I. Testcase 목록

1) CFG:

$$N \to \epsilon \mid N_1\,B$$
$$N_1 \to D\,N_2$$
$$N_2 \to \epsilon \mid D\,N_3$$
$$N_3 \to \epsilon \mid D$$
$$B \to \epsilon \mid C\,D\,D\,D\,B$$
$$C \to \,,$$
$$D \to 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$$

Start symbol: N
정답: True

2) CFG:

$$P \to \epsilon$$
$$\mid \quad 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$$
$$\mid \quad 0\,P\,0 \mid 1\,P\,1 \mid 2\,P\,2 \mid 3\,P\,3 \mid 4\,P\,4 \mid 5\,P\,5 \mid 6\,P\,6 \mid 7\,P\,7 \mid 8\,P\,8 \mid 9\,P\,9$$

Start symbol: P
정답: False

3) CFG:

$$E \to T\,E'$$
$$E' \to \epsilon \mid \|\,T\,E'$$
$$T \to F\,T'$$
$$T' \to \epsilon \mid \&\&\,F\,T'$$
$$F \to !\,F \mid (E) \mid True \mid False$$

Start symbol: E
정답: True

4) CFG:

$$S \to (S)\,V\,W \mid a\,S\,b\,V\,W \mid d\,V\,W$$
$$V \to V\,a \mid \epsilon$$
$$W \to W\,c \mid \epsilon$$

Start symbol: S
정답: False

5) CFG:

$$S \to U\,V\,W$$
$$U \to (S) \mid a\,S\,b \mid d$$
$$V \to a\,V \mid \epsilon$$
$$W \to c\,W \mid \epsilon$$

Start symbol: S
정답: True

6) CFG:

$$M \to WS\,INT\,WS \mid WS\,ID\,WS \mid WS\,STR\,WS \mid WS\,L\,WS$$
$$L \to (\,WS\,LC\,)$$
$$LC \to \epsilon \mid LC\,WS'\,M$$
$$INT \to INT\,DG$$
$$ID \to LT\,ID'$$
$$ID' \to \epsilon \mid ID'\,LT \mid ID'\,DG$$
$$STR \to DQ\,CHAR\,DQ$$
$$WS \to \epsilon \mid WS\,WS'$$
$$WS' \to WS'\,[space] \mid WS'\,[newline]$$
$$DG \to 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$$
$$LT \to a \mid b \mid c \mid d \mid e \mid f \mid g \mid h \mid i \mid j$$
$$\mid k \mid l \mid m \mid n \mid o \mid p \mid q \mid r \mid s \mid t$$
$$\mid u \mid v \mid w \mid x \mid y \mid z$$
$$DQ \to {}''$$
$$CHAR \to \epsilon \mid CHAR\,CHAR'$$
$$CHAR' \to DG \mid LT \mid [space]$$

Start symbol: M
정답: False

7) CFG:

$$M \to WS\,MSG\,WS$$
$$MSG \to INT \mid ID \mid STR \mid L$$
$$L \to (\,WS\,L'$$
$$L' \to) \mid MSG\,L''$$
$$L'' \to) \mid WS'\,L'$$
$$INT \to DG\,INT'$$
$$INT' \to \epsilon \mid DG\,INT$$
$$ID \to LT\,ID'$$
$$ID' \to \epsilon \mid LT\,ID' \mid DG\,ID'$$
$$STR \to DQ\,CHAR\,DQ$$
$$WS \to \epsilon \mid WS'$$
$$WS' \to WC\,WS$$
$$DG \to 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$$
$$LT \to a \mid b \mid c \mid d \mid e \mid f \mid g \mid h \mid i \mid j$$
$$\mid k \mid l \mid m \mid n \mid o \mid p \mid q \mid r \mid s \mid t$$
$$\mid u \mid v \mid w \mid x \mid y \mid z$$
$$DQ \to {}''$$
$$CHAR \to \epsilon \mid CHAR'\,CHAR$$
$$CHAR' \to DG \mid LT \mid [space]$$
$$WC \to [space] \mid [newline]$$

Start symbol: M
정답: True

8) CFG:

$$stmt \rightarrow \epsilon \mid exprstmt\,stmt \mid ifstmt\,stmt$$
$$exprstmt \rightarrow 0 \mid 1$$
$$ifstmt \rightarrow if\,(\ exprstmt\ )\,\{\ stmt\ \}$$

Start symbol: stmt
정답: True

9) CFG:

$$type \rightarrow int\,arrtyp \mid float\,arrtyp$$
$$arrtyp \rightarrow \epsilon \mid [\,]$$
$$arglist \rightarrow \epsilon \mid type\,var\,,\,arglist$$
$$var \rightarrow x \mid y$$

Start symbol: arglist
정답: True

10) CFG:

$$S \rightarrow A\,a\,A\,b \mid B\,b\,B\,a$$
$$A \rightarrow \epsilon$$
$$B \rightarrow \epsilon$$

Start symbol: S
정답: True

11) CFG:

$$S \rightarrow a\,S\,b\,S \mid b\,S\,a\,S \mid \epsilon$$

Start symbol: S
정답: False

12) CFG:

$$expr \rightarrow expr\,or\,term \mid term$$
$$term \rightarrow term\,and\,factor \mid factor$$
$$factor \rightarrow not\,factor \mid (\,expr\,) \mid true \mid false$$

Start symbol: expr
정답: False

13) CFG:

$$expr \rightarrow 0 \mid 1 \mid lvalue \mid lvalue = expr \mid lvalue\,(\,expr\,)$$
$$lvalue \rightarrow var \mid *lvalue$$
$$var \rightarrow f \mid x \mid y$$

Start symbol: expr
정답: False

14) CFG:

$$S \to A\,aa\,S\,S\,c \mid aa\,b\,S\,C$$
$$A \to a\,b\,cc\,S \mid \epsilon$$
$$B \to S\,B\,b \mid A\,aa\,B\,bb \mid \epsilon$$
$$C \to ccc\,S\,cc \mid A\,S\,c\,C$$

Start symbol: S
정답: False

15) CFG:

$$K \to T\,t$$
$$T \to T'\,C$$
$$T' \to c \mid \epsilon$$
$$C \to a \mid C'$$
$$C' \to \epsilon$$

Start symbol: K
정답: True

16) CFG:

$$S \to P\,U\,S' \mid s$$
$$S' \to P\,Y \mid \epsilon$$
$$P \to p \mid pp$$
$$U \to u \mid \epsilon$$
$$Y \to i\,e\,S \mid \epsilon$$

Start symbol: S
정답: True

17) CFG:

$$S \to C\,V\,n\,C\,S \mid E$$
$$C \to c\,C' \mid t\,C' \mid n\,C' \mid g\,C' \mid V\,C$$
$$C' \to r\,C \mid s \mid \epsilon$$
$$V \to a\,V' \mid o\,V' \mid i$$
$$V' \to u\,V \mid e \mid \epsilon$$
$$E \to ! \mid ? \mid \epsilon$$

