Descartes 2 Interpreter – Write Up  
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Introduction

The following document outlines our Descartes 2 Interpreter functionality, as well as test data that was used to show off said functionality. For a more complete test of our program, visit the github page here: <https://github.com/andter/Descarte_Interpreter>

Functionality

1. Assignment Statements and expressions fully working, including all basic arithmetic operators outlined, as well as working order of operations, and assigning doubles to variables.
2. IF-THEN-ELSE statements functioning, including advanced expressions in Boolean statements as well as nested If statements. All Boolean expressions work as well as an additional “!=” Boolean operator.
3. Loop break statements ALMOST completely working. All loops work however they are unable to be nested. This bug has to do with how we execute and instantiate loops, and will hopefully be fixed in future releases.
4. READ and PRINT statements completely working in all contexts, including printing and reading comma separated values.

# Assignment Statements and Expressions

## Program e.g. 1:

VAR := 5 + 8 \* 4;   
PRINT VAR .

Result:

StmtLIST: VAR := 5 + 8 \* 4 ; PRINT VAR

STMT: VAR := 5 + 8 \* 4

ASSIGNSTMT: VAR := 5 + 8 \* 4

EXPR: 5 + 8 \* 4

BOOLTERM: 5 + 8 \* 4

BoolFactor: 5 + 8 \* 4

ARITHEXPR: 5 + 8 \* 4

TERM: 5

FACTOR: 5

ATOM: 5

TERMTAIL: + 8 \* 4

TERM: 8 \* 4

FACTOR: 8

ATOM: 8

FACTORTAIL: \* 4

FACTOR: 4

ATOM: 4

stmtTail: PRINT VAR

STMT: PRINT VAR

PRINTSTMT: PRINT VAR

Program Validated!

Program Output:

37.0

Variables:

Var:37.0

Program e.g. 2:First := 5 + 8 \* 4;  
Second := 12;  
Final := First \* Second + 3;  
PRINT First, Second, Final .

## Result:

StmtLIST: First := 5 + 8 \* 4 ; Second := 12 ; Final := First \* Second + 3 ; PRINT First , Second , Final

STMT: First := 5 + 8 \* 4

ASSIGNSTMT: First := 5 + 8 \* 4

EXPR: 5 + 8 \* 4

BOOLTERM: 5 + 8 \* 4

BoolFactor: 5 + 8 \* 4

ARITHEXPR: 5 + 8 \* 4

TERM: 5

FACTOR: 5

ATOM: 5

TERMTAIL: + 8 \* 4

TERM: 8 \* 4

FACTOR: 8

ATOM: 8

FACTORTAIL: \* 4

FACTOR: 4

ATOM: 4

stmtTail: Second := 12 ; Final := First \* Second + 3 ; PRINT First , Second , Final

STMT: Second := 12

ASSIGNSTMT: Second := 12

EXPR: 12

BOOLTERM: 12

BoolFactor: 12

ARITHEXPR: 12

TERM: 12

FACTOR: 12

ATOM: 12

stmtTail: Final := First \* Second + 3 ; PRINT First , Second , Final

STMT: Final := First \* Second + 3

ASSIGNSTMT: Final := First \* Second + 3

EXPR: First \* Second + 3

BOOLTERM: First \* Second + 3

BoolFactor: First \* Second + 3

ARITHEXPR: First \* Second + 3

TERM: First \* Second

FACTOR: First

ATOM: First

FACTORTAIL: \* Second

FACTOR: Second

ATOM: Second

TERMTAIL: + 3

TERM: 3

FACTOR: 3

ATOM: 3

stmtTail: PRINT First , Second , Final

STMT: PRINT First , Second , Final

PRINTSTMT: PRINT First , Second , Final

IDLISTTAIL: , Second , Final

IDLISTTAIL: , Final

Program Validated!

