Compiler Theory

The 4th Program Assignment – LR(1) Parser

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Theoretical Foundations

An LR parser is a type of bottom-up parser used for analyzing deterministic context-free languages. It's called "LR" because it reads input from Left to right and produces a Rightmost derivation in reverse. There are several types of LR parsers, such as SLR (Simple LR), LALR (Look-Ahead LR), and Canonical LR. Here's a brief overview of the key concepts:

Bottom-Up Parsing: LR parsers work by starting from the input symbols and trying to construct the parse tree from the leaves (input symbols) up to the root (start symbol). This contrasts with top-down parsers like LL parsers, which start from the start symbol and try to rewrite it to match the input string.

Shift-Reduce Parsing: The main mechanism of LR parsers involves two operations:

Shift: Read the next input symbol and push it onto a stack.

Reduce: Replace a string of symbols on the stack (which matches the right-hand side of a production rule) with the left-hand side non-terminal of that rule.

Parse Table: The parsing decisions are driven by a precomputed table, which guides whether to shift, reduce, or accept the input. This table is constructed based on the grammar of the language being parsed.

States and Items: The parser maintains a state, which represents the current position in the parsing process. Each state corresponds to a set of "items," where each item indicates how much of a production rule has been seen. For example, an item might look like this: $A \rightarrow \alpha \bullet \beta$, indicating that the parser has seen α and expects to see β next.

Lookahead: LR parsers use lookahead tokens to decide on parsing actions. The lookahead token is the next input symbol that the parser examines to make decisions. Different types of LR parsers use different amounts of lookahead. For example, SLR parsers use a simple one-symbol lookahead, whereas Canonical LR parsers use a more sophisticated method.

Types of LR Parsers

SLR (Simple LR): Simplest form of LR parsing, using basic follow sets for lookahead decisions.

LALR (Look-Ahead LR): A more powerful and commonly used form that merges states with identical core items but different lookaheads, reducing the size of the parse table.

Canonical LR: The most powerful form, using full lookahead sets for each state, which results in larger parse tables but can handle a broader range of grammars.

Advantages and Disadvantages

Advantages:

Can handle a wide range of context-free grammars, including many that are not suitable for LL parsers.

More powerful than LL parsers, allowing for left-recursive grammars.

Disadvantages:

More complex to implement and understand compared to LL parsers.

The parse tables can be large, especially for Canonical LR parsers.

In summary, LR parsers are a robust and powerful tool for syntax analysis in compilers, capable of handling a broad spectrum of grammars with deterministic parsing.

BNF

PROGRAM -> program IDENTIFIER BLOCK
IDENTIFIER -> identifier
BLOCK -> begin STATEMENT end
STATEMENT -> IF_BLOCK STMT | ASSIGNMENT STMT | PRINT STMT | DISPLAY STMT | FOR_STMT STMT | WHILE_STMT STMT
STMT -> IF_BLOCK STMT | ASSIGNMENT STMT | PRINT STMT | DISPLAY STMT | FOR_STMT STMT | WHILE_STMT STMT | break; | /eps
IF_BLOCK -> IF_STMT | IF_STMT ELSE_IF_STMT | IF_STMT ELSE_STMT | IF_STMT ELSE_IF_STMT ELSE_STMT
IF_STMT -> if (COMPARISON_STMT) BLOCK
ELSE_IF_STMT -> else_if (COMPARISON_STMT) BLOCK NEW_ELSE_IF
NEW_ELSE_IF -> ELSE_IF_STMT | /eps
ELSE_STMT -> else BLOCK
TYPE -> int | integer | /eps
COMPARISON_STMT -> NUMORID COMPARISON_OP NUMORID
ASSIGNMENT -> TYPE ASSIGN ;
ASSIGN -> IDENTIFIER EQUAL ASSIGN’
ASSIGN’ -> , IDENTIFIER EQUAL ASSIGN’ | /eps
EQUAL -> = ASSIGNED ASSIGN’
ASSIGNED -> NUMERIC ASSIGNED’
ASSIGNED’ -> ARITHOP NUMORID ASSIGNED’ | /eps
NUMORID -> NUMBER | IDENTIDIFER
PRINT -> print_line (STRING) ;
STRING -> string | identifier
NUMBER -> number_literal
COMPARISON_OP->>|<|==|!=|<=|>=
ARITHOP -> + | - | / | *
INCREMENTALOP -> ++ | /eps
DISPLAY -> display (string) ;
FOR_STMT -> for (ASSIGNMENT COMPARISON_STMT ; IDENTIFIER INCREMENTALOP) BLOCK
WHILE_STMT -> while (COMPARSION_STMT) BLOCK

