

$\text{prog} \rightarrow \bullet \text{"program"} \text{"id"} \text{body}$

$\text{prog} \rightarrow \text{"program"} \bullet \text{"id"} \text{body}$

$\text{prog} \rightarrow \text{"program"} \text{"id"} \bullet \text{body}$

$\text{prog} \rightarrow \text{"program"} \text{"id"} \text{body} \bullet$

$\text{body} \rightarrow \bullet \text{decl-list} \{ \text{"stmt-list"} \}$

$\text{body} \rightarrow \text{decl-list} \bullet \{ \text{"stmt-list"} \}$

$\text{body} \rightarrow \text{decl-list} \{ \bullet \text{"stmt-list"} \}$

$\text{body} \rightarrow \text{decl-list} \{ \text{"stmt-list"} \bullet \}$

$\text{body} \rightarrow \text{decl-list} \{ \text{"stmt-list"} \} \bullet$

$\text{decl-list} \rightarrow \bullet \text{decl} \text{";" } \text{decl-list}$

$\text{decl-list} \rightarrow \text{decl} \bullet \text{";" } \text{decl-list}$

$\text{decl-list} \rightarrow \text{decl} \text{";" } \bullet \text{decl-list}$

$\text{decl-list} \rightarrow \text{decl} \text{";" } \text{decl-list} \bullet$

$\text{decl-list} \rightarrow \epsilon \bullet$

$\text{decl} \rightarrow \bullet \text{type id-list}$

$\text{decl} \rightarrow \text{type} \bullet \text{id-list}$

$\text{decl} \rightarrow \text{type id-list} \bullet$

$\text{type} \rightarrow \bullet \text{"num"}$

$\text{type} \rightarrow \text{"num"} \bullet$

$\text{type} \rightarrow \bullet \text{"char"}$

$\text{type} \rightarrow \text{"char"} \bullet$

$\text{id-list} \rightarrow \bullet \text{"id"} \text{id-list'}$

$\text{id-list} \rightarrow \text{"id"} \bullet \text{id-list'}$

$\text{id-list} \rightarrow \text{"id"} \text{id-list'} \bullet$

$\text{id-list'} \rightarrow \bullet \text{","} \text{id-list}$

$\text{id-list'} \rightarrow \text{","} \bullet \text{id-list}$

$\text{id-list'} \rightarrow \text{","} \text{id-list} \bullet$

$\text{id-list'} \rightarrow \epsilon \bullet$

$\text{stmt-list} \rightarrow \bullet \text{stmt} \text{";" } \text{stmt-list}$

$\text{stmt-list} \rightarrow \text{stmt} \bullet \text{";" } \text{stmt-list}$

stmt-list \rightarrow stmt “;” •stmt-list

stmt-list \rightarrow stmt “;” stmt-list•

stmt-list \rightarrow ϵ •

stmt \rightarrow •assign-stmt

stmt \rightarrow assign-stmt •

stmt \rightarrow •if-stmt

stmt \rightarrow if-stmt •

stmt \rightarrow •while-stmt

stmt \rightarrow while-stmt •

stmt \rightarrow •read-stmt

stmt \rightarrow read-stmt •

stmt \rightarrow •write-stmt

stmt \rightarrow write-stmt•

assign-stmt \rightarrow •“id” “=” simple_expr

assign-stmt \rightarrow “id” •“=” simple_expr

assign-stmt \rightarrow “id” “=”• simple_expr

assign-stmt \rightarrow “**id**” “=” simple_expr •

if-stmt \rightarrow • “**if**” “(“ condition “)” “{“ stmt-list “}” if-stmt'

if-stmt \rightarrow “**if**” • “(“ condition “)” “{“ stmt-list “}” if-stmt'

if-stmt \rightarrow “**if**” “(“ • condition “)” “{“ stmt-list “}” if-stmt'

if-stmt \rightarrow “**if**” “(“ condition • “)” “{“ stmt-list “}” if-stmt'

if-stmt \rightarrow “**if**” “(“ condition “)” • “{“ stmt-list “}” if-stmt'

if-stmt \rightarrow “**if**” “(“ condition “)” “{“ • stmt-list “}” if-stmt'

if-stmt \rightarrow “**if**” “(“ condition “)” “{“ stmt-list • “}” if-stmt'

if-stmt \rightarrow “**if**” “(“ condition “)” “{“ stmt-list “}” • if-stmt'

if-stmt \rightarrow “**if**” “(“ condition “)” “{“ stmt-list “}” if-stmt' •

if-stmt' \rightarrow • “**else**” “{“ stmt-list “}”

if-stmt' \rightarrow “**else**” • “{“ stmt-list “}”

if-stmt' \rightarrow “**else**” “{“ • stmt-list “}”

if-stmt' \rightarrow “**else**” “{“ stmt-list • “}”

if-stmt' \rightarrow “**else**” “{“ stmt-list “}” •

if-stmt' \rightarrow ϵ •

condition $\rightarrow \bullet$ expression

condition \rightarrow expression \bullet

while-stmt $\rightarrow \bullet$ stmt-prefix “{“ stmt-list “}”

while-stmt \rightarrow stmt-prefix \bullet “{“ stmt-list “}”

while-stmt \rightarrow stmt-prefix “{“ \bullet stmt-list “}”

while-stmt \rightarrow stmt-prefix “{“ stmt-list \bullet “}”

while-stmt \rightarrow stmt-prefix “{“ stmt-list “}” \bullet

stmt-prefix $\rightarrow \bullet$ “**while**” “(“ condition “)”