Program Output:

37.0 12.0 447.0

Variables:

first: 37.0

second: 12.0

final: 447.0

## Program e.g. 3:

First := 5.3 + 8.5 - 4.3;  
Second := 15.5;  
Final := First \* Second + 3.9;  
PRINT First, Second, Final .

## Result:

PROG: First := 5.3 + 8.5 - 4.3 ; Second := 15.5 ; Final := First \* Second + 3.9 ; PRINT First , Second , Final .

StmtLIST: First := 5.3 + 8.5 - 4.3 ; Second := 15.5 ; Final := First \* Second + 3.9 ; PRINT First , Second , Final

STMT: First := 5.3 + 8.5 - 4.3

ASSIGNSTMT: First := 5.3 + 8.5 - 4.3

EXPR: 5.3 + 8.5 - 4.3

BOOLTERM: 5.3 + 8.5 - 4.3

BoolFactor: 5.3 + 8.5 - 4.3

ARITHEXPR: 5.3 + 8.5 - 4.3

TERM: 5.3

FACTOR: 5.3

ATOM: 5.3

TERMTAIL: + 8.5 - 4.3

TERM: 8.5

FACTOR: 8.5

ATOM: 8.5

TERMTAIL: - 4.3

TERM: 4.3

FACTOR: 4.3

ATOM: 4.3

stmtTail: Second := 15.5 ; Final := First \* Second + 3.9 ; PRINT First , Second , Final

STMT: Second := 15.5

ASSIGNSTMT: Second := 15.5

EXPR: 15.5

BOOLTERM: 15.5

BoolFactor: 15.5

ARITHEXPR: 15.5

TERM: 15.5

FACTOR: 15.5

ATOM: 15.5

stmtTail: Final := First \* Second + 3.9 ; PRINT First , Second , Final

STMT: Final := First \* Second + 3.9

ASSIGNSTMT: Final := First \* Second + 3.9

EXPR: First \* Second + 3.9

BOOLTERM: First \* Second + 3.9

BoolFactor: First \* Second + 3.9

ARITHEXPR: First \* Second + 3.9

TERM: First \* Second

FACTOR: First

ATOM: First

FACTORTAIL: \* Second

FACTOR: Second

ATOM: Second

TERMTAIL: + 3.9

TERM: 3.9

FACTOR: 3.9

ATOM: 3.9

stmtTail: PRINT First , Second , Final

STMT: PRINT First , Second , Final

PRINTSTMT: PRINT First , Second , Final

IDLISTTAIL: , Second , Final

IDLISTTAIL: , Final

Program Validated!

Program Output:

9.5 15.5 151.15

Variables:

first: 9.5

second: 15.5

final: 151.15

# IF-THEN-ELSE Statements and Boolean Expressions

## Program e.g. 4:

First := 5;

Second := 10;

IF First = Second THEN

Final:= 20;

ELSE Final := 30;

FI

PRINT Final .

## Result:

StmtLIST: First := 5 ; Second := 10 ; IF First = Second THEN Final := 20 ; ELSE Final := 30 ; FI PRINT Final

STMT: First := 5

ASSIGNSTMT: First := 5

EXPR: 5

BOOLTERM: 5

BoolFactor: 5

ARITHEXPR: 5

TERM: 5

FACTOR: 5

ATOM: 5

stmtTail: Second := 10 ; IF First = Second THEN Final := 20 ; ELSE Final := 30 ; FI PRINT Final

STMT: Second := 10

ASSIGNSTMT: Second := 10

EXPR: 10

BOOLTERM: 10

BoolFactor: 10

ARITHEXPR: 10

TERM: 10

FACTOR: 10

ATOM: 10

stmtTail: IF First = Second THEN Final := 20 ; ELSE Final := 30 ; FI PRINT Final

STMT: IF First = Second THEN Final := 20 ; ELSE Final := 30 ; FI

IFSTMT: IF First = Second THEN Final := 20 ; ELSE Final := 30 ; FI

COUNT == 1

EXPR: First = Second

BOOLTERM: First = Second

BoolFactor: First = Second

ARITHEXPR: First

TERM: First

FACTOR: First

ATOM: First

RELATIONOPTION: = Second

ARITHEXPR: Second

TERM: Second

FACTOR: Second

ATOM: Second

StmtLIST: Final := 20 ;