First set

First (PROGRAM) = {program}
First (IDENTIFIER)= {identifier}
First (BLOCK)={begin}
First (TYPE)={integer, int, /eps}
First (STATEMENT)= {if, identifier, $, printline, display, for, while, int, integer}
First (STMT)= {if, alphabet, $, printline, display, for, while, int, integer, /eps}
First (IF_BLOCK)={if}
First (IF_STMT)={if}
First (ELSE_IF)= {else_if}
First (NEW_ELSE_IF_ STMT)={else_if, /eps}
First (ELSE_STMT)={else}
First (COMPARISON_STMT)= {identifier)
First (ASSIGNMENT)= {alphabet, int, integer}
First (ASSIGN)= {alphabet, int, integer}
First (ASSIGN') = {,}
First (ASSIGNED)={identifier, number)
First (ASSIGNED')= {+, -, *, /, /eps}
First (PRINT)={print_line}
First (NUMBER)= {number_literal}
First (STRING)= {string, identifier}

First (COMPARISONOP)={<, <=,!=,<, >=}
First (ARITHOP)= {+, -, *, /}
First (INCREMENTALOP)={ ++, /eps}
First (DISPLAY)= {display}
First (FOR_STMT)={for}
First (WHILE_STMT) = {while}
First (Equal) = {=}
First (NUMORID) = {number_literal | identifier}
Follow Set
Follow (PROGRAM) = {identifier}
Follow (DIGIT) = {digits, ., _begin, identifier, ;, , , >, <, >=, <=, ==, !=, +, -, *, /, ++}
Follow (IDENTIFIER)= {begin, identifier ;, , , >, <, >=, <=, ==, !=, +, -, *, /}
Follow (BLOCK)={identifier, end, display, for, while, break, if int, integer, print_line}
Follow (TYPE)={identifier}
Follow (STATEMENT)= {end}
Follow (STMT)= {end}
Follow (IF_BLOCK)={identifier, end, display, for, while, break, if, int, integer, print_line}
Follow (IF_STMT)={identifier, end, display, for, while, break, if, int, integer, print_line, else_if, else}
Follow (ELSE_IF)= {identifier, end, display, for, while, break, if, int, integer, print_line, else}
Follow (NEW_ELSE_IF_ STMT)={identifier, end, display, for, while, break, if int, integer, print_line, else}
Follow (ELSE_STMT)={identifier, end, display, for, while, break, if, int, integer, print_line}
Follow (COMPARISON_STMT)= {), ;}
Follow (ASSIGNMENT)= {identifier, end, display, for, while, break, if, int, integer, print_line, ;}
Follow (ASSIGN)= {;}
Follow (ASSIGN') = {alphabet, $}
Follow (ASSIGNED)={;, ,)
Follow (ASSIGNED')= {;, ,}
Follow (PRINT)={identifier, end, display, for, while, break, if, int, integer, print_line}
Follow (NUMBER)= {identifier, >, <, >=, <=, ==, !=, +, -, *, /, ++,)}
Follow (STRING)= {)}
Follow (COMPARISONOP)={ digit, identifier}
Follow (ARITHOP)= {digit, identifier}
Follow (INCREMENTALOP)={)}
Follow (DISPLAY)= {identifier, end, display, for, while, break, if, int, integer, print_line}
Follow (FOR_STMT)={identifier, end, display, for, while, break, if, int, integer, print_line}
Follow (WHILE_STMT) = {identifier, end, display, for, while, break, if, int, integer, print_line}
Follow (Equal) ={identifier, ;}
Follow (NUMORID) = {identifier, >, <, >=, <=, ==, !=, +, -, *, /, ++,)}

