1) Programs → Functions

First (Programs) = First (Functions) = First (OtherFuns) U
First (MainFun) = {TK_KEY_FUN}
Follow (Programs) = Follow (Functions) = {EOF}

2) Functions → MainFun
3) Functions → OtherFuns MainFun
4) MainFun → TK_KEY_FUN TK_KEY_MAIN TK_KEY_BEGIN FunBody
TK_KEY_END

First(MainFun) = {TK_KEY_FUN}
Follow (MainFun) = Follow (Functions) = {EOF}

5) OtherFuns → Funct OtherFuns
6) OtherFuns → ε
7) Funct → TK_KEY_FUN TK_ID TK_OPEN Parameters TK_CLOSE
TK_KEY_BEGIN FunBody TK_KEY_END

First (OtherFuns) = First (Funct) U {e} = { TK_KEY_FUN, e}
Follow (OtherFuns) = First (MainFun) = {TK_KEY_FUN}
First (Funct) = {TK_KEY_FUN}
Follow (Funct) = {TK_KEY_FUN}

8) Parameters → TK_KEY_IN TK_COLON InList TK_SEMI TK_KEY_OUT
TK_COLON OutID

First (Parameters) = {TK_KEY_IN}
Follow (Parameters) = {TK_CLOSE}

9) InList → TK_KEY_NONE
10) InList → IDList

First (InList) = {TK_KEY_NONE, IK_ID}
Follow (InList) = {TK_SEMI}

11) IDList → TK_ID RemID

First (IDList) = {TK_ID}
Follow (IDList) = Follow (InList) = {TK_SEMI}

12) RemID → TK_COMMA TK_ID RemID
13) RemID → ε

First (RemID) = {TK_COMMA, e}
Follow (RemID) = Follow (IDList) = {TK_SEMI}

14) OutID → TK_KEY_NONE
15) OutID → TK_ID

First (OutID) = {TK_KEY_NONE, TK_ID}
Follow (OutID) = Follow (Parameters) = {TK_CLOSE}

16) FunBody → Declarations OtherStatements

First (FunBody) = First (Declarations) U First (OtherStatements)=
{TK_KEY_VAR, e, TK_KEY_LET, TK_KEY_IF, TK_KEY_WHILE, TK_KEY_RETURN,
TK_KEY_PRINT, TK_KEY_GET, TK_KEY_FUN, TK_SEMI}
Follow (FunBody} = {TK_KEY_END}

17) Declarations → Declaration Declarations
18) Declarations → ε

First (Declarations) = First (Declaration) U {e} = {TK_KEY_VAR, e}
Follow (Declarations) = First (OtherStatements) = {TK_KEY_LET,
TK_KEY_IF, TK_KEY_WHILE, TK_KEY_RETURN, TK_KEY_PRINT, TK_KEY_GET,
TK_KEY_FUN, TK_SEMI}

19) Declaration → TK_KEY_VAR IDList TK_SEMI

First (Declaration) = {TK_KEY_VAR}
Follow (Declaration) = First (Declarations) U Follow (Declarations)
= {TK_KEY_VAR, e, TK_KEY_LET, TK_KEY_IF, TK_KEY_WHILE,
TK_KEY_RETURN, TK_KEY_PRINT, TK_KEY_GET, TK_KEY_FUN, TK_SEMI}

20) OtherStatements → Statement OtherStatements
21) OtherStatements → Statement

First (OtherStatements) = First (Statement) = {TK_KEY_LET,
TK_KEY_IF, TK_KEY_WHILE, TK_KEY_RETURN, TK_KEY_PRINT, TK_KEY_GET,
TK_KEY_FUN, TK_SEMI}
Follow (OtherStatements) = Follow (FunBody) = {TK_KEY_END}

22) Statement → AssignmentStmt
23) Statement → ConditionalStmt
24) Statement →| RepetitiveStmt
25) Statement → ReturnStmt
26) Statement → FunctionCall
27) Statement → IO_Stmt
28) Statement → TK_SEMI

First (Statement) = {TK_KEY_LET, TK_KEY_IF, TK_KEY_WHILE,
TK_KEY_RETURN, TK_KEY_PRINT, TK_KEY_GET, TK_KEY_FUN, TK_SEMI}
Follow (Statement) = First (OtherStatements) U Follow
(OtherStatements) = {TK_KEY_LET, TK_KEY_IF, TK_KEY_WHILE,
TK_KEY_RETURN, TK_KEY_PRINT, TK_KEY_GET, TK_KEY_FUN, TK_SEMI,
TK_KEY_END}