STMT: Final := 20

ASSIGNSTMT: Final := 20

EXPR: 20

BOOLTERM: 20

BoolFactor: 20

ARITHEXPR: 20

TERM: 20

FACTOR: 20

ATOM: 20

ELSEPART: ELSE Final := 30 ;

StmtLIST: Final := 30

STMT: Final := 30

ASSIGNSTMT: Final := 30

EXPR: 30

BOOLTERM: 30

BoolFactor: 30

ARITHEXPR: 30

TERM: 30

FACTOR: 30

ATOM: 30

stmtTail: PRINT Final

STMT: PRINT Final

Program Validated!

Program Output:

30.0

Variables:

first: 5.0

second: 10.0

final: 30.0

## Program e.g. 5:

First := 5;

Second := 10;

IF First \* Second - 25 = 25 THEN

Final:= 20;

ELSE Final := 30;

FI

PRINT Final .

## Result:

StmtLIST: First := 5 ; Second := 10 ; IF First \* Second - 25 = 25 THEN Final := 20 ; ELSE Final := 30 ; FI PRINT Final

STMT: First := 5

ASSIGNSTMT: First := 5

EXPR: 5

BOOLTERM: 5

BoolFactor: 5

ARITHEXPR: 5

TERM: 5

FACTOR: 5

ATOM: 5

stmtTail: Second := 10 ; IF First \* Second - 25 = 25 THEN Final := 20 ; ELSE Final := 30 ; FI PRINT Final

STMT: Second := 10

ASSIGNSTMT: Second := 10

EXPR: 10

BOOLTERM: 10

BoolFactor: 10

ARITHEXPR: 10

TERM: 10

FACTOR: 10

ATOM: 10

stmtTail: IF First \* Second - 25 = 25 THEN Final := 20 ; ELSE Final := 30 ; FI PRINT Final

STMT: IF First \* Second - 25 = 25 THEN Final := 20 ; ELSE Final := 30 ; FI

IFSTMT: IF First \* Second - 25 = 25 THEN Final := 20 ; ELSE Final := 30 ; FI

COUNT == 1

EXPR: First \* Second - 25 = 25

BOOLTERM: First \* Second - 25 = 25

BoolFactor: First \* Second - 25 = 25

ARITHEXPR: First \* Second - 25

TERM: First \* Second

FACTOR: First

ATOM: First

FACTORTAIL: \* Second

FACTOR: Second

ATOM: Second

TERMTAIL: - 25

TERM: 25

FACTOR: 25

ATOM: 25

RELATIONOPTION: = 25

ARITHEXPR: 25

TERM: 25

FACTOR: 25

ATOM: 25

StmtLIST: Final := 20 ;

STMT: Final := 20

ASSIGNSTMT: Final := 20

EXPR: 20

BOOLTERM: 20

BoolFactor: 20

ARITHEXPR: 20

TERM: 20

FACTOR: 20

ATOM: 20

ELSEPART: ELSE Final := 30 ;

StmtLIST: Final := 30

STMT: Final := 30

ASSIGNSTMT: Final := 30

EXPR: 30

BOOLTERM: 30

BoolFactor: 30

ARITHEXPR: 30

TERM: 30

FACTOR: 30

ATOM: 30

stmtTail: PRINT Final

STMT: PRINT Final

PRINTSTMT: PRINT Final

Program Validated!

Program Output:

20.0

Variables:

first: 5.0

second: 10.0

final: 20.0

## Program e.g. 6:

First := 5;

Second := 10;

IF First \* Second - 25 = 25 THEN

Final := 10;

IF 70 > First \* Second THEN

Final := 80;

ELSE Final := 30;

FI

ELSE Final := 90;

FI

PRINT Final .