Start symbol: S
정답: True

18) CFG:

$$S \to S'\,P\,P'$$
$$S' \to P'\,a\,b \mid \epsilon$$
$$P \to b\,P'\,a \mid a \mid b$$
$$P' \to a \mid c \mid \epsilon$$

Start symbol: S
정답: False

19) CFG:

$$K \to T\,t$$
$$T \to T'\,C$$
$$T' \to c \mid t \mid \epsilon$$
$$C \to a \mid C'$$
$$C' \to \epsilon$$

Start symbol: K
정답: False

20) CFG:

$$S \to C\,V\,m\,C\,S \mid E$$
$$C \to V\,C\,C' \mid m\,C'\,V \mid c\,C' \mid l$$
$$C' \to p\,C \mid r\,C' \mid s\,C' \mid \epsilon$$
$$V \to a\,V' \mid o\,V' \mid i$$
$$V' \to u\,V \mid e \mid \epsilon$$
$$E \to !\mid ? \mid \epsilon$$

Start symbol: S
정답: False

ii.   Parse

1) Sentence:

$$132,476,598\$$$

CFG:

$$N \to \epsilon \mid N_1\,B$$
$$N_1 \to D\,N_2$$
$$N_2 \to \epsilon \mid D\,N_3$$
$$N_3 \to \epsilon \mid D$$
$$B \to \epsilon \mid C\,D\,D\,D\,B$$
$$C \to ,$$
$$D \to 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$$

Start symbol: N
정답: True

2) Sentence:

$1\,3\,2\,,\,4\,7\,6\,,\,5\,9\,\$$

CFG:

$$N \rightarrow \epsilon \mid N_1\,B$$
$$N_1 \rightarrow D\,N_2$$
$$N_2 \rightarrow \epsilon \mid D\,N_3$$
$$N_3 \rightarrow \epsilon \mid D$$
$$B \rightarrow \epsilon \mid C\,D\,D\,D\,B$$
$$C \rightarrow ,$$
$$D \rightarrow 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$$

Start symbol: N
정답: False

3) Sentence:

$1\,3\,2\,,\,4\,7\,,\,5\,9\,8\,\$$

CFG:

$$N \rightarrow \epsilon \mid N_1\,B$$
$$N_1 \rightarrow D\,N_2$$
$$N_2 \rightarrow \epsilon \mid D\,N_3$$
$$N_3 \rightarrow \epsilon \mid D$$
$$B \rightarrow \epsilon \mid C\,D\,D\,D\,B$$
$$C \rightarrow ,$$
$$D \rightarrow 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$$

Start symbol: N
정답: False

4) Sentence:

$(\,True \,\|\, False\,)\,\&\&\,True\,\$$

CFG:

$$E \rightarrow T\,E'$$
$$E' \rightarrow \epsilon \mid \|\,T\,E'$$
$$T \rightarrow F\,T'$$
$$T' \rightarrow \epsilon \mid \&\&\,F\,T'$$
$$F \rightarrow !\,F \mid (E) \mid True \mid False$$

Start symbol: E
정답: True

5) Sentence:

$$a\,a\,b\,b\,a\,c\,a\,\$$$

CFG:

$$S \to U\,V\,W$$
$$U \to (S) \mid a\,S\,b \mid d$$
$$V \to a\,V \mid \epsilon$$
$$W \to c\,W \mid \epsilon$$

Start symbol: S
정답: False

6) Sentence:

$$a\,(\,a\,d\,b\,c\,c\,)\,a\,b\,a\,a\,a\,c\,c\,c\,\$$$

CFG:

$$S \to U\,V\,W$$
$$U \to (S) \mid a\,S\,b \mid d$$
$$V \to a\,V \mid \epsilon$$
$$W \to c\,W \mid \epsilon$$

Start symbol: S
정답: True

7) Sentence:

$$0\,5\,2\,3\,j\,\$$$

CFG:

$$M \to WS\,MSG\,WS$$
$$MSG \to INT \mid ID \mid STR \mid L$$
$$L \to (\,WS\,L'$$
$$L' \to \;) \mid MSG\,L''$$
$$L'' \to \;) \mid WS'\,L'$$
$$INT \to DG\,INT'$$
$$INT' \to \epsilon \mid DG\,INT$$
$$ID \to LT\,ID'$$
$$ID' \to \epsilon \mid LT\,ID' \mid DG\,ID'$$
$$STR \to DQ\,CHAR\,DQ$$
$$WS \to \epsilon \mid WS'$$
$$WS' \to WC\,WS$$
$$DG \to 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$$
$$LT \to a \mid b \mid c \mid d \mid e \mid f \mid g \mid h \mid i \mid j$$
$$\qquad \mid k \mid l \mid m \mid n \mid o \mid p \mid q \mid r \mid s \mid t$$
$$\qquad \mid u \mid v \mid w \mid x \mid y \mid z$$
$$DQ \to \;''$$
$$CHAR \to \epsilon \mid CHAR'\,CHAR$$
$$CHAR' \to DG \mid LT \mid [space]$$
$$WC \to [space] \mid [newline]$$

Start symbol: M
정답: False

8) Sentence:

$$(\, i \, d \, 9 \, 4 \, [newline] \, 0 \, 4 \, 0 \, 6 \, [space] \, '' \, j \, [space] \, 1 \, 3 \, '' \,) \, \$$$

CFG:

$$M \to WS\,MSG\,WS$$
$$MSG \to INT \mid ID \mid STR \mid L$$
$$L \to (\, WS\,L'$$
$$L' \to) \mid MSG\,L''$$
$$L'' \to) \mid WS'\,L'$$
$$INT \to DG\,INT'$$
$$INT' \to \epsilon \mid DG\,INT$$
$$ID \to LT\,ID'$$
$$ID' \to \epsilon \mid LT\,ID' \mid DG\,ID'$$
$$STR \to DQ\,CHAR\,DQ$$
$$WS \to \epsilon \mid WS'$$
$$WS' \to WC\,WS$$
$$DG \to 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$$
$$LT \to a \mid b \mid c \mid d \mid e \mid f \mid g \mid h \mid i \mid j$$
$$\mid k \mid l \mid m \mid n \mid o \mid p \mid q \mid r \mid s \mid t$$
$$\mid u \mid v \mid w \mid x \mid y \mid z$$
$$DQ \to ''$$
$$CHAR \to \epsilon \mid CHAR'\,CHAR$$
$$CHAR' \to DG \mid LT \mid [space]$$
$$WC \to [space] \mid [newline]$$

Start symbol: M

정답: True

9) Sentence:

$$1 \, 0 \, if \, (\, 0 \,) \, \{ \, if \, (\, 1 \,) \, \{ \, \} \, 0 \, \} \, \$$$

CFG:

$$stmt \to \epsilon \mid exprstmt\,stmt \mid ifstmt\,stmt$$
$$exprstmt \to 0 \mid 1$$
$$ifstmt \to if \, (\, exprstmt \,) \, \{ \, stmt \, \}$$