29) AssignmentStmt → TK_KEY_LET TK_ID TK_KEY_BE Expression TK_SEMI
30) AssignmentStmt →TK_KEY_LET TK_ID TK_KEY_BE FunctionCall TK_SEMI

First (AssignmentStmt) = {TK_KEY_LET}
Follow (AssignmentStmt) = {TK_KEY_LET, TK_KEY_IF, TK_KEY_WHILE,
TK_KEY_RETURN, TK_KEY_PRINT, TK_KEY_GET, TK_KEY_FUN, TK_SEMI}

31) Expression → TK_ID
32) Expression → TK_NUM
33) Expression → TK_KEY_PLUS TK_OPEN Expression TK_COMMA Expression
TK_CLOSE

34) Expression → TK_KEY_MINUS TK_OPEN Expression TK_COMMA Expression TK_CLOSE
35) Expression → TK_KEY_MUL TK_OPEN Expression TK_COMMA Expression TK_CLOSE
36) Expression → TK_KEY_DIV TK_OPEN Expression TK_COMMA Expression TK_CLOSE
37) Expression → TK_KEY_MODULO TK_OPEN Expression TK_COMMA TK_NUM TK_CLOSE
38) Expression → TK_OPEN Expression TK_CLOSE

First (Expression) = {TK_ID, TK_NUM, TK_KEY_PLUS, TK_KEY_MINUS, TK_KEY_MUL, TK_KEY_DIV, TK_KEY_MODULO, TK_OPEN}
Follow (Expression) = {TK_CLOSE, TK_COMMA, TK_SEMI}

39) FunctionCall → TK_KEY_FUN TK_ID TK_OPEN IDList TK_CLOSE

First (FunctionCall) = {TK_KEY_FUN}
Follow (FunctionCall) = {TK_KEY_LET, TK_KEY_IF, TK_KEY_WHILE, TK_KEY_RETURN, TK_KEY_PRINT, TK_KEY_GET, TK_KEY_FUN, TK_SEMI, TK_KEY_END}

40) ConditionalStmt → TK_KEY_IF TK_OPEN BoolExp TK_CLOSE TK_KEY_BEGIN OtherStatements TK_KEY_END

First (ConditionalStmt) = {TK_KEY_IF}
Follow (ConditionalStmt) = {TK_KEY_LET, TK_KEY_IF, TK_KEY_WHILE, TK_KEY_RETURN, TK_KEY_PRINT, TK_KEY_GET, TK_KEY_FUN, TK_SEMI, TK_KEY_END}

41) BoolExp → TK_ID TK_EQUI TK_ID
42) BoolExp → TK_ID TK_NOTEQUAL TK_ID
43) BoolExp → TK_ID TK_LT TK_ID
44) BoolExp → TK_ID TK_GT TK_ID
45) BoolExp → TK_ID TK_LEQ TK_ID
46) BoolExp → TK_ID TK_GEQ TK_ID
47) BoolExp → TK_ID
First (BoolExp) = {TK_ID}
Follow (BoolExp) {TK_CLOSE}
48) RepetitiveStmt → TK_KEY_WHILE TK_OPEN BoolExp TK_CLOSE TK_KEY_BEGIN OtherStatements TK_KEY_END

First (RepetitiveStmt) = {TK_KEY_WHILE}
Follow (RepetitiveStmt) = {TK_KEY_LET, TK_KEY_IF, TK_KEY_WHILE, TK_KEY_RETURN, TK_KEY_PRINT, TK_KEY_GET, TK_KEY_FUN, TK_SEMI, TK_KEY_END}

49) ReturnStmt → TK_KEY_RETURN TK_ID TK_SEMI

First (ReturnStmt) = {TK_KEY_RETURN}
Follow (ReturnStmt) = {TK_KEY_LET, TK_KEY_IF, TK_KEY_WHILE, TK_KEY_RETURN, TK_KEY_PRINT, TK_KEY_GET, TK_KEY_FUN, TK_SEMI, TK_KEY_END}

50) IO_Stmt → TK_KEY_PRINT TK_ID TK_SEMI

51) IO_Stmt → TK_KEY_GET TK_ID TK_SEMI

First (IO_Stmt) = {TK_KEY_PRINT, TK_KEY_GET}
Follow (IO_Stmt) = {TK_KEY_LET, TK_KEY_IF, TK_KEY_WHILE, TK_KEY_RETURN, TK_KEY_PRINT, TK_KEY_GET, TK_KEY_FUN, TK_SEMI, TK_KEY_END}

Note: Requested to verify the LL(1) conversion of the natural grammar (from file natural.doc), and compute first and follow sets. You can do it once LL(1) parsing is taught in the class. End note