## Result:

StmtLIST: First := 5 ; Second := 10 ; IF First \* Second - 25 = 25 THEN Final := 10 ; IF 70 > First \* Second THEN Final := 80 ; ELSE Final := 30 ; FI ELSE Final := 90 ; FI PRINT Final

STMT: First := 5

ASSIGNSTMT: First := 5

EXPR: 5

BOOLTERM: 5

BoolFactor: 5

ARITHEXPR: 5

TERM: 5

FACTOR: 5

ATOM: 5

stmtTail: Second := 10 ; IF First \* Second - 25 = 25 THEN Final := 10 ; IF 70 > First \* Second THEN Final := 80 ; ELSE Final := 30 ; FI ELSE Final := 90 ; FI PRINT Final

STMT: Second := 10

ASSIGNSTMT: Second := 10

EXPR: 10

BOOLTERM: 10

BoolFactor: 10

ARITHEXPR: 10

TERM: 10

FACTOR: 10

ATOM: 10

stmtTail: IF First \* Second - 25 = 25 THEN Final := 10 ; IF 70 > First \* Second THEN Final := 80 ; ELSE Final := 30 ; FI ELSE Final := 90 ; FI PRINT Final

STMT: IF First \* Second - 25 = 25 THEN Final := 10 ; IF 70 > First \* Second THEN Final := 80 ; ELSE Final := 30 ; FI ELSE Final := 90 ; FI PRINT Final

IFSTMT: IF First \* Second - 25 = 25 THEN Final := 10 ; IF 70 > First \* Second THEN Final := 80 ; ELSE Final := 30 ; FI ELSE Final := 90 ; FI PRINT Final

COUNT == 1

EXPR: First \* Second - 25 = 25

BOOLTERM: First \* Second - 25 = 25

BoolFactor: First \* Second - 25 = 25

ARITHEXPR: First \* Second - 25

TERM: First \* Second

FACTOR: First

ATOM: First

FACTORTAIL: \* Second

FACTOR: Second

ATOM: Second

TERMTAIL: - 25

TERM: 25

FACTOR: 25

ATOM: 25

RELATIONOPTION: = 25

ARITHEXPR: 25

TERM: 25

FACTOR: 25

ATOM: 25

StmtLIST: Final := 10 ; IF 70 > First \* Second THEN Final := 80 ; ELSE Final := 30 ; FI

STMT: Final := 10

ASSIGNSTMT: Final := 10

EXPR: 10

BOOLTERM: 10

BoolFactor: 10

ARITHEXPR: 10

TERM: 10

FACTOR: 10

ATOM: 10

stmtTail: IF 70 > First \* Second THEN Final := 80 ; ELSE Final := 30 ; FI

STMT: IF 70 > First \* Second THEN Final := 80 ; ELSE Final := 30 ; FI

IFSTMT: IF 70 > First \* Second THEN Final := 80 ; ELSE Final := 30 ; FI

COUNT == 1

EXPR: 70 > First \* Second

BOOLTERM: 70 > First \* Second

BoolFactor: 70 > First \* Second

ARITHEXPR: 70

TERM: 70

FACTOR: 70

ATOM: 70

RELATIONOPTION: > First \* Second

ARITHEXPR: First \* Second

TERM: First \* Second

FACTOR: First

ATOM: First

FACTORTAIL: \* Second

FACTOR: Second

ATOM: Second

StmtLIST: Final := 80 ;

STMT: Final := 80

ASSIGNSTMT: Final := 80

EXPR: 80

BOOLTERM: 80

BoolFactor: 80

ARITHEXPR: 80

TERM: 80

FACTOR: 80

ATOM: 80

ELSEPART: ELSE Final := 30 ;

StmtLIST: Final := 30

STMT: Final := 30

ASSIGNSTMT: Final := 30

EXPR: 30

BOOLTERM: 30

BoolFactor: 30

ARITHEXPR: 30

TERM: 30

FACTOR: 30

ATOM: 30

ELSEPART: ELSE Final := 90 ;

StmtLIST: Final := 90

STMT: Final := 90

ASSIGNSTMT: Final := 90

EXPR: 90

BOOLTERM: 90

BoolFactor: 90

ARITHEXPR: 90

TERM: 90

FACTOR: 90

ATOM: 90

Program Validated!