Parsing Table

CSV file attached

Outputs

```
PS D:\Handong\4-1\Compiler Theory\HW4> javac -d bin *.java
PS D:\Handong\4-1\Compiler Theory\HW4> java -cp bin LRparser .\testCaseLRparser\test1.txt
[0, program, 2]
[0, program, 2, Test1, 4]
[0, program, 2, IDENTIFIER, 3]
[0, program, 2, IDENTIFIER, 3, begin, 6]
[0, program, 2, IDENTIFIER, 3, begin, 6, int, 21]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, Time.10.24, 43]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, 2206, 83]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMBER, 81]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMORID, 80]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMORID, 80, ASSIGNED', 104]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, Hour.In.Day, 43]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, 0, 83]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMBER, 81]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMORID, 80]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMORID, 80, ASSIGNED', 104]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, $Minute.In.Hour, 43]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138, ASSIGN', 143]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ASSIGN', 102]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138, ASSIGN', 143]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ASSIGN', 102]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, EQUAL, 61]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, EQUAL, 61, ASSIGN', 77]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, ASSIGN, 41]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, ASSIGN, 41, ;, 60]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, Time.10.24, 73]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, IDENTIFIER, 71]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, NUMORID, 69]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, NUMORID, 69, <, 93]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, NUMORID, 69, COMPARISON_OP, 91]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, NUMORID, 69, COMPARISON_OP, 91, 10, 119]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, NUMORID, 69, COMPARISON_OP, 91, NUMBER, 117]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, IF_STMT, 14, ELSE_IF_STMT, 37, else, 40, begin, 59, print_line, 16]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, IF_STMT, 14, ELSE_IF_STMT, 37, else, 40, begin, 59, print_line, 16, (, 44]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, IF_STMT, 14, ELSE_IF_STMT, 37, else, 40, begin, 59, print_line, 16, (, 44, "Good evening.", 64]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, IF_STMT, 14, ELSE_IF_STMT, 37, else, 40, begin, 59, print_line, 16, (, 44, STRING, 63]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, IF_STMT, 14, ELSE_IF_STMT, 37, else, 40, begin, 59, print_line, 16, (, 44, STRING, 63, ), 85]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, IF_STMT, 14, ELSE_IF_STMT, 37, else, 40, begin, 59, print_line, 16, (, 44, STRING, 63, ), 85, ;, 110]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, IF_STMT, 14, ELSE_IF_STMT, 37, else, 40, begin, 59, PRINT, 10]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, IF_STMT, 14, ELSE_IF_STMT, 37, else, 40, begin, 59, PRINT, 10, STMT, 33]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, IF_STMT, 14, ELSE_IF_STMT, 37, else, 40, begin, 59, STATEMENT, 76]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, IF_STMT, 14, ELSE_IF_STMT, 37, else, 40, begin, 59, STATEMENT, 76, end, 100]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, IF_STMT, 14, ELSE_IF_STMT, 37, else, 40, BLOCK, 58]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, IF_STMT, 14, ELSE_IF_STMT, 37, ELSE_STMT, 56]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, IF_BLOCK, 25]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, IF_BLOCK, 25, STMT, 49]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, STMT, 32]
[0, program, 2, IDENTIFIER, 3, begin, 6, STATEMENT, 7]
[0, program, 2, IDENTIFIER, 3, begin, 6, STATEMENT, 7, end, 23]
[0, program, 2, IDENTIFIER, 3, BLOCK, 5]
[0, PROGRAM, 1]
Accept
```