Start symbol: stmt

정답: True

10) Sentence:

$$if \, (\, 1 \,) \, \{ \, if \, (\, 1 \, \} \, if \, (\, 0 \,) \, \{ \, \} \, \$$$

CFG:

$$stmt \to \epsilon \mid exprstmt\,stmt \mid ifstmt\,stmt$$
$$exprstmt \to 0 \mid 1$$
$$ifstmt \to if \, (\, exprstmt \,) \, \{ \, stmt \, \}$$

Start symbol: stmt

정답: False

11) Sentence:

$$int \; y \, , \; float \; [\,] \; x \, , \; float \; x \, , \; \$$$

CFG:

$$type \rightarrow int \; arrtyp \mid float \; arrtyp$$
$$arrtyp \rightarrow \epsilon \mid [\,]$$
$$arglist \rightarrow \epsilon \mid type \; var \, , \; arglist$$
$$var \rightarrow x \mid y$$

Start symbol: arglist
정답: True

12) Sentence:

$$int \; y \, , \; float \; [\,] \; x \, , \; float \, , \, , \; \$$$

CFG:

$$type \rightarrow int \; arrtyp \mid float \; arrtyp$$
$$arrtyp \rightarrow \epsilon \mid [\,]$$
$$arglist \rightarrow \epsilon \mid type \; var \, , \; arglist$$
$$var \rightarrow x \mid y$$

Start symbol: arglist
정답: False

13) Sentence:

$$b \, a \, \$$$

CFG:

$$S \rightarrow A \, a \, A \, b \mid B \, b \, B \, a$$
$$A \rightarrow \epsilon$$
$$B \rightarrow \epsilon$$

Start symbol: S
정답: True

14) Sentence:

$$a \, a \, \$$$

CFG:

$$S \rightarrow A \, a \, A \, b \mid B \, b \, B \, a$$
$$A \rightarrow \epsilon$$
$$B \rightarrow \epsilon$$

Start symbol: S
정답: False

15) Sentence:

$$c\,a\,t\,\$$$

CFG:

$$K \to T\,t$$
$$T \to T'\,C$$
$$T' \to c \mid \epsilon$$
$$C \to a \mid C'$$
$$C' \to \epsilon$$

Start symbol: K
정답: True

16) Sentence:

$$p\,u\,p\,p\,i\,e\,s\,\$$$

CFG:

$$S \to P\,U\,S' \mid s$$
$$S' \to P\,Y \mid \epsilon$$
$$P \to p \mid pp$$
$$U \to u \mid \epsilon$$
$$Y \to i\,e\,S \mid \epsilon$$

Start symbol: S
정답: False

17) Sentence:

$$p\,u\,p\,p\,i\,e\,s\,\$$$

CFG:

$$S \to P\,U\,S' \mid s$$
$$S' \to P\,Y \mid \epsilon$$
$$P \to p \mid pp$$
$$U \to u \mid \epsilon$$
$$Y \to i\,e\,S \mid \epsilon$$

Start symbol: S
정답: True

18) Sentence:

$$congrats!\$$$

CFG:

$$S \rightarrow CVnCS \mid E$$
$$C \rightarrow cC' \mid tC' \mid nC' \mid gC' \mid VC$$
$$C' \rightarrow rC \mid s \mid \epsilon$$
$$V \rightarrow aV' \mid oV' \mid i$$
$$V' \rightarrow uV \mid e \mid \epsilon$$
$$E \rightarrow ! \mid ? \mid \epsilon$$

Start symbol: S

정답: True

19) Sentence:

$$concern!\$$$

CFG:

$$S \rightarrow CVnCS \mid E$$
$$C \rightarrow cC' \mid tC' \mid nC' \mid gC' \mid VC$$
$$C' \rightarrow rC \mid s \mid \epsilon$$
$$V \rightarrow aV' \mid oV' \mid i$$
$$V' \rightarrow uV \mid e \mid \epsilon$$
$$E \rightarrow ! \mid ? \mid \epsilon$$

Start symbol: S

정답: False

20) Sentence:

$$conoes!\$$$

CFG:

$$S \rightarrow CVnCS \mid E$$
$$C \rightarrow cC' \mid tC' \mid nC' \mid gC' \mid VC'$$
$$C' \rightarrow rC \mid s \mid \epsilon$$
$$V \rightarrow aV' \mid oV' \mid i$$
$$V' \rightarrow uV \mid e \mid \epsilon$$
$$E \rightarrow ! \mid ? \mid \epsilon$$

Start symbol: S

정답: True

II.   별첨

let testcases_cfg : Parse.cfg list =
  [
    (* 1 *)   ([N "N"; N "N1"; N "N2"; N "N3"; N "B"; N "C"; N "D"], [T "0"; T "1"; T "2"; T "3"; T "4"; T "5"; T "6"; T "7"; T "8"; T "9"; T ","], N "N", [(N "N", []); (N "N", [N "N1"; N "B"]); (N "N1", [N "D"; N "N2";]); (N "N2", []); (N "N2", [N "D"; N "N3";]); (N "N3", []); (N "N3", [N "D"]); (N "B", []); (N "B", [N "C"; N "D"; N "D"; N "D"; N "B"]); (N "C", [T ","]); (N "D", [T "0"]); (N "D", [T "1"]); (N "D", [T "2"]); (N "D", [T "3"]); (N "D", [T "4"]); (N "D", [T "5"]); (N "D", [T "6"]); (N "D", [T "7"]); (N "D", [T "8"]); (N "D", [T "9"])])

    (* 2 *)   ([N "P"], [T "0"; T "1"; T "2"; T "3"; T "4"; T "5"; T "6"; T "7"; T "8"; T "9"], N "P", [(N "P", []); (N "P", [T "0"]); (N "P", [T "1"]); (N "P", [T "2"]); (N "P", [T "3"]); (N "P", [T "4"]); (N "P", [T "5"]); (N "P", [T "6"]); (N "P", [T "7"]); (N "P", [T "8"]); (N "P", [T "9"]); (N "P", [T "0"; N "P"; T "0"]); (N "P", [T "1"; N "P"; T "1"]); (N "P", [T "2"; N "P"; T "2"]); (N "P", [T "3"; N "P"; T "3"]); (N "P", [T "4"; N "P"; T "4"]); (N "P", [T "5"; N "P"; T "5"]); (N "P", [T "6"; N "P"; T "6"]); (N "P", [T "7"; N "P"; T "7"]); (N "P", [T "8"; N "P"; T "8"]); (N "P", [T "9"; N "P"; T "9"])])

    (* 3 *)   ([N "E"; N "E'"; N "T"; N "T'"; N "F"], [T "!"; T "||"; T "&&"; T "("; T ")"; T "True"; T "False"], N "E", [(N "E", [N "T"; N "E'"]); (N "E'", []); (N "E'", [T "||"; N "T"; N "E'"]); (N "T", [N "F"; N "T'"]); (N "T'", []); (N "T'", [T "&&"; N "F"; N "T'"]); (N "F", [T "!"; N "F"]); (N "F", [T "("; N "E"; T ")"]); (N "F", [T "True"]); (N "F", [T "False"])])