Program Output:

80.0

Variables:

first: 5.0

second: 10.0

Final: 80.9

## LOOPS Program e.g. 7:

First := 1;

Second := 10;

LOOP Increment:

First := First + 1;

IF First > Second THEN BREAK FI

REPEAT;

PRINT First .

## Result:

StmtLIST: First := 1 ; Second := 10 ; LOOP Increment : First := First + 1 ; IF First > Second THEN BREAK FI REPEAT ; PRINT First

STMT: First := 1

ASSIGNSTMT: First := 1

EXPR: 1

BOOLTERM: 1

BoolFactor: 1

ARITHEXPR: 1

TERM: 1

FACTOR: 1

ATOM: 1

stmtTail: Second := 10 ; LOOP Increment : First := First + 1 ; IF First > Second THEN BREAK FI REPEAT ; PRINT First

STMT: Second := 10

ASSIGNSTMT: Second := 10

EXPR: 10

BOOLTERM: 10

BoolFactor: 10

ARITHEXPR: 10

TERM: 10

FACTOR: 10

ATOM: 10

stmtTail: LOOP Increment : First := First + 1 ; IF First > Second THEN BREAK FI REPEAT ; PRINT First

STMT: LOOP Increment : First := First + 1 ; IF First > Second THEN BREAK FI REPEAT

LOOPSTMT: LOOP Increment : First := First + 1 ; IF First > Second THEN BREAK FI REPEAT

StmtLIST: First := First + 1 ; IF First > Second THEN BREAK FI

STMT: First := First + 1

ASSIGNSTMT: First := First + 1

EXPR: First + 1

BOOLTERM: First + 1

BoolFactor: First + 1

ARITHEXPR: First + 1

TERM: First

FACTOR: First

ATOM: First

TERMTAIL: + 1

TERM: 1

FACTOR: 1

ATOM: 1

stmtTail: IF First > Second THEN BREAK FI

STMT: IF First > Second THEN BREAK FI

IFSTMT: IF First > Second THEN BREAK FI

EXPR: First > Second

BOOLTERM: First > Second

BoolFactor: First > Second

ARITHEXPR: First

TERM: First

FACTOR: First

ATOM: First

RELATIONOPTION: > Second

ARITHEXPR: Second

TERM: Second

FACTOR: Second

ATOM: Second

StmtLIST: BREAK

STMT: BREAK

BREAKSTMT: BREAK

ELSEPART: FI

stmtTail: PRINT First

STMT: PRINT First

PRINTSTMT: PRINT First

Program Validated!

Program Output:

11.0

Variables:

second : 10.0

first : 11.0

## Program e.g. 8:

First := 1;

Second := 10;

Third := 1;

LOOP Factorial:

Third := Third \* First;

First := First + 1;

IF Third > Second THEN BREAK FI

REPEAT;

PRINT First .

## Result:

StmtLIST: First := 1 ; Second := 10 ; Third := 1 ; LOOP Factorial : Third := Third \* First ; First := First + 1 ; IF Third > Second THEN BREAK FI REPEAT ; PRINT First

STMT: First := 1

ASSIGNSTMT: First := 1

EXPR: 1

BOOLTERM: 1

BoolFactor: 1

ARITHEXPR: 1

TERM: 1

FACTOR: 1

ATOM: 1

stmtTail: Second := 10 ; Third := 1 ; LOOP Factorial : Third := Third \* First ; First := First + 1 ; IF Third > Second THEN BREAK FI REPEAT ; PRINT First

