Fortran 77 : 4. Relational and Logic Operators

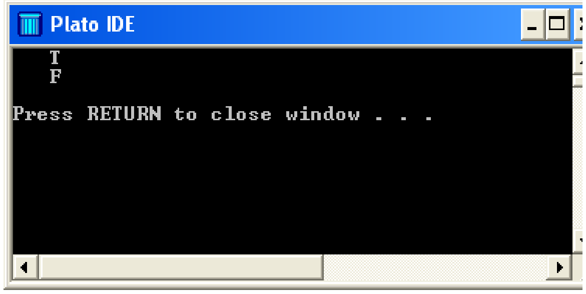
Relational operators in logical statements are used control the flow of code. In this document we simply consider the coding and results of relational operators. Logical statements can be linked together using logical operators.

Logical variables and values

Logical variables were first introduced in section 2 of this series[1]. A logical variable can only take one of two values - true or false, written '.TRUE.' and '.FALSE.' in the Fortran language, but written as 'T' or 'F' when the value of a logical variable is output.

The following program and output demonstrates logical variables and values.

```
C ***********
C Logical
C ***********
    PROGRAM LOGVAR
    LOGICAL YES,NO
    YES=.TRUE.
    NO=.FALSE.
    WRITE(*,*) YES
    WRITE(*,*) NO
    STOP
    END
```



```
   T
   F
Press RETURN to close window . . .
```

Relational Operators

The following table lists the relational operators in Fortran and their meaning.

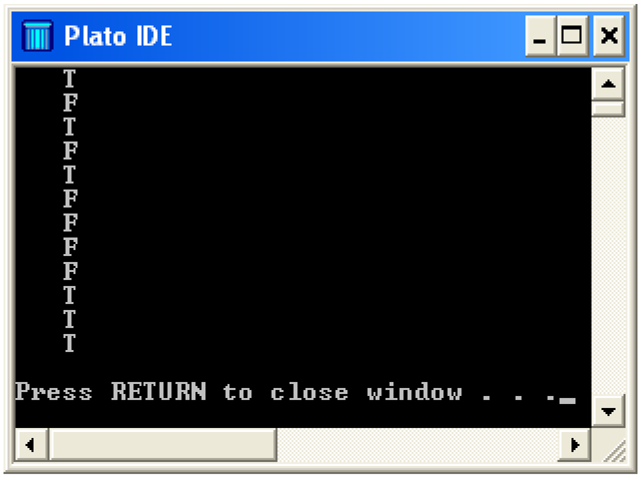
Relational operator	Mathematical notation	Matlab/Freemat
Equal to	=	.EQ.
Greater than	>	.GT.
Greater than or equal to	≥	.GE.
Less than	<	.LT.
Less than or equal to	≤	.LE.
Not equal to	≠	.NE.

[1] Fortran 77 : 2. Variables and Identifiers

In the following program the relational operators are used to compare 2 with 2 and then compare 2 with 3.

```
C ***********
C Relational
C ***********
   PROGRAM RELATIONAL
C Comparing 2 with 2
   WRITE(*,*) 2.EQ.2
   WRITE(*,*) 2.GT.2
   WRITE(*,*) 2.GE.2
   WRITE(*,*) 2.LT.2
   WRITE(*,*) 2.LE.2
   WRITE(*,*) 2.NE.2
C Comparing 2 with 3
   WRITE(*,*) 2.EQ.3
   WRITE(*,*) 2.GT.3
   WRITE(*,*) 2.GE.3
   WRITE(*,*) 2.LT.3
   WRITE(*,*) 2.LE.3
   WRITE(*,*) 2.NE.3
   STOP
   END
```

The output from the program is as follows.



```
    T
    F
    T
    F
    T
    F
    F
    F
    F
    T
    T
    T

Press RETURN to close window . . .
```

Logical Operators

Logical operators act on or link logical statements to form new logical statements. There is one unary (meaning that it acts on only one operand) logical operator - NOT. The two main binary (meaning that it acts on two operands) logical operators – AND and OR.

NOT

If an operand evaluates to true (1) or false (0) the operator NOT has the following effect.

operand	NOT operand
T	F
F	T

In Fortran the NOT operator is represented by ‘NOT.’.

AND

If the two operands evaluate to true (T) or false (F) the operator AND has the following effect.

operand	operand	operand AND operand
T	T	T
T	F	F
F	T	F
F	F	F

In Fortran the AND operator is represented by ‘.AND.’.

OR

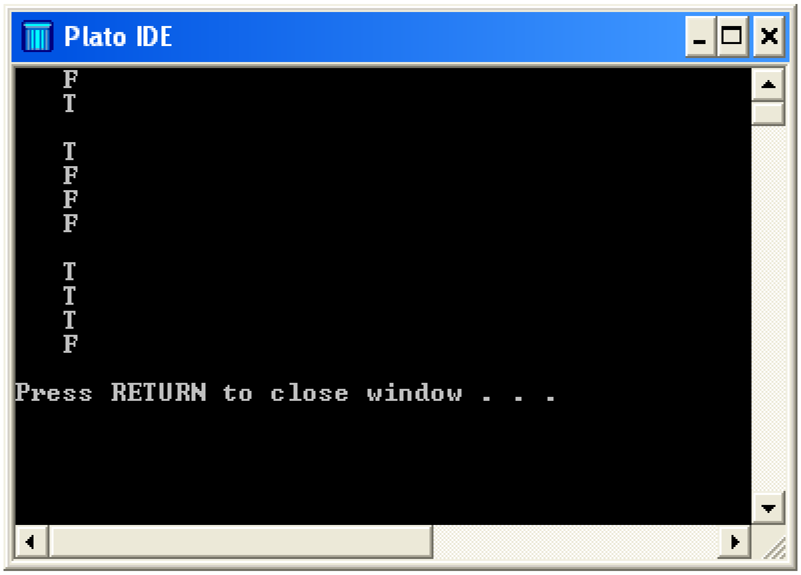
If the two operands evaluate to true (T) or false (F) the operator OR has the following effect.

operand	operand	operand OR operand
T	T	T
T	F	T
F	T	T
F	F	F

In Fortran the OR operator is represented by ‘.OR.’.

The following program and output demonstrate the logical operators in Fortran.

```
C ***********
C Logical
C ***********
      PROGRAM LOGICAL
      WRITE(*,*) .NOT.(.TRUE.)
      WRITE(*,*) .NOT.(.FALSE.)
      WRITE(*,*)
      WRITE(*,*) (.TRUE.).AND.(.TRUE.)
      WRITE(*,*) (.TRUE.).AND.(.FALSE.)
      WRITE(*,*) (.FALSE.).AND.(.TRUE.)
      WRITE(*,*) (.FALSE.).AND.(.FALSE.)
      write(*,*)
      WRITE(*,*) (.TRUE.).OR.(.TRUE.)
      WRITE(*,*) (.TRUE.).OR.(.FALSE.)
      WRITE(*,*) (.FALSE.).OR.(.TRUE.)
      WRITE(*,*) (.FALSE.).OR.(.FALSE.)
      STOP
      END
```



```
 F
 T

 T
 F
 F
 F

 T
 T
 T
 F

Press RETURN to close window . . .
```