    (* 4 *)   ([N "S"; N "V"; N "W"], [T "("; T ")"; T "a"; T "b"; T "c"; T "d"], N "S", [(N "S", [T "("; N "S"; T ")"; N "V"; N "W"]); (N "S", [T "a"; N "S"; T "b"; N "V"; N "W"]); (N "S", [T "d"; N "V"; N "W"]); (N "V", [N "V"; T "a"]); (N "V", []); (N "W", [N "W"; T "c"]); (N "W", [])])

    (* 5 *)   ([N "S"; N "U"; N "V"; N "W"], [T "("; T ")"; T "a"; T "b"; T "c"; T "d"], N "S", [(N "S", [N "U"; N "V"; N "W"]); (N "U", [T "("; N "S"; T ")"]); (N "U", [T "a"; N "S"; T "b"]); (N "U", [T "d"]); (N "V", [T "a"; N "V"]); (N "V", []); (N "W", [T "c"; N "W"]); (N "W", [])])

    (* 6 *)   ([N "M"; N "L"; N "LC"; N "INT"; N "ID"; N "ID'"; N "STR"; N "WS"; N "WS'"; N "DG"; N "LT"; N "DQ"; N "CHAR"; N "CHAR'"],   [T "("; T ")"; T "\""; T " "; T "\\n"; T "0"; T "1"; T "2"; T "3"; T "4"; T "5"; T "6"; T "7"; T "8"; T "9"; T "a"; T "b"; T "c"; T "d"; T "e"; T "f"; T "g"; T "h"; T "i"; T "j"; T "k"; T "l"; T "m"; T "n"; T "o"; T "p"; T "q"; T "r"; T "s"; T "t"; T "u"; T "v"; T "w"; T "x"; T "y"; T "z"], N "M", [(N "M", [N "WS"; N "INT"; N "WS"]); (N "M", [N "WS"; N "ID"; N "WS"]); (N "M", [N "WS"; N "STR"; N "WS"]); (N "M", [N "WS"; N "L"; N "WS"]); (N "L", [T "("; N "WS"; N "LC"; T ")"]); (N "LC", []); (N "LC", [N "LC"; N "WS'"; N "M"]); (N "INT", [N "INT"; N "DG"]); (N "ID", [N "LT"; N "ID'"]); (N "ID'", []); (N "ID'", [N "ID'"; N "LT"]); (N "ID'", [N "ID'"; N "DG"]); (N "STR", [N "DQ"; N "CHAR"; N "DQ"]); (N "WS", []); (N "WS", [N "WS"; N "WS"]); (N "WS'", [N "WS'"; N " "]); (N "WS'", [N "WS'"; N "\\n"]); (N "DG", [T "0"]); (N "DG", [T "1"]); (N "DG", [T "2"]); (N "DG", [T "3"]); (N "DG", [T "4"]); (N "DG", [T "5"]); (N "DG", [T "6"]); (N "DG", [T "7"]); (N "DG", [T "8"]); (N "DG", [T "9"]); (N "LT", [T "a"]); (N "LT", [T "b"]); (N "LT", [T "c"]); (N "LT", [T "d"]); (N "LT", [T "e"]); (N "LT", [T "f"]); (N "LT", [T "g"]); (N "LT", [T "h"]); (N "LT", [T "i"]); (N "LT", [T "j"]); (N "LT", [T "k"]); (N "LT", [T "l"]); (N "LT", [T "m"]); (N "LT", [T "n"]); (N "LT", [T "o"]); (N "LT", [T "p"]); (N "LT", [T "q"]); (N "LT", [T "r"]); (N "LT", [T "s"]); (N "LT", [T "t"]); (N "LT", [T "u"]); (N "LT", [T "v"]); (N "LT", [T "w"]); (N "LT", [T "x"]); (N "LT", [T "y"]); (N "LT", [T "z"]); (N "DQ", [T "\""]); (N "CHAR", []); (N "CHAR", [N "CHAR"; N "CHAR'"]); (N "CHAR'", [N "DG"]); (N "CHAR'", [N "LT"]); (N "CHAR'", [T " "])])

    (* 7 *)   ([N "M"; N "MSG"; N "L"; N "L'"; N "L''"; N "INT"; N "INT'"; N "ID"; N "ID'"; N "STR"; N "WS"; N "WS'"; N "DG"; N "LT"; N "DQ"; N "CHAR"; N "CHAR'"; N "WC"],   [T "("; T ")"; T "\""; T " "; T "\\n"; T "0"; T "1"; T "2"; T "3"; T "4"; T "5"; T "6"; T "7"; T "8"; T "9"; T "a"; T "b"; T "c"; T "d"; T "e"; T "f"; T "g"; T "h"; T "i"; T "j"; T "k"; T "l"; T "m"; T "n"; T "o"; T "p"; T "q"; T "r"; T "s"; T "t"; T "u"; T "v"; T "w"; T "x"; T "y"; T "z"],   N "M", [(N "M", [N "WS"; N "MSG"; N "WS"]); (N "MSG", [N "INT"]); (N "MSG", [N "ID"]); (N "MSG", [N "STR"]); (N "MSG", [N "L"]); (N "L", [T "("; N "WS"; N "L'"]); (N "L'", [T ")"]); (N "L'", [N "MSG"; N "L''"]); (N "L''", [T ")"]); (N "L''", [N "WS'"; N "L'"]); (N "INT", [N "DG"; N "INT'"]); (N "INT'", []); (N "INT'", [N "DG"; N "INT'"]); (N "ID", [N "LT"; N "ID'"]); (N "ID'", []); (N "ID'", [N "LT"; N "ID'"]); (N "ID'", [N "DG"; N "ID'"]); (N "STR", [N "DQ"; N "CHAR"; N "DQ"]); (N "WS", []); (N "WS", [N "WS"; N "WS'"]); (N "WS'", [N "WC"; N "WS"]); (N "DG", [T "0"]); (N "DG", [T "1"]); (N "DG", [T "2"]); (N "DG", [T "3"]); (N "DG", [T "4"]); (N "DG", [T "5"]); (N "DG", [T "6"]); (N "DG", [T "7"]); (N "DG", [T "8"]); (N "DG", [T "9"]); (N "LT", [T "a"]); (N "LT", [T "b"]); (N "LT", [T "c"]); (N "LT", [T "d"]); (N "LT", [T "e"]); (N "LT", [T "f"]); (N "LT", [T "g"]); (N "LT", [T "h"]); (N "LT", [T "i"]); (N "LT", [T "j"]); (N "LT", [T "k"]); (N "LT", [T "l"]); (N "LT", [T "m"]); (N "LT", [T "n"]); (N "LT", [T "o"]); (N "LT", [T "p"]); (N "LT", [T "q"]); (N "LT", [T "r"]); (N "LT", [T "s"]); (N "LT", [T "t"]); (N "LT", [T "u"]); (N "LT", [T "v"]); (N "LT", [T "w"]); (N "LT", [T "x"]); (N

