

[BNF]

START -> PROGRAM

PROGRAM -> program identifier COMPOUND_STMT

COMPOUND_STMT -> begin STMTS end

STMTS -> STMT STMTS | STMT

STMT -> CONDITIONAL_STMT | WHILE_STMT | FOR_STMT | SIMPLE_STMT ;

CONDITIONAL_STMT -> if EXPRESSION COMPOUND_STMT ELSE_IF_STMT | if EXPRESSION

COMPOUND_STMT ELSE_IF_STMT else COMPOUND_STMT

ELSE_IF_STMT -> else_if EXPRESSION COMPOUND_STMT ELSE_IF_STMT | /eps

WHILE_STMT -> while EXPRESSION COMPOUND_STMT

FOR_STMT -> for (DECLARATION_STMT ; EXPRESSION ; EXPRESSION) COMPOUND_STMT

SIMPLE_STMT -> ASSIGNMENT_STMT | PRINT_STMT | DECLARATION_STMT | BREAK_STMT |

DISPLAY_STMT

ASSIGNMENT_STMT -> identifier = EXPRESSION

PRINT_STMT -> print_line (string_literal) | print_line (identifier)

DECLARATION_STMT -> TYPE VARIABLE_DECLARATION VARIABLE_DECLARATIONS

VARIABLE_DECLARATIONS -> , VARIABLE_DECLARATION VARIABLE_DECLARATIONS | /eps

VARIABLE_DECLARATION -> identifier | identifier = EXPRESSION

BREAK_STMT -> break

DISPLAY_STMT -> display (string_literal)

EXPRESSION -> SIMPLE_EXPRESSION | SIMPLE_EXPRESSION RELATIONAL_OPERATOR

SIMPLE_EXPRESSION

SIMPLE_EXPRESSION -> SIMPLE_EXPRESSION ADDING_OPERATOR TERM | TERM

TERM -> TERM MULTIPLYING_OPERATOR FACTOR | FACTOR

FACTOR -> identifier | number_literal | (EXPRESSION) | identifier ++

RELATIONAL_OPERATOR -> < | > | = | ==

ADDING_OPERATOR -> + | -

ADDING_OPERATOR -> * | /

MULTIPLYING_OPERATOR -> * | /

TYPE -> int | integer

[First Set]

First Set

$\text{FIRST}(\text{PROGRAM}) = \{ \text{program} \}$

$\text{FIRST}(\text{COMPOUND_STMT}) = \{ \text{begin} \}$

$\text{FIRST}(\text{STMTS}) = \{ \text{if}, \text{while}, \text{for}, \text{print_line}, \text{display}, \text{break}, \underline{\text{identifier}}, \text{int}, \text{integer} \}$

$\text{FIRST}(\text{STMT}) = \{ \text{if}, \text{while}, \text{for}, \text{print_line}, \text{display}, \text{break}, \underline{\text{identifier}}, \text{int}, \text{integer} \}$

$\text{FIRST}(\text{CONDITIONAL_STMT}) = \{ \text{if} \}$

$\text{FIRST}(\text{ELSE_IF_STMT}) = \{ \text{else-if}, \epsilon \}$

$\text{FIRST}(\text{WHILE_STMT}) = \{ \text{while} \}$

$\text{FIRST}(\text{FOR_STMT}) = \{ \text{for} \}$

$\text{FIRST}(\text{SIMPLE_STMT}) = \{ \underline{\text{identifier}}, \text{print_line}, \text{int}, \text{integer}, \text{display}, \text{break}, \}$

$\text{FIRST}(\text{ASSIGNMENT_STMT}) = \{ \underline{\text{identifier}} \}$

$\text{FIRST}(\text{PRINT_STMT}) = \{ \text{print_line} \}$

$\text{FIRST}(\text{DECLARATION_STMT}) = \{ \text{int}, \text{integer} \}$

$\text{FIRST}(\text{VARIABLE_DECLARATIONS}) = \{ \epsilon, \}$

$\text{FIRST}(\text{VARIABLE_DECLARATION}) = \{ \underline{\text{identifier}} \}$

$\text{FIRST}(\text{DISPLAY_STMT}) = \{ \text{display} \}$

$\text{FIRST}(\text{BREAK_STMT}) = \{ \text{break} \}$

$\text{FIRST}(\text{IDENTIFIER}) = \{ \underline{\text{identifier}} \}$

$\text{FIRST}(\text{EXPRESSION}) = \{ \underline{\text{identifier}}, \underline{\text{number_literal}}, (\}$

$\text{FIRST}(\text{SIMPLE_EXPRESSION}) = \{ \underline{\text{identifier}}, \underline{\text{number_literal}}, (\}$

$\text{FIRST}(\text{SIMPLE_EXPRESSION}') = \{ +, -, \epsilon \}$

$\text{FIRST}(\text{TERM}) = \{ \underline{\text{identifier}}, \underline{\text{number_literal}}, (\}$

