightarrow \langle \text{decl-list} \rangle$

$\langle \text{decl-list} \rangle \rightarrow \langle \text{decl} \rangle ; \langle \text{decl-list} \rangle$   
|  $\epsilon$

$\langle \text{decl} \rangle \rightarrow \text{id} : \langle \text{type} \rangle$

|  $\text{constant id} = \langle \text{expr} \rangle$

|  $\text{function id } \langle \text{formal-list} \rangle : \langle \text{type} \rangle \langle \text{block} \rangle$

|  $\text{procedure id } \langle \text{formal-list} \rangle \langle \text{block} \rangle$

$\langle \text{type} \rangle \rightarrow \text{integer} \mid \text{bool} \mid \text{String}$

$\langle \text{formal-list} \rangle \rightarrow ( \langle \text{formal-list-bar} \rangle$

$\langle \text{formal-list-bar} \rangle \rightarrow ) \mid \langle \text{formals} \rangle )$

$\langle \text{formals} \rangle \rightarrow \text{id} : \langle \text{type} \rangle \langle \text{formals-bar} \rangle$

$\langle \text{formals-bar} \rangle \rightarrow , \text{id} : \langle \text{type} \rangle \langle \text{formals-bar} \rangle \mid \epsilon$

$\langle \text{stmt} \rangle \rightarrow \text{id} \langle \text{call-assign} \rangle$

|  $\text{if } \langle \text{expr} \rangle \text{ then } \langle \text{stmt} \rangle \langle \text{if-stmt} \rangle$

|  $\text{while } \langle \text{expr} \rangle \text{ do } \langle \text{stmt} \rangle \text{ od}$

|  $\text{for id} := \langle \text{expr} \rangle \text{ to } \langle \text{expr} \rangle \text{ do } \langle \text{stmt} \rangle \text{ od}$

|  $\text{read } \langle \text{id} \rangle$

|  $\text{write } \langle \text{id} \rangle$

|  $\text{return } \langle \text{expr} \rangle$

|  $\langle \text{block} \rangle$

$\langle \text{call-assign} \rangle \rightarrow := \langle \text{expr} \rangle$

|  $\langle \text{arg-list} \rangle$

$\langle \text{if-stmt} \rangle \rightarrow \text{fi} \mid \text{else } \langle \text{stmt} \rangle \text{ fi}$

$\langle \text{block} \rangle \rightarrow \text{begin } \langle \text{Var-decl-list} \rangle \langle \text{stmt-list} \rangle \text{ end}$

$\langle \text{Var-decl-list} \rangle \rightarrow \langle \text{Var-decl} \rangle ; \langle \text{Var-decl-list} \rangle$   
 $\mid \lambda$

$\langle \text{Var-decl} \rangle \rightarrow \text{id} : \langle \text{type} \rangle$

$\langle \text{stmt-list} \rangle \rightarrow \langle \text{stmt} \rangle ; \langle \text{stmt-list} \rangle$   
 $\mid \lambda$

$\langle \text{arg-list} \rangle \rightarrow ( \langle \text{arg-list-bar} \rangle$

$\langle \text{arg-list-bar} \rangle \rightarrow ) \mid \langle \text{args} \rangle )$

$\langle \text{args} \rangle \rightarrow \langle \text{expr} \rangle \langle \text{args-bar} \rangle$

$\langle \text{args-bar} \rangle \rightarrow , \langle \text{args} \rangle \mid \lambda$

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$\langle \text{expr} \rangle \rightarrow \langle \text{rel} \rangle \langle \text{expr-bar} \rangle$

$\langle \text{expr-bar} \rangle \rightarrow \begin{matrix} \text{Conj} \\ \text{and/or} \end{matrix} \langle \text{rel} \rangle \langle \text{expr-bar} \rangle \mid \lambda$

$\langle \text{rel} \rangle \rightarrow \langle \text{arith} \rangle \langle \text{rel-bar} \rangle$

$\langle \text{rel-bar} \rangle \rightarrow \begin{matrix} \text{Relational} \\ \text{!} = < > = < = > = \end{matrix} \langle \text{arith} \rangle \langle \text{rel-bar} \rangle \mid \lambda$

$\langle \text{arith} \rangle \rightarrow \langle \text{unary} \rangle \langle \text{arith-bar} \rangle$

$\langle \text{arith-bar} \rangle \rightarrow \begin{matrix} \text{Arith-op} \\ * / + - \end{matrix} \langle \text{unary} \rangle \langle \text{arith-bar} \rangle \mid \lambda$

$\langle \text{unary} \rangle \rightarrow \begin{matrix} \text{Unary-op} \\ - \text{ not} \end{matrix} \langle F \rangle \mid \langle F \rangle$

$\langle F \rangle \rightarrow \text{integer-constant} \mid \text{string-constant} \mid \text{true} \mid \text{false} \mid ( \langle \text{expr} \rangle )$   
 $\mid \text{id} \mid \langle \text{call-id} \rangle$

$\langle \text{call-id} \rangle \rightarrow \lambda \mid \langle \text{arg-list} \rangle$