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PS D:\Handong\4-1\Compiler Theory\HW4> java -cp bin LRparser .\testCaseLRparser\test1error.txt
[0, program, 2]
[0, program, 2, Test1, 4]
[0, program, 2, IDENTIFIER, 3]
[0, program, 2, IDENTIFIER, 3, begin, 6]
[0, program, 2, IDENTIFIER, 3, begin, 6, int, 21]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, Time.10.24, 43]
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[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, 2206, 83]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMBER, 81]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMORID, 80]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMORID, 80, ASSIGNED', 104]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, Hour.In.Day, 43]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, 0, 83]
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[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, $Minute.In.Hour, 43]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138, ASSIGN', 143]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ASSIGN', 102]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138, ASSIGN', 143]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ASSIGN', 102]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, EQUAL, 61]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, EQUAL, 61, ASSIGN', 77]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, ASSIGN, 41]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, ASSIGN, 41, ;, 60]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, Time.10.24, 73]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, IDENTIFIER, 71]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, NUMORID, 69]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, NUMORID, 69, <, 93]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, NUMORID, 69, COMPARISON_OP, 91]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, NUMORID, 69, COMPARISON_OP, 91, 10, 119]
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[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, print_line, 16, (, 44, "Good morning.", 64]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, print_line, 16, (, 44, STRING, 63]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, print_line, 16, (, 44, STRING, 63, ), 85]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, print_line, 16, (, 44, STRING, 63, ), 85, ;, 110]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, PRINT, 10]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, PRINT, 10, TYPE, 15]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, PRINT, 10, TYPE, 15, Hour.In.Day, 43]
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[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, PRINT, 10, TYPE, 15, IDENTIFIER, 42, =, 62]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, PRINT, 10, TYPE, 15, IDENTIFIER, 42, =, 62, 24, 83]
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[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, PRINT, 10, TYPE, 15, IDENTIFIER, 42, =, 62, NUMORID, 80]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, PRINT, 10, TYPE, 15, IDENTIFIER, 42, =, 62, NUMORID, 80, AS