stmt-prefix \rightarrow “**while**” \bullet “(“ condition “)”

stmt-prefix \rightarrow “**while**” “(“ \bullet condition “)”

stmt-prefix \rightarrow “**while**” “(“ condition \bullet “)”

stmt-prefix \rightarrow “**while**” “(“ condition “)” \bullet

read-stmt $\rightarrow \bullet$ “**read**” “**id**”

read-stmt \rightarrow “**read**” \bullet “**id**”

read-stmt \rightarrow “**read**” “**id**” \bullet

write-stmt $\rightarrow \bullet$ “**write**” writable

write-stmt \rightarrow “**write**” \bullet writable

write-stmt \rightarrow “**write**” writable \bullet

writable $\rightarrow \bullet$ simple-expr

writable \rightarrow simple-expr \bullet

writable $\rightarrow \bullet$ “**literal**”

writable \rightarrow “**literal**” \bullet

expression $\rightarrow \bullet$ simple-expr expression'

expression \rightarrow simple-expr \bullet expression'

expression \rightarrow simple-expr expression' \bullet

expression' $\rightarrow \bullet$ relop simple-expr

expression' \rightarrow relop \bullet simple-expr

expression' \rightarrow relop simple-expr \bullet

expression' $\rightarrow \epsilon \bullet$

$\text{simple-expr} \rightarrow \bullet \text{term simple-expr}'$

$\text{simple-expr} \rightarrow \text{term} \bullet \text{simple-expr}'$

$\text{simple-expr} \rightarrow \text{term simple-expr}' \bullet$

$\text{simple-expr}' \rightarrow \bullet \text{addop term simple-expr}'$

$\text{simple-expr}' \rightarrow \text{addop} \bullet \text{term simple-expr}'$

$\text{simple-expr}' \rightarrow \text{addop term} \bullet \text{simple-expr}'$

$\text{simple-expr}' \rightarrow \text{addop term simple-expr}' \bullet$

$\text{simple-expr}' \rightarrow \epsilon \bullet$

$\text{term} \rightarrow \bullet \text{factor-a term}'$

$\text{term} \rightarrow \text{factor-a} \bullet \text{term}'$

$\text{term} \rightarrow \text{factor-a term}' \bullet$

$\text{term}' \rightarrow \bullet \text{mulop factor-a term}'$

$\text{term}' \rightarrow \text{mulop} \bullet \text{factor-a term}'$

$\text{term}' \rightarrow \text{mulop factor-a} \bullet \text{term}'$

$\text{term}' \rightarrow \text{mulop factor-a term}' \bullet$

$\text{term}' \rightarrow \epsilon \bullet$

$\text{factor-a} \rightarrow \bullet \text{ factor}$

$\text{factor-a} \rightarrow \text{factor} \bullet$

$\text{factor-a} \rightarrow \bullet \text{“not” factor}$

$\text{factor-a} \rightarrow \text{“not”} \bullet \text{ factor}$

$\text{factor-a} \rightarrow \text{“not” factor} \bullet$

$\text{factor} \rightarrow \bullet \text{“id”}$

$\text{factor} \rightarrow \text{“id”} \bullet$

$\text{factor} \rightarrow \bullet \text{ constant}$

$\text{factor} \rightarrow \text{constant} \bullet$

$\text{factor} \rightarrow \bullet \text{“(“ expression “)”}$

$\text{factor} \rightarrow \text{“(“} \bullet \text{ expression “)”}$

$\text{factor} \rightarrow \text{“(“ expression} \bullet \text{ “)”}$

$\text{factor} \rightarrow \text{“(“ expression “)”} \bullet$

$\text{relop} \rightarrow \bullet \text{“==”}$

$\text{relop} \rightarrow \text{"==" } \bullet$

$\text{relop} \rightarrow \bullet \text{">"}$

$\text{relop} \rightarrow \text{">" } \bullet$

$\text{relop} \rightarrow \bullet \text{">="}$

$\text{relop} \rightarrow \text{">=" } \bullet$

$\text{relop} \rightarrow \bullet \text{"<"}$

$\text{relop} \rightarrow \text{"<" } \bullet$

$\text{relop} \rightarrow \bullet \text{"<="}$

$\text{relop} \rightarrow \text{"<=" } \bullet$

$\text{relop} \rightarrow \bullet \text{"!="}$

$\text{relop} \rightarrow \text{"!=" } \bullet$

$\text{addop} \rightarrow \bullet \text{"+"}$

$\text{addop} \rightarrow \text{"+" } \bullet$

$\text{addop} \rightarrow \bullet \text{"-"}$

$\text{addop} \rightarrow \text{"-" } \bullet$

$\text{addop} \rightarrow \bullet \text{"or"}$

$\text{addop} \rightarrow \text{"or" } \bullet$

$\text{mulop} \rightarrow \bullet \text{“*”}$

$\text{mulop} \rightarrow \text{“*”} \bullet$

$\text{mulop} \rightarrow \bullet \text{“/”}$

$\text{mulop} \rightarrow \text{“/”} \bullet$

$\text{mulop} \rightarrow \bullet \text{“and”}$

$\text{mulop} \rightarrow \text{“and”} \bullet$

$\text{constant} \rightarrow \bullet \text{“num_const”}$

$\text{constant} \rightarrow \text{“num_const”} \bullet$

$\text{constant} \rightarrow \bullet \text{“char_const”}$

$\text{constant} \rightarrow \text{“char_const”} \bullet$