STMT: Second := 10

ASSIGNSTMT: Second := 10

EXPR: 10

BOOLTERM: 10

BoolFactor: 10

ARITHEXPR: 10

TERM: 10

FACTOR: 10

ATOM: 10

stmtTail: Third := 1 ; LOOP Factorial : Third := Third \* First ; First := First + 1 ; IF Third > Second THEN BREAK FI REPEAT ; PRINT First

STMT: Third := 1

ASSIGNSTMT: Third := 1

EXPR: 1

BOOLTERM: 1

BoolFactor: 1

ARITHEXPR: 1

TERM: 1

FACTOR: 1

ATOM: 1

stmtTail: LOOP Factorial : Third := Third \* First ; First := First + 1 ; IF Third > Second THEN BREAK FI REPEAT ; PRINT First

STMT: LOOP Factorial : Third := Third \* First ; First := First + 1 ; IF Third > Second THEN BREAK FI REPEAT

LOOPSTMT: LOOP Factorial : Third := Third \* First ; First := First + 1 ; IF Third > Second THEN BREAK FI REPEAT

StmtLIST: Third := Third \* First ; First := First + 1 ; IF Third > Second THEN BREAK FI

STMT: Third := Third \* First

ASSIGNSTMT: Third := Third \* First

EXPR: Third \* First

BOOLTERM: Third \* First

BoolFactor: Third \* First

ARITHEXPR: Third \* First

TERM: Third \* First

FACTOR: Third

ATOM: Third

FACTORTAIL: \* First

FACTOR: First

ATOM: First

stmtTail: First := First + 1 ; IF Third > Second THEN BREAK FI

STMT: First := First + 1

ASSIGNSTMT: First := First + 1

EXPR: First + 1

BOOLTERM: First + 1

BoolFactor: First + 1

ARITHEXPR: First + 1

TERM: First

FACTOR: First

ATOM: First

TERMTAIL: + 1

TERM: 1

FACTOR: 1

ATOM: 1

stmtTail: IF Third > Second THEN BREAK FI

STMT: IF Third > Second THEN BREAK FI

IFSTMT: IF Third > Second THEN BREAK FI

EXPR: Third > Second

BOOLTERM: Third > Second

BoolFactor: Third > Second

ARITHEXPR: Third

TERM: Third

FACTOR: Third

ATOM: Third

RELATIONOPTION: > Second

ARITHEXPR: Second

TERM: Second

FACTOR: Second

ATOM: Second

StmtLIST: BREAK

STMT: BREAK

BREAKSTMT: BREAK

ELSEPART: FI

stmtTail: PRINT First

STMT: PRINT First

PRINTSTMT: PRINT First

Program Validated!

Program Output:

5.0

Variables:

second : 10.0

third : 24.0

first : 5.0

## Program e.g. 9:

First := 1;

Second := 10;

Third := 1;

LOOP Factorial:

Third := Third \* First;

First := First + 1;

IF Third > Second THEN BREAK FI

REPEAT;

LOOP Decrement:

Third := Third - 1;

Second := Second - First;

IF Second < 0 AND Third < 0 THEN BREAK FI

REPEAT;

PRINT First .

## Result:

StmtLIST: First := 1 ; Second := 10 ; Third := 1 ; LOOP Factorial : Third := Third \* First ; First := First + 1 ; IF Third > Second THEN BREAK FI REPEAT ; LOOP Decrement : Third := Third - 1 ; Second := Second - First ; IF Second < 0 AND Third < 0 THEN BREAK FI REPEAT ; PRINT First

STMT: First := 1

ASSIGNSTMT: First := 1

EXPR: 1

BOOLTERM: 1

BoolFactor: 1

ARITHEXPR: 1

TERM: 1

FACTOR: 1

ATOM: 1

stmtTail: Second := 10 ; Third := 1 ; LOOP Factorial : Third := Third \* First ; First := First + 1 ; IF Third > Second THEN BREAK FI REPEAT ; LOOP Decrement : Third := Third - 1 ; Second := Second - First ; IF Second < 0 AND Third < 0 THEN BREAK FI REPEAT ; PRINT First