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, PRINT, 10, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, PRINT, 10, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, A
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, PRINT, 10, TYPE, 15, IDENTIFIER, 42, EQUAL, 61]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, PRINT, 10, TYPE, 15, IDENTIFIER, 42, EQUAL, 61, ASSIGN', 77
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, PRINT, 10, TYPE, 15, ASSIGN, 41]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, PRINT, 10, TYPE, 15, ASSIGN, 41, ;, 60]
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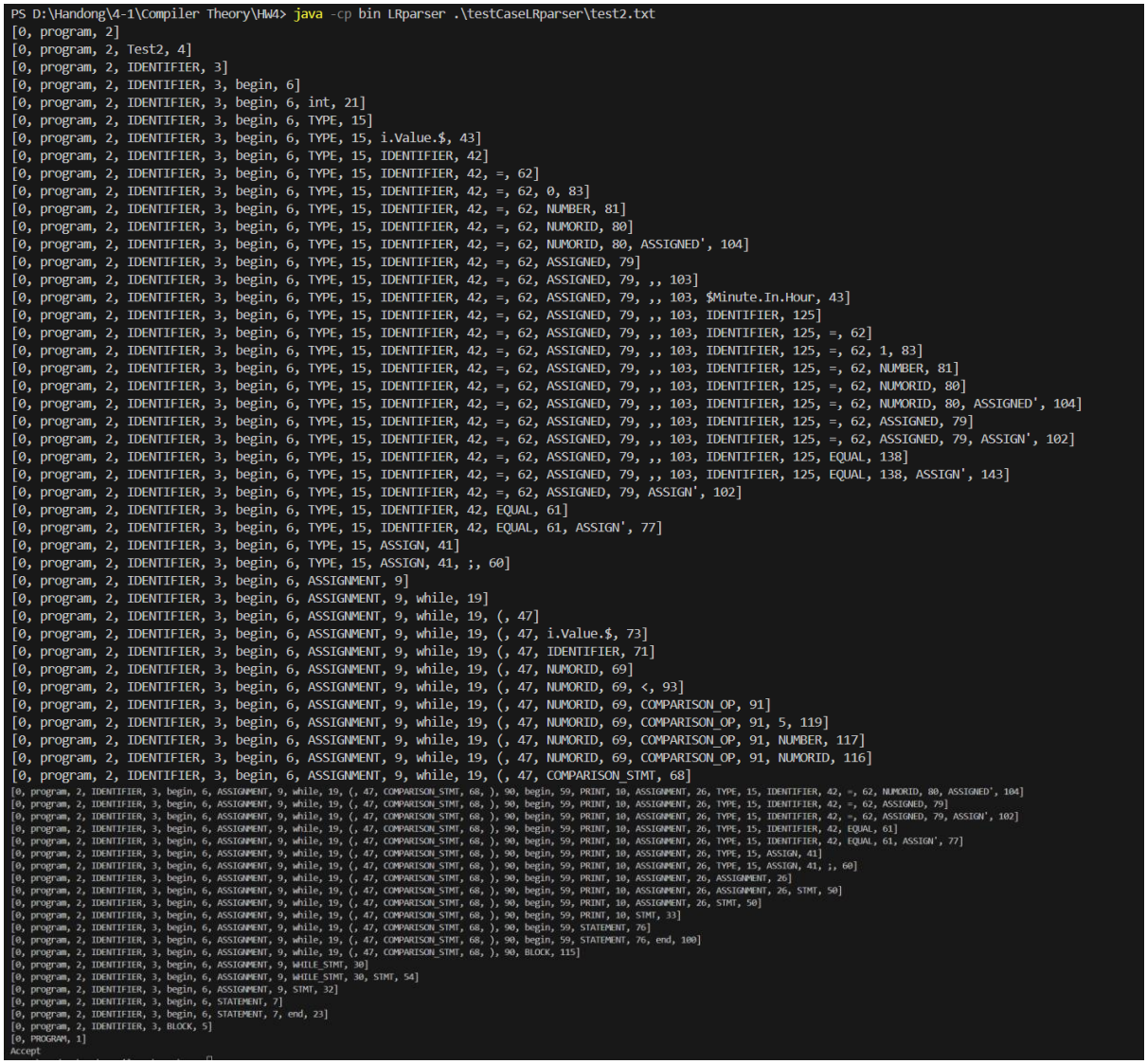
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, PRINT, 10, STMT, 33]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, STATEMENT, 134]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, STATEMENT, 134, end, 142]
Undefiend
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, if, 20, (, 48, COMPARISON_STMT, 74, ), 98, begin, 122, STATEMENT, 134, end, 142, null, -1]
Parsing error
PS D:\Handong\4-1\Compiler Theory\HW4>
```


PS D:\Handong\4-1\Compiler Theory\HW4> java -cp bin LRparser .\testCaseLRparser\test2.txt
[0, program, 2]
[0, program, 2, Test2, 4]
[0, program, 2, IDENTIFIER, 3]
[0, program, 2, IDENTIFIER, 3, begin, 6]
[0, program, 2, IDENTIFIER, 3, begin, 6, int, 21]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, i.Value.$, 43]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, 0, 83]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMBER, 81]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMORID, 80]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMORID, 80, ASSIGNED', 104]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, $Minute.In.Hour, 43]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, 1, 83]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMBER, 81]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMORID, 80]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMORID, 80, ASSIGNED', 104]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ASSIGN', 102]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138, ASSIGN', 143]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ASSIGN', 102]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, EQUAL, 61]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, EQUAL, 61, ASSIGN', 77]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, ASSIGN, 41]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, ASSIGN, 41, ;, 60]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, i.Value.