$\text{FIRST}(\text{TERM}') = \{ *, /, \epsilon \}$

$\text{FIRST}(\text{FACTOR}) = \{ \underline{\text{identifier}}, \underline{\text{number_literal}}, (\}$

$\text{FIRST}(\text{RELATIONAL_OPERATOR}) = \{ <, >, =, == \}$

$\text{FIRST}(\text{ADDING_OPERATOR}) = \{ +, - \}$

$\text{FIRST}(\text{MULTIPLYING_OPERATOR}) = \{ *, / \}$

$\text{FIRST}(\text{STRING_LITERAL}) = \{ \text{string_literal} \}$

$\text{FIRST}(\text{NUMBER_LITERAL}) = \{ \text{number_literal} \}$

$\text{FIRST}(\text{TYPE}) = \{ \text{int}, \text{integer} \}$

[Follow Set]

Follow Set

$\text{FOLLOW}(\text{PROGRAM}) = \{ \$ \}$

$\text{FOLLOW}(\text{COMPOUND_STMT}) = \{ \$, \text{else_if}, \text{else}, \text{if}, \text{identifier}, \text{print_line}, \text{int}, \text{integer}, \text{display}, \text{break}, \text{while}, \text{for}, \text{end} \}$

$\text{FOLLOW}(\text{STMTS}) = \{ \text{end} \}$

$\text{FOLLOW}(\text{STMT}) = \{ \text{if}, \text{identifier}, \text{print_line}, \text{int}, \text{integer}, \text{end}, \text{while}, \text{for}, \text{display}, \text{break} \}$

$\text{FOLLOW}(\text{CONDITIONAL_STMT}) = \{ \text{if}, \text{identifier}, \text{print_line}, \text{int}, \text{integer}, \text{end}, \text{while}, \text{for}, \text{display}, \text{break} \}$

$\text{FOLLOW}(\text{ELSE_IF_STMT}) = \{ \text{if}, \text{identifier}, \text{print_line}, \text{int}, \text{integer}, \text{end}, \text{while}, \text{for}, \text{display}, \text{break} \}$

$\text{FOLLOW}(\text{WHILE_STMT}) = \{ \text{if}, \text{identifier}, \text{print_line}, \text{int}, \text{integer}, \text{end}, \text{while}, \text{for}, \text{display}, \text{break} \}$

$\text{FOLLOW}(\text{FOR_STMT}) = \{ \text{if}, \text{identifier}, \text{print_line}, \text{int}, \text{integer}, \text{end}, \text{while}, \text{for}, \text{display}, \text{break} \}$

$\text{FOLLOW}(\text{SIMPLE_STMT}) = \{ ; \}$

$\text{FOLLOW}(\text{ASSIGNMENT_STMT}) = \{ ; \}$

$\text{FOLLOW}(\text{PRINT_STMT}) = \{ ; \}$

$\text{FOLLOW}(\text{DECLARATION_STMT}) = \{ ; \}$

$\text{FOLLOW}(\text{VARIABLE_DECLARATIONS}) = \{ ; \}$

$\text{FOLLOW}(\text{VARIABLE_DECLARATION}) = \{ ;, _ \}$

$\text{FOLLOW}(\text{DISPLAY_STMT}) = \{ ; \}$

$\text{FOLLOW}(\text{BREAK_STMT}) = \{ ; \}$

$\text{FOLLOW}(\text{IDENTIFIER}) = \{ ;, _, =, *, /, +, -, \text{begin}, !,), <, >, =, ++, == \}$

$\text{FOLLOW}(\text{EXPRESSION}) = \{ \text{begin}, !,), _ \}$

$\text{FOLLOW}(\text{SIMPLE_EXPRESSION}) = \{ \text{begin}, !,), _, <, >, =, == \}$

$\text{FOLLOW}(\text{SIMPLE_EXPRESSION}') = \{ \text{begin}, !,), _, <, >, =, == \}$

$\text{FOLLOW}(\text{TERM}) = \{ +, -, \text{begin}, !,), _, <, >, =, == \}$

$\text{FOLLOW}(\text{TERM}') = \{ +, -, \text{begin}, !,), _, <, >, =, == \}$

$\text{FOLLOW}(\text{FACTOR}) = \{ *, /, +, -, \text{begin}, !,), _, <, >, =, == \}$

$\text{FOLLOW}(\text{RELATIONAL_OPERATOR}) = \{ \text{identifier}, \text{number_literal}, (\}$

$\text{FOLLOW}(\text{ADDING_OPERATOR}) = \{ \text{identifier}, \text{number_literal}, (\}$

$\text{FOLLOW}(\text{MULTIPLYING_OPERATOR}) = \{ \text{identifier}, \text{number_literal}, (\}$

$\text{FOLLOW}(\text{STRING_LITERAL}) = \{) \}$

$\text{FOLLOW}(\text{NUMBER_LITERAL}) = \{ *, /, +, -, \text{begin}, !,), _, <, >, =, == \}$

$\text{FOLLOW}(\text{TYPE}) = \{ \text{identifier} \}$