"LT", [T "y"]); (N "LT", [T "z"]); (N "DQ", [T "\""]); (N "CHAR", []); (N "CHAR", [N "CHAR'"; N "CHAR"]); (N "CHAR'", [N "DG"]); (N "CHAR'", [N "LT"]); (N "CHAR'", [T " "]); (N "WC", [T " "]); (N "WC", [T "\\n"])])

    (* 8 *)   ([N "stmt"; N "exprstmt"; N "ifstmt";], [T "0;"; T "1;"; T "if ("; T ") {"; T "}";], N "stmt", [(N "stmt", []); (N "stmt", [N "exprstmt"; N "stmt"]); (N "stmt", [N "ifstmt"   ; N "stmt"]); (N "exprstmt", [T "0;"]); (N "exprstmt", [T "1;"]); (N "ifstmt", [T "if ("; N "exprstmt"; T ") {"; N "stmt"; T "}"])])

    (* 9 *)   ([N "type"; N "arglist"; N "var"; N "arrtyp";], [T "int"; T "float"; T "x"; T "y"; T ","; T "["; T "]";], N "arglist", [(N "type", [T "int"; N "arrtyp"]); (N "type", [T "float"; N "arrtyp"]); (N "arrtyp", []); (N "arrtyp", [T "["; T "]"]); (N "arglist", []); (N "arglist", [N "type"; N "var"; T ","; N "arglist"]); (N "var", [T "x";]); (N "var", [T "y";])])

    (* 10 *)   ([N "S"; N "A"; N "B";], [T "a"; T "b";], N "S", [(N "S", [N "A"; T "a"; N "A"; T "b";]); (N "S", [N "B"; T "b"; N "B"; T "a";]); (N "A", []); (N "B", [])])

    (* 11 *)   ([N "S"], [T "a"; T "b"], N "S", [(N "S", [T "a"; N "S"; T "b"; N "S";]); (N "S", [T "b"; N "S"; T "a"; N "S";]); (N "S", [])])

    (* 12 *)   ([N "expr"; N "term"; N "factor";], [T "or"; T "and"; T "not"; T "true"; T "false"; T "("; T ")";], N "expr", [(N "expr", [N "expr"; T "or"; N "term";]); (N "expr", [N "term";]); (N "term", [N "term"; T "and"; N "factor";]); (N "term", [N "factor";]); (N "factor", [T "not"; N "factor"]); (N "factor", [T "("; N "expr"; T ")";]); (N "factor", [T "true";]); (N "factor", [T "false";])])

    (* 13 *)   ([N "expr"; N "lvalue"; N "var";], [T "0"; T "1"; T "="; T "f"; T "x"; T "y"; T "*"; T "("; T ")";], N "expr", [(N "expr", [T "0"]); (N "expr", [T "1"]); (N "expr", [N "lvalue"]); (N "expr", [N "lvalue"; T "="; N "expr";]); (N "expr", [N "lvalue"; T "("; N "expr"; T ")";]); (N "lvalue", [N "var"]); (N "lvalue", [T "*"; N "lvalue";]); (N "var", [T "f"]); (N "var", [T "x"]); (N "var", [T "y"])])

    (* 14 *)   ([N "A"; N "B"; N "C"; N "S"], [T "a"; T "aa"; T "b"; T "bb"; T "c"; T "cc";], N "S", [(N "S", [N "A"; T "aa"; N "S"; N "S"; T "c";]); (N "S", [T "aa"; T "b"; N "S"; N "C";]); (N "A", [T "a"; T "b"; T "cc"; N "S";]); (N "A", []); (N "B", [N "S"; N "B"; T "b";]); (N "B", [N "A"; T "aa"; N "B"; T "bb";]); (N "B", []); (N "C", [T "cc"; T "c"; N "S"; T "cc";]); (N "C", [N "A"; N "S"; T "c"; N "C";])])

    (* 15 *)   ([N "K"; N "T"; N "T'"; N "C"; N "C'"], [T "a"; T "c"; T "t"], N "K", [(N "K", [N "T"; T "t"]); (N "T", [N "T'"; N "C"]); (N "T'", [T "c"]); (N "T'", []); (N "C", [T "a"]); (N "C", [N "C'"]); (N "C'", [])])

    (* 16 *)   ([N "S"; N "S'"; N "P"; N "P'"; N "U"; N "Y"], [T "p"; T "u"; T "i"; T "e"; T "s"; T "pp"], N "S", [(N "S", [N "P"; N "U"; N "S'"]); (N "S", [T "s"]); (N "S'", [N "P"; N "Y"]); (N "S'", []); (N "P", [T "p"]); (N "P", [T "pp"]); (N "U", [T "u"]); (N "U", []); (N "Y", [T "i"; T "e"; N "S"]); (N "Y", [])])

    (* 17 *)   ([N "S"; N "V"; N "V'"; N "C"; N "C'"; N "E"], [T "a"; T "e"; T "i"; T "u"; T "c"; T "o"; T "n"; T "g"; T "r"; T "t"; T "s"; T "!"; T "?"], N "S", [(N "S", [N "C"; N "V"; T "n"; N "C"; N "S"]); (N "S", [N "E"]); (N "C", [T "c"; N "C'"]); (N "C", [T "t"; N "C'"]); (N "C", [T "n"; N "C'"]); (N "C", [T "g"; N "C'"]); (N "C", [N "V"; N "C'"]); (N "C'", [T "r"; N "C'"]); (N "C'", [T "s"]); (N "C'", []); (N "V", [T "a"; N "V'"]); (N "V", [T "o"; N "V'"]); (N "V", [T "i"]); (N "V'", [T "u"; N "V'"]); (N "V'", [T "e"]); (N "V'", []); (N "E", [T "!"]); (N "E", [T "?"]); (N "E", [])])

    (* 18 *)   ([N "S"; N "S'"; N "P"; N "P'"], [T "a"; T "b"; T "c"], N "S", [(N "S", [N "S'"; N "P"; N "P'"]); (N "S'", [N "P'"; T "a"; T "b"]); (N "S'", []); (N "P", [T "b"; N "P'"; T "a"]); (N "P", [T "a"]); (N "P", [T "b"]); (N "P'", [T "a"]); (N "P'", [T "c"]); (N "P'", [])])

    (* 19 *)   ([N "K"; N "T"; N "T'"; N "C"; N "C'"], [T "a"; T "c"; T "t"], N "K", [(N "K", [N "T"; T "t"]); (N "T", [N "T'"; N "C"]); (N "T'", [T "c"]); (N "T'", [T "t"]); (N "T'", []); (N "C", [T "a"]); (N "C", [N "C'"]); (N "C'", [])])