$, 73]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, IDENTIFIER, 71]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, NUMORID, 69]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, NUMORID, 69, <, 93]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, NUMORID, 69, COMPARISON_OP, 91]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, NUMORID, 69, COMPARISON_OP, 91, 5, 119]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, NUMORID, 69, COMPARISON_OP, 91, NUMBER, 117]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, NUMORID, 69, COMPARISON_OP, 91, NUMORID, 116]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, COMPARISON_STMT, 68]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, PRINT, 10, ASSIGNMENT, 26, TYPE, 15, IDENTIFIER, 42, =, 62, NUMORID, 80, ASSIGNED', 104]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, PRINT, 10, ASSIGNMENT, 26, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, PRINT, 10, ASSIGNMENT, 26, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ASSIGN', 102]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, PRINT, 10, ASSIGNMENT, 26, TYPE, 15, IDENTIFIER, 42, EQUAL, 61]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, PRINT, 10, ASSIGNMENT, 26, TYPE, 15, IDENTIFIER, 42, EQUAL, 61, ASSIGN', 77]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, PRINT, 10, ASSIGNMENT, 26, TYPE, 15, ASSIGN, 41]
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[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, PRINT, 10, ASSIGNMENT, 26, ASSIGNMENT, 26]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, PRINT, 10, ASSIGNMENT, 26, ASSIGNMENT, 26, STMT, 50]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, PRINT, 10, ASSIGNMENT, 26, STMT, 50]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, PRINT, 10, STMT, 33]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, STATEMENT, 76]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, STATEMENT, 76, end, 100]
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[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, STMT, 32]
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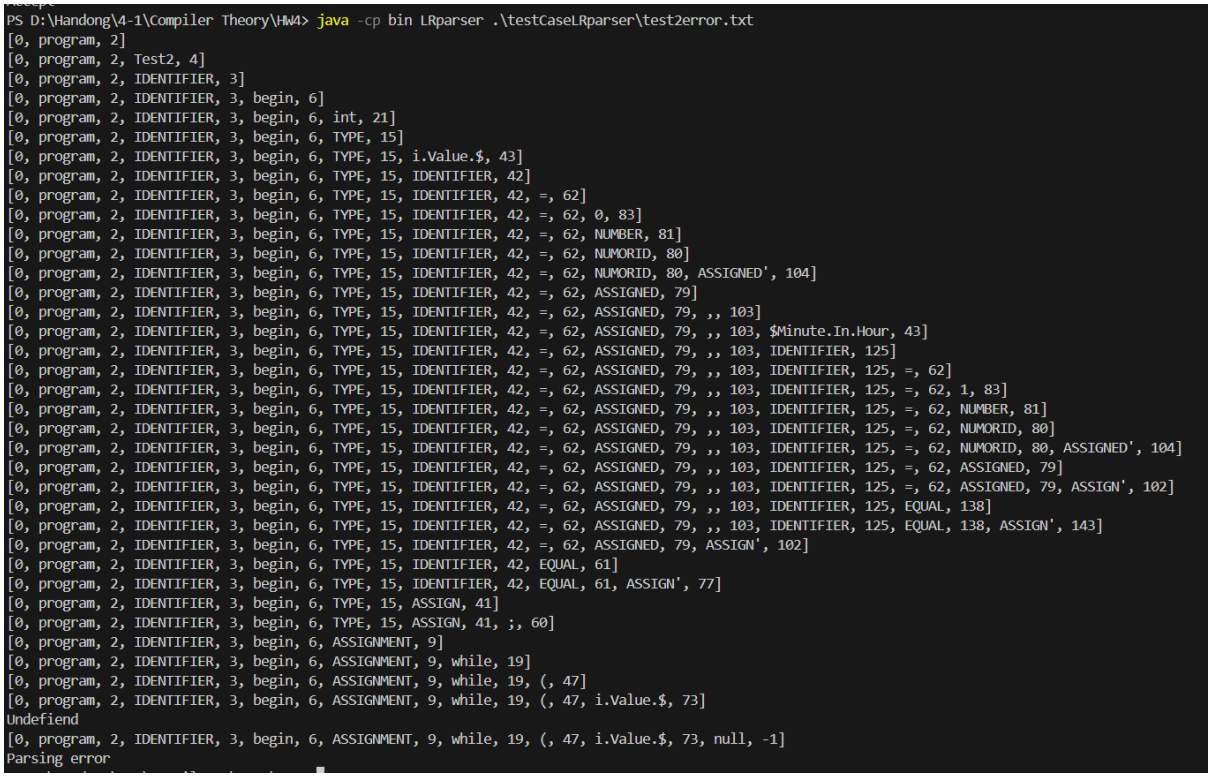
[0, PROGRAM, 1]
Accept


PS D:\Handong\4-1\Compiler Theory\HW4> java -cp bin LRparser .\testCaseLRparser\test2error.txt
[0, program, 2]
[0, program, 2, Test2, 4]
[0, program, 2, IDENTIFIER, 3]
[0, program, 2, IDENTIFIER, 3, begin, 6]
[0, program, 2, IDENTIFIER, 3, begin, 6, int, 21]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, i.Value.$, 43]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, 0, 83]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMBER, 81]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMORID, 80]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMORID, 80, ASSIGNED', 104]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, $Minute.In.Hour, 43]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, 1, 83]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMBER, 81]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMORID, 80]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMORID, 80, ASSIGNED', 104]
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[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ASSIGN', 102]
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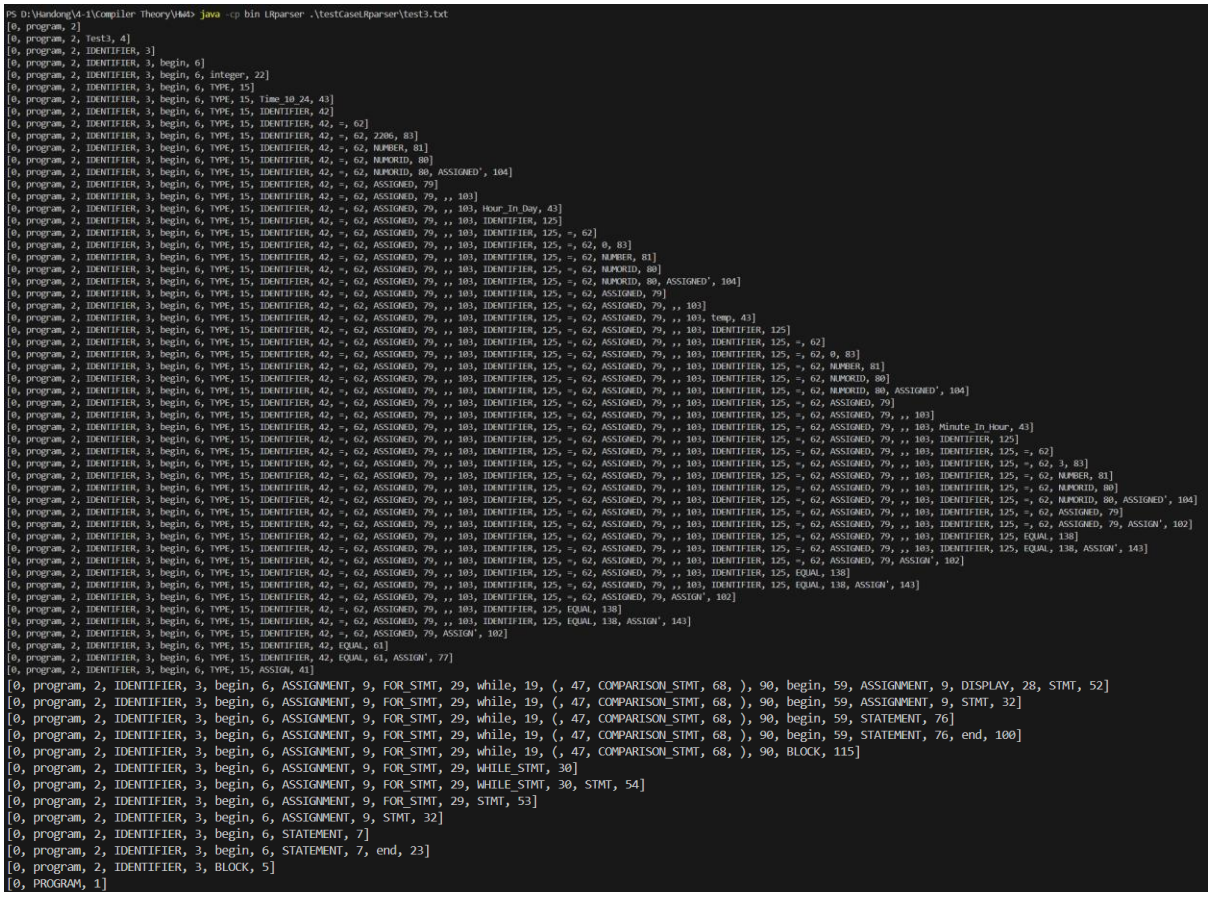
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, ASSIGN, 41]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, ASSIGN, 41, ;, 60]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, i.Value.$, 73]
Undefiend
