

# SELECTION CONSTRUCTS



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- You can select between blocks of statements by using the selection construct
- **IF statement** is used as a selection construct
- Four types of IF constructs
  - IF-ELSE Construct
  - IF Construct
  - IF-ELSEIF Construct
  - Simple IF Construct

# IF-ELSE Construct

The general form of the IF-ELSE construct is as follows:

**IF** ( condition ) **THEN**

BLOCK1

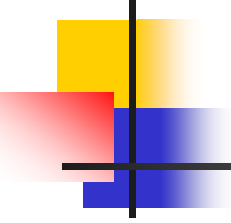
**ELSE**

BLOCK2

**ENDIF**

Where

- condition is a logical expression
- each of block1 and block2 consists of **one** or **more** FORTRAN statements
- condition is `.TRUE.` ( execute block1 )
- condition is `.FALSE.` ( execute block2 )
- the condition should be between parentheses
- **IF** condition **THEN** should be in the same line
- **ELSE** should be in a separate line
- **ENDIF** should be in a separate line

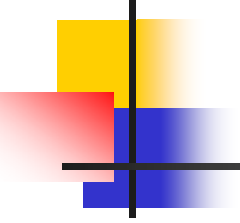


**Example 1:** Write a FORTRAN program that reads two integer numbers and prints the maximum.

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Solution:

```
INTEGER  NUM1, NUM2
PRINT* , 'ENTER TWO DIFFERENT INTEGER NUMBERS'
READ* , NUM1, NUM2
PRINT* , 'INPUT: ', NUM1, NUM2
IF (NUM1 .GT. NUM2) THEN
    PRINT* , 'MAXIMUM IS ', NUM1
ELSE
    PRINT* , 'MAXIMUM IS ', NUM2
ENDIF
END
```



**Example 2** : Write a FORTRAN program that reads an integer number and finds out if the number is even or odd. The program should print a proper message.

Solution:

```
INTEGER K
PRINT*, 'ENTER AN INTEGER NUMBER'
READ*, K
PRINT*, 'INPUT: ', K
IF (K/2*2 .EQ. K) THEN
    PRINT*, ' THE NUMBER IS EVEN'
ELSE
    PRINT*, ' THE NUMBER IS ODD'
ENDIF
END
```

# IF Construct



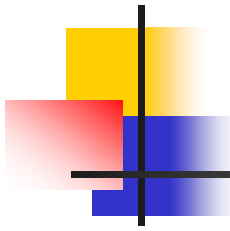
The general form of the IF construct is as follows:

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IF ( condition ) THEN

BLOCK

ENDIF



**Example:** Write a FORTRAN program that reads a grade. If the grade is not zero, the program must add 2 points to the grade. Then, the new grade should be printed.

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Solution:

```
REAL GRADE
PRINT*, 'ENTER A GRADE'
READ*, GRADE
PRINT*, 'ORIGINAL GRADE IS', GRADE
IF (GRADE .GT. 0) THEN
    GRADE = GRADE + 2.0
    PRINT*, 'SCALED GRADE IS ', GRADE
ENDIF
END
```

## Exercises

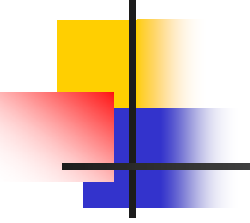
What is the output of the following program ?

```
REAL A, B, C
READ*, A, B, C
IF ( A .LT. B ) THEN
    PRINT*, A + B
    IF ( B .GT. 4.0 ) THEN
        PRINT*, B*C
    ELSE
        PRINT*, C
    ENDIF
ELSE
    PRINT*, A*B*C
ENDIF
END
```

Assume the input for the program is:

5.0      6.0      3.0

What is the output of the following program ?



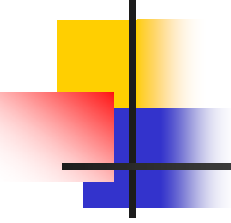
```
INTEGER A, B, C
READ*, A, B, C
IF (A.GT.B) THEN
    IF (B.LT.C) THEN
        PRINT*, B
    ELSE
        PRINT*, C
    ENDIF
ELSE
    PRINT*, A
ENDIF
PRINT*, A, B, C
END
```

Assume the input for the program is:

-2      -4      -3



What is the output of the following program ?



```
REAL A , B
INTEGER K
READ* , A, K , B
IF (A .LT. 3.0) THEN
    PRINT* , A + K
    IF (B .LT. 2.5) THEN
        PRINT* , B**K
    ENDIF
ELSE
    PRINT* , A*B*K
ENDIF
END
```

Assume the input for the program is:

2.5 2 2.5

## IF-ELSEIF Construct

The general form of the IF- ELSEIF construct is as follows:



```
IF ( condition-1 ) THEN
```

```
BLOCK1
```

```
ELSEIF ( condition-2 ) THEN
```

```
BLOCK2
```

```
ELSEIF ( condition-3 ) THEN
```

```
BLOCK3
```

```
. . .
```

