

```

/*
* =====
*
* Thais Minet
* CS 4223 Checkpoint #3
* 10/3/17
*
* =====
*/

prgm          : routine
              ;

routine       : MAIN END_STMT data algorithm END MAIN END_STMT
              ;

data          : DATA COLON declarationList
              ;

declarationList : declaration END_STMT declarationList
              | declaration END_STMT
              ;

declaration   : dataType COLON variableList
              ;

dataType      : REAL
              | INTEGER
              ;

variableList  : VARIABLE COMMA variableList
              | VARIABLE LBRACKET INT_CONST RBRACKET COMMA variableList
              | VARIABLE
              | VARIABLE LBRACKET INT_CONST RBRACKET
              ;

algorithm     : body
              ;

body          : stmtList
              ;

stmtList     : stmt END_STMT stmtList
              | stmt END_STMT
              ;

stmt         : assignment
              | loop
              | conditional
              | print
              | read
              | exit
              ;

assignment   : variable ASSIGNMENT expression
              ;

```

```

loop          : whileLoop END_STMT body END WHILE
              | countingLoop END_STMT body END COUNTING
              ;

whileLoop     : WHILE expr

countingLoop  : COUNTING variable UPWARD expr TO expr
              | COUNTING variable DOWNWARD expr TO expr
              ;

conditional   : IF expr END_STMT body END IF
              | IF expr END_STMT body ELSE END_STMT body END IF
              ;

print         : PRINT printList
              ;

printList     : printItem COMMA printList
              | printItem
              ;

printItem     : expr
              | CHAR_STRING_CONST
              | CARRIAGE_RETURN
              ;

read          : READ variable
              ;

exit          : EXIT

expr          : expr AND comp
              | expr OR comp
              | NOT expr
              | comp
              ;

comp          : comp LESS arithmetic
              | comp LESS_EQ arithmetic
              | comp GREATER arithmetic
              | comp GREATER_EQ arithmetic
              | comp EQUAL arithmetic
              | comp NOT_EQ arithmetic
              | arithmetic
              ;

arithmetic    : arithmetic ADD term
              | arithmetic SUB term
              | term
              ;

term          : term MUL factor
              | term DIV factor
              | term MOD factor
              | factor
              ;

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```

factor      : LPAREN expr RPAREN
            | SUB factor
            | ADD factor
            | atom
            ;

atom        : variable
            | constant
            ;

variable    : arrayVariable
            | VARIABLE
            ;

arrayVariable : VARIABLE LBRACKET expr RBRACKET
            ;

constant    : INT_CONST
            | REAL_CONST
            ;

```