

$$\begin{aligned}
\langle program \rangle &\rightarrow \langle roots \rangle \\
\langle roots \rangle &\rightarrow \langle roots \rangle \\
&| \quad \langle root \rangle \langle roots \rangle \\
\langle root \rangle &\rightarrow \langle function \rangle \\
&| \quad \langle dcl \rangle \\
\langle dcl \rangle &\rightarrow \langle type \rangle \langle var \rangle ; | \langle type \rangle \langle assign \rangle ; \\
\langle stmts \rangle &\rightarrow \langle stmt \rangle \\
&| \quad \langle stmt \rangle \langle stmts \rangle \\
\langle stmt \rangle &\rightarrow \langle assign \rangle ; \\
&| \quad \langle if \rangle \\
&| \quad \langle while \rangle \\
&| \quad \langle from \rangle \\
&| \quad \langle empty \rangle \\
&| \quad \langle functioncall \rangle ; \\
&| \quad \langle switch \rangle \\
\langle var \rangle &\rightarrow \langle identifier \rangle \\
\langle identifier \rangle &\rightarrow \langle letter \rangle \\
&| \quad \langle identifier \rangle \langle letter \rangle \\
&| \quad \langle identifier \rangle \langle digit \rangle \\
\langle letter \rangle &\rightarrow [a-z] \\
&| \quad [A-Z] \\
\langle digit \rangle &\rightarrow [0-9] \\
\langle assign \rangle &\rightarrow \langle var \rangle <-- \langle expr \rangle \\
\langle expr \rangle &\rightarrow \langle expr \rangle + \langle term \rangle \\
&| \quad \langle expr \rangle - \langle term \rangle \\
&| \quad \langle term \rangle \\
\langle term \rangle &\rightarrow \langle term \rangle * \langle factor \rangle \\
&| \quad \langle term \rangle / \langle factor \rangle \\
&| \quad \langle factor \rangle \\
\langle factor \rangle &\rightarrow (\langle expr \rangle) \\
&| \quad \langle var \rangle \\
\langle switch \rangle &\rightarrow \text{switch } (\langle expr \rangle) \text{ begin } \langle cases \rangle \text{ end}
\end{aligned}$$

$\langle cases \rangle \rightarrow \text{case } \langle expr \rangle : \langle stmts \rangle \langle endcase \rangle$
 $\langle endcase \rangle \rightarrow \langle cases \rangle$
 $\quad | \text{ break;}$
 $\quad | \text{ break; } \langle cases \rangle$
 $\quad | \text{ default: } \langle stmts \rangle \text{ break;}$
 $\quad | \text{ break; default: } \langle stmts \rangle \text{ break;}$
 $\langle from \rangle \rightarrow \text{from } \langle expr \rangle \text{ to } \langle logexpr \rangle \text{ step } \langle expr \rangle \text{ begin } \langle stmts \rangle \text{ end}$
 $\langle while \rangle \rightarrow \text{while}(\langle logexpr \rangle) \text{ begin } \langle stmts \rangle \text{ end}$
 $\langle if \rangle \rightarrow \text{if}(\langle logexpr \rangle) \text{ begin } \langle stmts \rangle \langle endif \rangle$
 $\langle endif \rangle \rightarrow \text{end else } \langle if \rangle$
 $\quad | \text{ end else begin } \langle stmts \rangle \text{ end}$
 $\quad | \text{ end}$
 $\langle logexpr \rangle \rightarrow \langle logexpr \rangle \text{ OR } \langle andcomp \rangle$
 $\quad | \langle andcomp \rangle$
 $\langle andcomp \rangle \rightarrow \langle andcomp \rangle \text{ AND } \langle comp \rangle$
 $\quad | \langle comp \rangle$
 $\langle comp \rangle \rightarrow \langle boolean\text{-operand} \rangle \langle comparison\text{-operator} \rangle \langle boolean\text{-operand} \rangle$
 $\langle boolean\text{-operand} \rangle \rightarrow \langle boolean \rangle$
 $\quad | \text{ !}\langle boolean \rangle \langle boolean \rangle \rightarrow \text{bool}$
 $\quad | \langle expr \rangle$
 $\quad | (\langle logexpr \rangle)$
 $\langle comparison\text{-operator} \rangle \rightarrow >$
 $\quad | <$
 $\quad | <=$
 $\quad | >=$
 $\quad | !=$
 $\quad | =$
 $\langle type \rangle \rightarrow \langle primitive\text{-type} \rangle$
 $\quad | \langle array\text{-type} \rangle$
 $\langle primitive\text{-type} \rangle \rightarrow \langle numeric\text{-type} \rangle$
 $\quad | \text{ bool}$
 $\langle numeric\text{-type} \rangle \rightarrow \langle integral\text{-type} \rangle$
 $\quad | \text{ double}$

$\langle \textit{integral-type} \rangle \rightarrow \text{int}$
 | char

$\langle \textit{array-type} \rangle \rightarrow \langle \textit{type} \rangle []$

$\langle \textit{function} \rangle \rightarrow \text{function } \langle \textit{identifier} \rangle \text{ returns } \langle \textit{type} \rangle \text{ using } (\langle \textit{type} \rangle \langle \textit{var} \rangle \langle \textit{using} \rangle)$
 $\text{begin } \langle \textit{stmts} \rangle \text{ return } \langle \textit{expr} \rangle \text{ end}$
 | $\text{function } \rightarrow \text{function } \langle \textit{identifier} \rangle \text{ returns nothing using } (\langle \textit{type} \rangle \langle \textit{var} \rangle \langle \textit{using} \rangle)$
 $\text{begin } \langle \textit{stmts} \rangle \text{ end}$

$\langle \textit{using} \rangle \rightarrow , \langle \textit{type} \rangle \langle \textit{var} \rangle \langle \textit{using} \rangle$
 | $\langle \textit{empty} \rangle$

$\langle \textit{functioncall} \rangle \rightarrow \text{call } \langle \textit{identifier} \rangle (\langle \textit{using} \rangle)$