STMT: Second := 10

ASSIGNSTMT: Second := 10

EXPR: 10

BOOLTERM: 10

BoolFactor: 10

ARITHEXPR: 10

TERM: 10

FACTOR: 10

ATOM: 10

stmtTail: Third := 1 ; LOOP Factorial : Third := Third \* First ; First := First + 1 ; IF Third > Second THEN BREAK FI REPEAT ; LOOP Decrement : Third := Third - 1 ; Second := Second - First ; IF Second < 0 AND Third < 0 THEN BREAK FI REPEAT ; PRINT First

STMT: Third := 1

ASSIGNSTMT: Third := 1

EXPR: 1

BOOLTERM: 1

BoolFactor: 1

ARITHEXPR: 1

TERM: 1

FACTOR: 1

ATOM: 1

stmtTail: LOOP Factorial : Third := Third \* First ; First := First + 1 ; IF Third > Second THEN BREAK FI REPEAT ; LOOP Decrement : Third := Third - 1 ; Second := Second - First ; IF Second < 0 AND Third < 0 THEN BREAK FI REPEAT ; PRINT First

STMT: LOOP Factorial : Third := Third \* First ; First := First + 1 ; IF Third > Second THEN BREAK FI REPEAT

LOOPSTMT: LOOP Factorial : Third := Third \* First ; First := First + 1 ; IF Third > Second THEN BREAK FI REPEAT

StmtLIST: Third := Third \* First ; First := First + 1 ; IF Third > Second THEN BREAK FI

STMT: Third := Third \* First

ASSIGNSTMT: Third := Third \* First

EXPR: Third \* First

BOOLTERM: Third \* First

BoolFactor: Third \* First

ARITHEXPR: Third \* First

TERM: Third \* First

FACTOR: Third

ATOM: Third

FACTORTAIL: \* First

FACTOR: First

ATOM: First

stmtTail: First := First + 1 ; IF Third > Second THEN BREAK FI

STMT: First := First + 1

ASSIGNSTMT: First := First + 1

EXPR: First + 1

BOOLTERM: First + 1

BoolFactor: First + 1

ARITHEXPR: First + 1

TERM: First

FACTOR: First

ATOM: First

TERMTAIL: + 1

TERM: 1

FACTOR: 1

ATOM: 1

stmtTail: IF Third > Second THEN BREAK FI

STMT: IF Third > Second THEN BREAK FI

IFSTMT: IF Third > Second THEN BREAK FI

EXPR: Third > Second

BOOLTERM: Third > Second

BoolFactor: Third > Second

ARITHEXPR: Third

TERM: Third

FACTOR: Third

ATOM: Third

RELATIONOPTION: > Second

ARITHEXPR: Second

TERM: Second

FACTOR: Second

ATOM: Second

StmtLIST: BREAK

STMT: BREAK

BREAKSTMT: BREAK

ELSEPART: FI

stmtTail: LOOP Decrement : Third := Third - 1 ; Second := Second - First ; IF Second < 0 AND Third < 0 THEN BREAK FI REPEAT ; PRINT First

STMT: LOOP Decrement : Third := Third - 1 ; Second := Second - First ; IF Second < 0 AND Third < 0 THEN BREAK FI REPEAT

LOOPSTMT: LOOP Decrement : Third := Third - 1 ; Second := Second - First ; IF Second < 0 AND Third < 0 THEN BREAK FI REPEAT

StmtLIST: Third := Third - 1 ; Second := Second - First ; IF Second < 0 AND Third < 0 THEN BREAK FI