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, while, 19, (, 47, i.Value.$, 73, null, -1]
Parsing error


PS D:\Handong\4-1\Compiler Theory\HW4> java -cp bin LRparser .\testCaseLRparser\test3.txt
[0, program, 2]
[0, program, 2, Test3, 4]
[0, program, 2, IDENTIFIER, 3]
[0, program, 2, IDENTIFIER, 3, begin, 6]
[0, program, 2, IDENTIFIER, 3, begin, 6, integer, 22]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, Time_10_24, 43]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, 2206, 83]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMBER, 81]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMORID, 80]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMORID, 80, ASSIGNED', 104]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, Hour_In_Day, 43]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, 0, 83]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMBER, 81]
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[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMORID, 80, ASSIGNED', 104]
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[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103]
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[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, Minute_In_Hour, 43]
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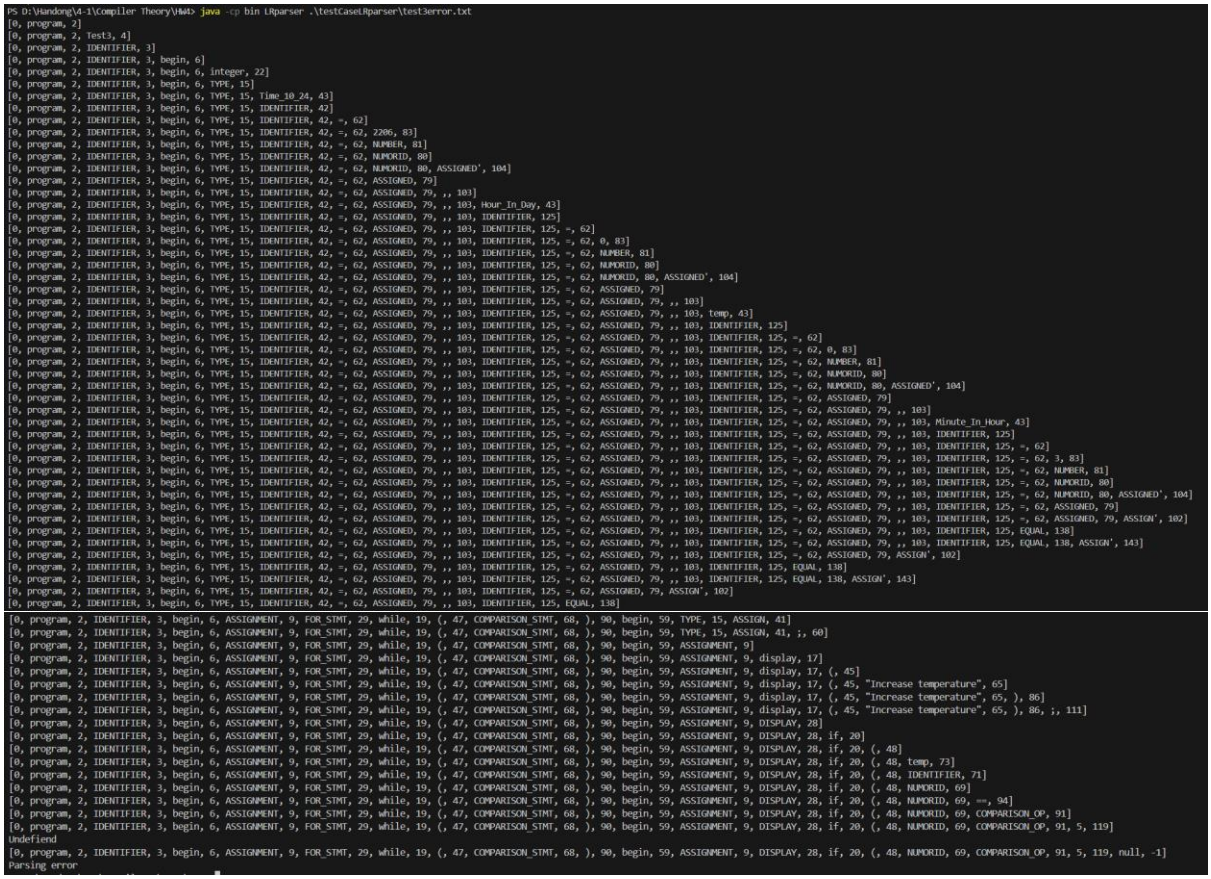
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, 3, 83]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMBER, 81]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMORID, 80]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMORID, 80, ASSIGNED', 104]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ASSIGN', 102]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138, ASSIGN', 143]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ASSIGN', 102]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138, ASSIGN', 143]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ASSIGN', 102]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, EQUAL, 61]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, EQUAL, 61, ASSIGN', 77]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, ASSIGN, 41]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, ASSIGNMENT, 9, DISPLAY, 28, STMT, 52]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, ASSIGNMENT, 9, STMT, 32]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, STATEMENT, 76]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, STATEMENT, 76, end, 100]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, while, 19, (, 47, COMPARISON_STMT, 68,), 90, BLOCK, 115]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, WHILE_STMT, 30]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, WHILE_STMT, 30, STMT, 54]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, STMT, 53]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, STMT, 32]
[0, program, 2, IDENTIFIER, 3, begin, 6, STATEMENT, 7]
[0, program, 2, IDENTIFIER, 3, begin, 6, STATEMENT, 7, end, 23]
[0, program, 2, IDENTIFIER, 3, BLOCK, 5]
[0, PROGRAM, 1]


PS D:\Handong\4-1\Compiler Theory\Hw4> java -cp bin LRparser .\testCaseLRparser\test3error.txt