    (* 20 *)   ([N "S"; N "V"; N "V'"; N "C"; N "C'"; N "E"], [T "a"; T "e"; T "i"; T "o"; T "u"; T "c"; T "m"; T "p"; T "r"; T "l"; T "s"; T "!"; T "?"], N "S", [(N "S", [N "C"; N "V"; T "m"; N "C"; N "S"]); (N "S", [N "E"]); (N "C", [N "V"; N "C"; N "C'"]); (N "C", [T "m"; N "C'"; N "V"]); (N "C", [T "c"; N "C'"]); (N "C", [T "l"]); (N "C", [T "p"; N "C'"]); (N "C'", [T "r"; N "C'"]); (N "C'", [T "s"; N "C'"]); (N "C'", []); (N "V", [T "a"; N "V'"]); (N "V", [T "o"; N "V'"]); (N "V", [T "i"]); (N "V'", [T "u"; N "V'"]); (N "V'", [T "e"]); (N "V'", []); (N "E", [T "!"]); (N "E", [T "?"]); (N "E", [])])
  ]

let testcases_sentence : (Parse.symbol * Parse.cfg) list =
  [
    (* 1 *)   ([T "1"; T "3"; T "2"; T ","; T "4"; T "7"; T "6"; T ","; T "5"; T "9"; T "8"; End], ([N "N"; N "N1"; N "N2"; N "N3"; N "B"; N "C"; N "D"], [T "0"; T "1"; T "2"; T "3"; T "4"; T "5"; T "6"; T "7"; T "8"; T "9"; T ","], N "N", [(N "N", []); (N "N", [N "N1"; N "B"]); (N "N1", [N "D"; N "N2";]); (N "N2", []); (N "N2", [N "D"; N "N3";]); (N "N3", []); (N "N3", [N "D"]); (N "B", []); (N "B", [N "C"; N "D"; N "D"; N "D"; N "B"]); (N "C", [T ","]); (N "D", [T "0"]); (N "D", [T "1"]); (N "D", [T "2"]); (N "D", [T "3"]); (N "D", [T "4"]); (N "D", [T "5"]); (N "D", [T "6"]); (N "D", [T "7"]); (N "D", [T "8"]); (N "D", [T "9"])]))
    (* 2 *)   ([T "1"; T "3"; T "2"; T ","; T "4"; T "7"; T "6"; T ","; T "5"; T "9"; End], ([N "N"; N "N1"; N "N2"; N "N3"; N "B"; N "C"; N "D"], [T "0"; T "1"; T "2"; T "3"; T "4"; T "5"; T "6"; T "7"; T "8"; T "9"; T ","], N "N", [(N "N", []); (N "N", [N "N1"; N "B"]); (N "N1", [N "D"; N "N2";]); (N "N2", []); (N "N2", [N "D"; N "N3";]); (N "N3",

[]); (N "N3", [N "D"]); (N "B", []); (N "B", [N "C"; N "D"; N "D"; N "D"; N "B"]); (N "C", [T ","]); (N "D", [T "0"]); (N "D", [T "1"]); (N "D", [T "2"]); (N "D", [T "3"]); (N "D", [T "4"]); (N "D", [T "5"]); (N "D", [T "6"]); (N "D", [T "7"]); (N "D", [T "8"]); (N "D", [T "9"])])]))

    (* 3 *)   ([T "1"; T "3"; T "2"; T ","; T "4"; T "7";T ","; T "5"; T "9"; T "8"; End], ([N "N"; N "N1"; N "N2"; N "N3"; N "B"; N "C"; N "D"], [T "0"; T "1"; T "2"; T "3"; T "4"; T "5"; T "6"; T "7"; T "8"; T "9"; T ","], N "N", [(N "N", []); (N "N", [N "N1"; N "B"]); (N "N1", [N "D"; N "N2";]); (N "N2", []); (N "N2", [N "D"; N "N3";]); (N "N3", []); (N "N3", [N "D"]); (N "B", []); (N "B", [N "C"; N "D"; N "D"; N "D"; N "B"]); (N "C", [T ","]); (N "D", [T "0"]); (N "D", [T "1"]); (N "D", [T "2"]); (N "D", [T "3"]); (N "D", [T "4"]); (N "D", [T "5"]); (N "D", [T "6"]); (N "D", [T "7"]); (N "D", [T "8"]); (N "D", [T "9"])])]))

    (* 4 *)   ([T "("; T "True"; T "||"; T "False"; T ")"; T "&&"; T "True"; End], ([N "E"; N "E'"; N "T"; N "T'"; N "F"], [T "!"; T "||"; T "&&"; T "("; T ")"; T "True"; T "False"], N "E", [(N "E", [N "T"; N "E'"]); (N "E'", []); (N "E'", [T "||"; N "T"; N "E'"]); (N "T", [N "F"; N "T'"]); (N "T'", []); (N "T'", [T "&&"; N "F"; N "T'"]); (N "F", [T "!"; N "F"]); (N "F", [T "("; N "E"; T ")"]); (N "F", [T "True"]); (N "F", [T "False"])])]))

    (* 5 *)   ([T "a"; T "a"; T "b"; T "b"; T "a"; T "c"; T "a"; End], ([N "S"; N "U"; N "V"; N "W"], [T "("; T ")"; T "a"; T "b"; T "c"; T "d"], N "S", [(N "S", [N "U"; N "V"; N "W"]); (N "U", [T "("; N "S"; T ")"]); (N "U", [T "a"; N "S"; T "b"]); (N "U", [T "d"]); (N "V", [T "a"; N "V"]); (N "V", []); (N "W", [T "c"; N "W"]); (N "W", [])])]))

    (* 6 *)   ([T "a"; T "("; T "a"; T "d"; T "b"; T "c"; T "c"; T ")"; T "a"; T "b"; T "a"; T "a"; T "c"; T "c"; T "c"; End], ([N "S"; N "U"; N "V"; N "W"], [T "("; T ")"; T "a"; T "b"; T "c"; T "d"], N "S", [(N "S", [N "U"; N "V"; N "W"]); (N "U", [T "("; N "S"; T ")"]); (N "U", [T "a"; N "S"; T "b"]); (N "U", [T "d"]); (N "V", [T "a"; N "V"]); (N "V", []); (N "W", [T "c"; N "W"]); (N "W", [])])]))