STMT: Third := Third - 1

ASSIGNSTMT: Third := Third - 1

EXPR: Third - 1

BOOLTERM: Third - 1

BoolFactor: Third - 1

ARITHEXPR: Third - 1

TERM: Third

FACTOR: Third

ATOM: Third

TERMTAIL: - 1

TERM: 1

FACTOR: 1

ATOM: 1

stmtTail: Second := Second - First ; IF Second < 0 AND Third < 0 THEN BREAK FI

STMT: Second := Second - First

ASSIGNSTMT: Second := Second - First

EXPR: Second - First

BOOLTERM: Second - First

BoolFactor: Second - First

ARITHEXPR: Second - First

TERM: Second

FACTOR: Second

ATOM: Second

TERMTAIL: - First

TERM: First

FACTOR: First

ATOM: First

stmtTail: IF Second < 0 AND Third < 0 THEN BREAK FI

STMT: IF Second < 0 AND Third < 0 THEN BREAK FI

IFSTMT: IF Second < 0 AND Third < 0 THEN BREAK FI

EXPR: Second < 0 AND Third < 0

BOOLTERM: Second < 0 AND Third < 0

BoolFactor: Second < 0

ARITHEXPR: Second

TERM: Second

FACTOR: Second

ATOM: Second

RELATIONOPTION: < 0

ARITHEXPR: 0

TERM: 0

FACTOR: 0

ATOM: 0

BoolFactorTail: AND Third < 0

BoolFactor: Third < 0

ARITHEXPR: Third

TERM: Third

FACTOR: Third

ATOM: Third

RELATIONOPTION: < 0

ARITHEXPR: 0

TERM: 0

FACTOR: 0

ATOM: 0

StmtLIST: BREAK

STMT: BREAK

BREAKSTMT: BREAK

ELSEPART: FI

stmtTail: PRINT First

STMT: PRINT First

PRINTSTMT: PRINT First

Program Validated!

Executing Program:

Program Output:

5.0

Variables:

first : 5.0

third : -1.0

second : -115.0

# PRINT and READ Statements

## Program e.g. 10:

READ Var;

PRINT Var .

## Result:

StmtLIST: READ Var ; PRINT Var

STMT: READ Var

READSTMT: READ Var

stmtTail: PRINT Var

STMT: PRINT Var

PRINTSTMT: PRINT Var

Program Validated!

Executing Program:

***100***

Program Output:

100.0

Variables:

var : 100.0

Program e.g. 11:

READ Var;

Var := Var \* 10;

READ Bool;

PRINT Var, Bool .

Result:

StmtLIST: READ Var ; Var := Var \* 10 ; READ Bool ; PRINT Var , Bool

STMT: READ Var

READSTMT: READ Var

stmtTail: Var := Var \* 10 ; READ Bool ; PRINT Var , Bool

STMT: Var := Var \* 10

ASSIGNSTMT: Var := Var \* 10

EXPR: Var \* 10

BOOLTERM: Var \* 10

BoolFactor: Var \* 10

ARITHEXPR: Var \* 10

TERM: Var \* 10

FACTOR: Var

ATOM: Var

FACTORTAIL: \* 10

FACTOR: 10

ATOM: 10

stmtTail: READ Bool ; PRINT Var , Bool

STMT: READ Bool

READSTMT: READ Bool

stmtTail: PRINT Var , Bool

STMT: PRINT Var , Bool

PRINTSTMT: PRINT Var , Bool

IDLISTTAIL: , Bool

Program Validated!

Executing Program:

***2***

***7***

Program Output:

20.0 7.0

Variables:

var : 20.0

bool : 7.0

Program e.g. 12:

READ A, B, C ;

PRINT A, B, C .

Result:

StmtLIST: READ A , B , C ; PRINT A , B , C

STMT: READ A , B , C

READSTMT: READ A , B , C

IDLISTTAIL: , B , C

IDLISTTAIL: , C

stmtTail: PRINT A , B , C

STMT: PRINT A , B , C

PRINTSTMT: PRINT A , B , C

IDLISTTAIL: , B , C

IDLISTTAIL: , C

Program Validated!

Executing Program:

***1***

***21***

***42***

Program Output:

1.0 21.0 42.0

Variables:

A : 1.0

B : 21.0

C : 42.0