[0, program, 2]
[0, program, 2, Test3, 4]
[0, program, 2, IDENTIFIER, 3]
[0, program, 2, IDENTIFIER, 3, begin, 6]
[0, program, 2, IDENTIFIER, 3, begin, 6, integer, 22]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, Time_10_24, 43]
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[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62]
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[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMBER, 81]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMORID, 80]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, NUMORID, 80, ASSIGNED', 104]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, Hour_In_Day, 43]
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[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79]
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[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, temp, 43]
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[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMBER, 81]
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[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, Minute_In_Hour, 43]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125]
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[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, 3, 83]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMBER, 81]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMORID, 80]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, NUMORID, 80, ASSIGNED', 104]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ASSIGN', 102]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138]
[0, program, 2, IDENTIFIER, 3, begin, 6, TYPE, 15, IDENTIFIER, 42, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, =, 62, ASSIGNED, 79, ,, 103, IDENTIFIER, 125, EQUAL, 138, ASSIGN', 143]
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[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, TYPE, 15, ASSIGN, 41]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, TYPE, 15, ASSIGN, 41, ;, 60]
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[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, ASSIGNMENT, 9, display, 17, (, 45, "Increase temperature", 65]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, ASSIGNMENT, 9, display, 17, (, 45, "Increase temperature", 65,), 86]
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, ASSIGNMENT, 9, display, 17, (, 45, "Increase temperature", 65,), 86, ;, 111]
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[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, ASSIGNMENT, 9, DISPLAY, 28, if, 20, (, 48, temp, 73]
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[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, ASSIGNMENT, 9, DISPLAY, 28, if, 20, (, 48, NUMORID, 69, COMPARISON_OP, 91, 5, 119]
Undefiend
[0, program, 2, IDENTIFIER, 3, begin, 6, ASSIGNMENT, 9, FOR_STMT, 29, while, 19, (, 47, COMPARISON_STMT, 68,), 90, begin, 59, ASSIGNMENT, 9, DISPLAY, 28, if, 20, (, 48, NUMORID, 69, COMPARISON_OP, 91, 5, 119, null, -1]
Parsing error