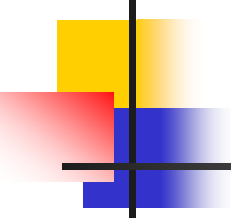
```
ELSEIF ( condition-n ) THEN
```

```
BLOCKn
```

```
ELSE
```

```
BLOCKn+1
```

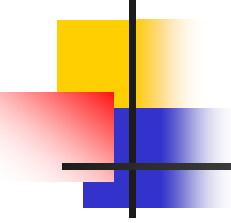
```
ENDIF
```



**Example 1:** Write a FORTRAN program that reads a student ID and his GPA out of 4.0. The program should print a message according to the following:

Condition	Message
$GPA \geq 3.5$	EXCELLENT
$3.5 > GPA \geq 3.0$	VERY GOOD
$3.0 > GPA \geq 2.5$	GOOD
$2.5 > GPA \geq 2.0$	FAIR
$GPA < 2.0$	POOR

```
REAL GPA
INTEGER ID
CHARACTER*10 STATE
READ*, ID, GPA
PRINT*, 'INPUT:', ID, GPA
IF (GPA .GE. 3.5) THEN
    STATE = 'EXCELLENT'
ELSEIF (GPA .GE. 3.0) THEN
    STATE = 'VERY GOOD'
ELSEIF (GPA .GE. 2.5) THEN
    STATE = 'GOOD'
ELSEIF (GPA .GE. 2.0) THEN
    STATE = 'FAIR'
ELSE
    STATE = 'POOR'
ENDIF
PRINT*, ID, ' ', STATE
END
```



**Example 2:** Write a FORTRAN program that reads three integer numbers and finds and prints the maximum. Use IF-ELSEIF construct.

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Solution:

```
INTEGER X1, X2, X3, MAX
PRINT*, 'ENTER THREE DIFFERENT INTEGER NUMBERS'
READ*, X1, X2, X3
PRINT*, 'THE NUMBERS ARE', X1, X2, X3
IF (X1 .GT. X2 . AND. X1 .GT. X3) THEN
    MAX = X1
ELSEIF (X2 .GT. X3) THEN
    MAX = X2
ELSE
    MAX = X3
ENDIF
PRINT*, 'THE MAXIMUM OF THE THREE NUMBERS =', MAX
END
```

# Simple IF Construct

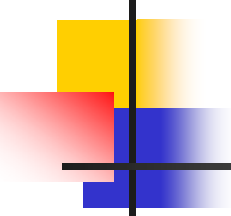
It has the following general form:

**IF** ( condition ) STATEMENT

**Example 1:** Use simple IF constructs to write a FORTRAN program that reads a student ID and his GPA out of 4.0. The program should print a message according to the following:

```
INTEGER ID
REAL GPA
CHARACTER*10 STATE
READ*, ID, GPA
PRINT*, 'INPUT:', ID, GPA
IF (GPA .GE. 3.5) STATE = 'EXCELLENT'
IF (GPA .GE. 3.0 .AND. GPA .LT. 3.5) STATE = 'VERY GOOD'
IF (GPA .GE. 2.5 .AND. GPA .LT. 3.0) STATE = 'GOOD'
IF (GPA .GE. 2.0 .AND. GPA .LT. 2.5) STATE = 'FAIR'
IF (GPA .LT. 2.0) STATE = 'POOR'
PRINT*, ID, ' ', STATE
END
```

Condition	Message
$GPA \geq 3.5$	EXCELLENT
$3.5 > GPA \geq 3.0$	VERY GOOD
$3.0 > GPA \geq 2.5$	GOOD
$2.5 > GPA \geq 2.0$	FAIR
$GPA < 2.0$	POOR



**Example 2:** Write a FORTRAN program that reads three integer numbers and finds and prints the maximum. Use simple IF construct.

---

Solution:

```
INTEGER X1, X2, X3, MAX
PRINT*, 'ENTER THREE DIFFERENT INTEGER NUMBERS'
READ*, X1, X2, X3
PRINT*, 'THE NUMBERS ARE', X1, X2, X3
MAX = X1
IF (X2 .GT. MAX) MAX = X2
IF (X3 .GT. MAX) MAX = X3
PRINT*, 'THE MAXIMUM OF THE THREE NUMBERS IS', MAX
END
```

## Exercise

What is the output of the following program ?

```
INTEGER N, M
N = 15
M = 10
IF (M .GE. N) THEN
  M = M + 1
  IF (N .EQ. M) THEN
    N = N + 5
  ELSEIF (N .GT. 0) THEN
    N = N + 10
  ENDIF
  M = M - 1
ENDIF
M = M - 1
PRINT*, M, N
END
```

## Exercise

What is the output of the following program ?

```
LOGICAL A, B
INTEGER EX1, EX2, EX3
READ*, EX1, EX2, EX3
A = EX1 .LE. EX2 .OR. EX2 .LE. EX3
B = EX2 + 2 .GT. EX3*2
IF (B) THEN
    A = .NOT. A
ELSE
    B = .NOT. B
ENDIF
PRINT*, A, B
END
```

Assume the input for the program is:

40

35

20