    (* 7 *)   ([T "0"; T "5"; T "2"; T "3"; T "j"; End], ([N "M"; N "MSG"; N "L"; N "L'"; N "L''"; N "INT"; N "INT'"; N "ID"; N "ID'"; N "STR"; N "WS"; N "WS'"; N "DG"; N "LT"; N "DQ"; N "CHAR"; N "CHAR'"; N "WC"],   [T "("; T ")"; T "\""; T " "; T "\\n"; T "0"; T "1"; T "2"; T "3"; T "4"; T "5"; T "6"; T "7"; T "8"; T "9"; T "a"; T "b"; T "c"; T "d"; T "e"; T "f"; T "g"; T "h"; T "i"; T "j"; T "k"; T "l"; T "m"; T "n"; T "o"; T "p"; T "q"; T "r"; T "s"; T "t"; T "u"; T "v"; T "w"; T "x"; T "y"; T "z"],   N "M", [(N "M", [N "WS"; N "MSG"; N "WS"]); (N "MSG", [N "INT"]); (N "MSG", [N "ID"]); (N "MSG", [N "STR"]); (N "MSG", [N "L"]); (N "L", [T "("; N "WS"; N "L'"]); (N "L'", [T ")"]); (N "L'", [N "MSG"; N "L''"]); (N "L''", [T ")"]); (N "L''", [N "WS'"; N "L'"]); (N "INT", [N "DG"; N "INT'"]); (N "INT'", []); (N "INT'", [N "DG"; N "INT'"]); (N "ID", [N "LT"; N "ID'"]); (N "ID'", []); (N "ID'", [N "LT"; N "ID'"]); (N "ID'", [N "DG"; N "ID'"]); (N "STR", [N "DQ"; N "CHAR"; N "DQ"]); (N "WS", []); (N "WS", [N "WS'"]); (N "WS'", [N "WC"; N "WS"]); (N "DG", [T "0"]); (N "DG", [T "1"]); (N "DG", [T "2"]); (N "DG", [T "3"]); (N "DG", [T "4"]); (N "DG", [T "5"]); (N "DG", [T "6"]); (N "DG", [T "7"]); (N "DG", [T "8"]); (N "DG", [T "9"]); (N "LT", [T "a"]); (N "LT", [T "b"]); (N "LT", [T "c"]); (N "LT", [T "d"]); (N "LT", [T "e"]); (N "LT", [T "f"]); (N "LT", [T "g"]); (N "LT", [T "h"]); (N "LT", [T "i"]); (N "LT", [T "j"]); (N "LT", [T "k"]); (N "LT", [T "l"]); (N "LT", [T "m"]); (N "LT", [T "n"]); (N "LT", [T "o"]); (N "LT", [T "p"]); (N "LT", [T "q"]); (N "LT", [T "r"]); (N "LT", [T "s"]); (N "LT", [T "t"]); (N "LT", [T "u"]); (N "LT", [T "v"]); (N "LT", [T "w"]); (N "LT", [T "x"]); (N "LT", [T "y"]); (N "LT", [T "z"]); (N "DQ", [T "\""]); (N "CHAR", []); (N "CHAR", [N "CHAR'"; N "CHAR"]); (N "CHAR'", [N "DG"]); (N "CHAR'", [N "LT"]); (N "CHAR'", [T " "]); (N "WC", [T " "]); (N "WC", [T "\\n"])])]))

    (* 8 *)   ([T "("; T "i"; T "d"; T "9"; T "4"; T "\\n"; T "0"; T "4"; T "0"; T "6"; T " "; T "\""; T "j"; T " "; T "1"; T "3"; T "\""; T ")"; End], ([N "M"; N "MSG"; N "L"; N "L'"; N "L''"; N "INT"; N "INT'"; N "ID"; N "ID'"; N "STR"; N "WS"; N "WS'"; N "DG"; N "LT"; N "DQ"; N "CHAR"; N "CHAR'"; N "WC"],   [T "("; T ")"; T "\""; T " "; T "\\n"; T "0"; T "1"; T "2"; T "3"; T "4"; T "5"; T "6"; T "7"; T "8"; T "9"; T "a"; T "b"; T "c"; T "d"; T "e"; T "f"; T "g"; T "h"; T "i"; T "j"; T "k"; T "l"; T "m"; T "n"; T "o"; T "p"; T "q"; T "r"; T "s"; T "t"; T "u"; T "v"; T "w"; T "x"; T "y"; T "z"], N "M", [(N "M", [N "WS"; N "MSG"; N "WS"]); (N "MSG", [N "INT"]); (N "MSG", [N "ID"]); (N "MSG", [N "STR"]); (N "MSG", [N "L"]); (N "L", [T "("; N "WS"; N "L'"]); (N "L'", [T ")"]); (N "L'", [N "MSG"; N "L''"]); (N "L''", [T ")"]); (N "L''", [N "WS'"; N "L'"]); (N "INT", [N "DG"; N "INT'"]); (N "INT'", []); (N "INT'", [N "DG"; N "INT'"]); (N "ID", [N "LT"; N "ID'"]); (N "ID'", []); (N "ID'", [N "LT"; N "ID'"]); (N "ID'", [N "DG"; N "ID'"]); (N "STR", [N "DQ"; N "CHAR"; N "DQ"]); (N "WS", []); (N "WS", [N "WS'"]); (N "WS'", [N "WC"; N "WS"]); (N "DG", [T "0"]); (N "DG", [T "1"]); (N "DG", [T "2"]); (N "DG", [T "3"]); (N "DG", [T "4"]); (N "DG", [T "5"]); (N "DG", [T "6"]); (N "DG", [T "7"]); (N "DG", [T "8"]); (N "DG", [T "9"]); (N "LT", [T "a"]); (N "LT", [T "b"]); (N "LT", [T "c"]); (N "LT", [T "d"]); (N "LT", [T "e"]); (N "LT", [T "f"]); (N "LT", [T "g"]); (N "LT", [T "h"]); (N "LT", [T "i"]); (N "LT", [T "j"]); (N "LT", [T "k"]); (N "LT", [T "l"]); (N "LT", [T "m"]); (N "LT", [T "n"]); (N "LT", [T "o"]); (N "LT", [T "p"]); (N "LT", [T "q"]); (N "LT", [T "r"]); (N "LT", [T "s"]); (N "LT", [T "t"]); (N "LT", [T "u"]); (N "LT", [T "v"]); (N "LT", [T "w"]); (N "LT", [T "x"]); (N "LT", [T "y"]); (N "LT", [T "z"]); (N "DQ", [T "\""]); (N "CHAR", []); (N "CHAR", [N "CHAR'"; N "CHAR"]); (N "CHAR'", [N "DG"]); (N "CHAR'", [N "LT"]); (N "CHAR'", [T " "]); (N "WC", [T " "]); (N "WC", [T "\\n"])])]))

    (* 9 *)   ([T "1;"; T "0;"; T "if ("; T "0;"; T ") {"; T "if ("; T "1;"; T ") {"; T "}"; T "0;"; T "}"; End], ([N "stmt"; N "exprstmt"; N "ifstmt";], [T "0;"; T "1;"; T "if ("; T ") {"; T "}";], N "stmt", [(N "stmt", []); (N "stmt", [N "exprstmt"; N "stmt"]); (N "stmt", [N "ifstmt"   ; N "stmt"]); (N "exprstmt", [T "0;"]); (N "exprstmt", [T "1;"]);

(N "ifstmt", [T "if ("; N "exprstmt"; T ") {"; N "stmt"; T "}"])]))

(* 10 *)   ([T "if ("; T "1;"; T ") {"; T "if ("; T "1;"; T "}"; T "if ("; T "0;"; T ") {"; T "}"; End], ([N "stmt"; N "exprstmt"; N "ifstmt";], [T "0;"; T "1;"; T "if ("; T ") {"; T "}";], N "stmt", [(N "stmt", []); (N "stmt", [N "exprstmt"; N "stmt"]); (N "stmt", [N "ifstmt"   ; N "stmt"]); (N "exprstmt", [T "0;"]); (N "exprstmt", [T "1;"]); (N "ifstmt", [T "if ("; N "exprstmt"; T ") {"; N "stmt"; T "}"])]))

(* 11 *)   ([T "int"; T "y"; T ","; T "float"; T "["; T "]"; T "x"; T ","; T "float"; T "x"; T ","; End], ([N "type"; N "arglist"; N "var"; N "arrtyp";], [T "int"; T "float"; T "x"; T "y"; T ","; T "["; T "]";], N "arglist", [(N "type", [T "int"; N "arrtyp"]); (N "type", [T "float"; N "arrtyp"]); (N "arrtyp", []); (N "arrtyp", [T "["; T "]"]); (N "arglist", []); (N "arglist", [N "type"; N "var"; T ","; N "arglist"]); (N "var", [T "x";]); (N "var", [T "y";])]))

(* 12 *)   ([T "int"; T "y"; T ","; T "float"; T "["; T "]"; T "x"; T ","; T "float"; T ","; T ","; End], ([N "type"; N "arglist"; N "var"; N "arrtyp";], [T "int"; T "float"; T "x"; T "y"; T ","; T "["; T "]";], N "arglist", [(N "type", [T "int"; N "arrtyp"]); (N "type", [T "float"; N "arrtyp"]); (N "arrtyp", []); (N "arrtyp", [T "["; T "]"]); (N "arglist", []); (N "arglist", [N "type"; N "var"; T ","; N "arglist"]); (N "var", [T "x";]); (N "var", [T "y";])]))

(* 13 *)   ([T "b"; T "a"; End], ([N "S"; N "A"; N "B";], [T "a"; T "b";], N "S", [(N "S", [N "A"; T "a"; N "A"; T "b";]); (N "S", [N "B"; T "b"; N "B"; T "a";]); (N "A", []); (N "B", [])]))

(* 14 *)   ([T "a"; T "a"; End], ([N "S"; N "A"; N "B";], [T "a"; T "b";], N "S", [(N "S", [N "A"; T "a"; N "A"; T "b";]); (N "S", [N "B"; T "b"; N "B"; T "a";]); (N "A", []); (N "B", [])]))

(* 15 *)   ([T "c"; T "a"; T "t"; End], ([N "K"; N "T"; N "T'"; N "C"; N "C'"], [T "a"; T "c"; T "t"], N "K", [(N "K", [N "T"; T "t"]); (N "T", [N "T'"; N "C"]); (N "T'", [T "c"]); (N "T'", []); (N "C", [T "a"]); (N "C", [N "C'"]); (N "C'", [])]))

(* 16 *)   ([T "p"; T "u"; T "p"; T "p"; T "i"; T "e"; T "s"; End], ([N "S"; N "S'"; N "P"; N "P'"; N "U"; N "Y"], [T "p"; T "u"; T "i"; T "e"; T "s"; T "pp"], N "S", [(N "S", [N "P"; N "U"; N "S'"]); (N "S", [T "s"]); (N "S'", [N "P"; N "Y"]); (N "S'", []); (N "P", [T "p"]); (N "P", [T "pp"]); (N "U", [T "u"]); (N "U", []); (N "Y", [T "i"; T "e"; N "S"]); (N "Y", [])]))

(* 17 *)   ([T "p"; T "u"; T "pp"; T "i"; T "e"; T "s"; End], ([N "S"; N "S'"; N "P"; N "P'"; N "U"; N "Y"], [T "p"; T "u"; T "i"; T "e"; T "s"; T "pp"], N "S", [(N "S", [N "P"; N "U"; N "S'"]); (N "S", [T "s"]); (N "S'", [N "P"; N "Y"]); (N "S'", []); (N "P", [T "p"]); (N "P", [T "pp"]); (N "U", [T "u"]); (N "U", []); (N "Y", [T "i"; T "e"; N "S"]); (N "Y", [])]))

(* 18 *)   ([T "c"; T "o"; T "n"; T "g"; T "r"; T "a"; T "t"; T "s"; T "!"; End], ([N "S"; N "V"; N "V'"; N "C"; N "C'"; N "E"], [T "a"; T "e"; T "i"; T "u"; T "c"; T "o"; T "n"; T "g"; T "r"; T "t"; T "s"; T "!"; T "?"], N "S", [(N "S", [N "C"; N "V"; T "n"; N "C"; N "S"]); (N "S", [N "E"]); (N "C", [T "c"; N "C'"]); (N "C", [T "t"; N "C'"]); (N "C", [T "n"; N "C'"]); (N "C", [T "g"; N "C'"]); (N "C", [N "V"; N "C"]); (N "C'", [T "r"; N "C"]); (N "C'", [T "s"]); (N "C'", []); (N "V", [T "a"; N "V'"]); (N "V", [T "o"; N "V'"]); (N "V", [T "i"]); (N "V'", [T "u"; N "V'"]); (N "V'", [T "e"]); (N "V'", []); (N "E", [T "!"]); (N "E", [T "?"]); (N "E", [])]))

(* 19 *)   ([T "c"; T "o"; T "n"; T "c"; T "e"; T "r"; T "n"; T "!"; End], ([N "S"; N "V"; N "V'"; N "C"; N "C'"; N "E"], [T "a"; T "e"; T "i"; T "u"; T "c"; T "o"; T "n"; T "g"; T "r"; T "t"; T "s"; T "!"; T "?"], N "S", [(N "S", [N "C"; N "V"; T "n"; N "C"; N "S"]); (N "S", [N "E"]); (N "C", [T "c"; N "C'"]); (N "C", [T "t"; N "C'"]); (N "C", [T "n"; N "C'"]); (N "C", [T "g"; N "C'"]); (N "C", [N "V"; N "C"]); (N "C'", [T "r"; N "C"]); (N "C'", [T "s"]); (N "C'", []); (N "V", [T "a"; N "V'"]); (N "V", [T "o"; N "V'"]); (N "V", [T "i"]); (N "V'", [T "u"; N "V'"]); (N "V'", [T "e"]); (N "V'", []); (N "E", [T "!"]); (N "E", [T "?"]); (N "E", [])]))

(* 20 *)   ([T "c"; T "o"; T "n"; T "o"; T "e"; T "s"; T "!"; End], ([N "S"; N "V"; N "V'"; N "C"; N "C'"; N "E"], [T "a"; T "e"; T "i"; T "u"; T "c"; T "o"; T "n"; T "g"; T "r"; T "t"; T "s"; T "!"; T "?"], N "S", [(N "S", [N "C"; N "V"; T "n"; N "C"; N "S"]); (N "S", [N "E"]); (N "C", [T "c"; N "C'"]); (N "C", [T "t"; N "C'"]); (N "C", [T "n"; N "C'"]); (N "C", [T "g"; N "C'"]); (N "C", [N "V"; N "C"]); (N "C'", [T "r"; N "C"]); (N "C'", [T "s"]); (N "C'", []); (N "V", [T "a"; N "V'"]); (N "V", [T "o"; N "V'"]); (N "V", [T "i"]); (N "V'", [T "u"; N "V'"]); (N "V'", [T "e"]); (N "V'", []); (N "E", [T "!"]); (N "E", [T "?"]); (N "E", [])]))
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