**Statements in BASIC Language**

**Part Two**

**Control Statements :**

**Introduction:** Usually the program run gradually step by step from first statement to the **end** statement but in sometimes we need to run certain statement before another or need to return to a certain statement to do that must use the control statements.

1. **Unconditional GOTO statement :**

Usage : used to transfer to run a certain statement in program.

Form : No. of statement space **GOTO** space No. of transferring statement.

**Example :**

10 READ A,B

15 DATA 5,4

20 X=A\*B

30 PRINT X

20

When running this program the statement number **50** will not run due to the effect of **GOTO** statement which transfer the run of program to the statement number 60.

40 GOTO 60

50 PRINT A,B

60 END

Run

1. **Conditional ON GOTO statement :**

Usage : used to transfer to run a certain statement with condition in program.

Form : No. of statement space ON space mathematical expression **GOTO** space N1,N2,N3…...

Where N1,N2,N3 … represent the number of statement need to running according to the value of mathematical expression , when the value of mathematical expression equal to 1 run statement N1, when equal to 2 run statement N2 …etc.

 Ex : 10 **ON** X **GOTO** 30,50,70

When x= 1 run the statement no. 30, x=2 run the statement no. 50, x= 3 run the statement no.70.

**Example :** write a program to find the area of geometrical shapes according to the value of (M)

When M= 1 find the area of rectangle.

 M= 2 find the area of circle.

 M= 3 find the area of square.

 10 INPUT M

20 ON M GOTO **30**,**90**,**140**,**200**

**30** REM AREA OF A RECTANGLE

40 READ X,Y

50 DATA 6,3

60 A = X\*Y

70 PRINT “M=”;M,”LENGTH=”;X,”WIDTH=”;Y,”AREA=”;A

80 GOTO 10

**90** REM AREA OF A CIRCLE

100 READ R

110 DATA 5

120 A=3.143\*R^2

130 PRINT “M=”;M,”RADIUS=”;R,”AREA=”;A

135 GOTO 10

**140** REM AREA OF A SQUARE

150 READ X

160 DATA 4

170 A=X^2

180 PRINT “M=”;M,”SIDE LENGTH=”;X,”AREA=”;A

? 1

M=1 LENGTH=6 WIDTH=3 AREA=18

 ? 2

M=2 RADIUS =5 AREA=78.575

? 3

M=3 SIDE LENGTH =4 AREA=16

?4

190 GOTO10

**200** END

Run

1. **IF …(simple condition)...THEN statement :**

Usage : used to transfer to run a certain statement when provided a certain condition in program.

Form : No. of statement space **IF** space logical or relational expression **THEN** space No. of transferring statement or order.

**EX : 30 IF x=3 THEN 50**

That is mean if the result of expression is true run the statement no. 50 , if the result of expression is not true run the statement below if statement (no. 40) directly.

**EX : 50 IF A > 0 THEN A=B+C**

That is mean if the value of A is greater than 0 (positive) the value of A equal to summation of B and C.

**Example 1**: write a program to find the greater and smaller number between two numbers suppose the numbers are A,B

10 INPUT A,B

20 IF A < B THEN 40

30 GOTO 50

40 PRINT “THE GREATER IS “;B,”THE SMALLER IS”;A

50 PRINT “THE GREATER IS “;A,”THE SMALLER IS”;B

60 END

**Example 2**: write a program to determine whether the number (x) is odd or even.

10 INPUT X

20 IF X MODE 2 = 0 THEN 50

30 PRINT “THE NUMBER IS ODD”;X

40 GOTO 60

50 PRINT “THE NUMBER IS EVEN”;X

1. ND
2. **IF …(compound condition)...THEN statement :**

Usage : used to transfer to run a certain statement when provided a certain compound condition in program.

Form : No. of statement space **IF** space logical or relational expression **THEN** space No. of transferring statement or order.

Compound condition

Simple condition

Simple condition

and

or

and

or

Simple condition

=

**………….**

|  |
| --- |
| Rules of AND |
| Compound condition | Simple condition1 | AND | Simple condition2 |
| TRUE | TRUE | AND | TRUE |
| FALSE | TRUE | AND | FALSE |
| FALSE | FALSE | AND | TRUE |
| FALSE | FALSE | AND | FALSE |
| Rules of OR |
| Compound condition | Simple condition1 | OR | Simple condition2 |
| TRUE | TRUE | OR | TRUE |
| TRUE | TRUE | OR | FALSE |
| TRUE | FALSE | OR | TRUE |
| FALSE | FALSE | OR | FALSE |

Example: write a program to read five the name of student that their average range between 50 and 100 and print the mark.

10 PRINT “NAME”,”MARK”

20 PRINT “-----------“,”------------“

30 READ N1$,M1, N2$,M2, N3$,M3, N4$,M4, N5$,M5

**40 IF M>=50 AND M<=100 THEN 60**

50 GOTO 80

60 PRINT N$,M

70 DATA “ALI”,40,”AHMED”,55,”HAIDER”,70,”MOHAMED”,85,”ANWAR”45

80 END

5- **IF …...THEN ….. ELSE Statement :**

Usage : used to transfer to run a certain statement when provided a certain condition in program.

Form : No. of statement space **IF** space logical or relational expression **THEN** space No. of transferring statement or order **ELSE** space No. of transferring statement or order .

In this statement more than one ELSE in the same IF statement such as

**50 IF X>Y THEN 150 ELSE IF X<Y THEN 200 ELSE 250**

That is mean if the value of x is greater than y run the statement no.150 and if the value of x is less than y run the statement no.200 and if x=y run statement no.250

**6- FOR ……NEXT Statement :**

Usage : This statement use to control of repeating some an order for certain time.

Form :

**No.** of statement space **FOR** **variable name** space = **start value** **To** **final value**

.

.

.

**No.** of statement space **NEXT** space **variable name**

Such as repeating print **ALI** **ten** times .

**10 FOR I = 1 TO 10**

This called loop and every order in side this loop will repeating according to the **final value** (10)

20 PRINT “ALI”

**30 NEXT I**

40 END

There is another form to FOR ….NEXT statement by adding the number of step :

 **No.** of statement space **FOR** **variable name** space = **start value** **To** **final value space STEP number**

.

.

.

**No.** of statement space **NEXT** space **variable name**

In this form can use a certain value of step such as :

10 FOR I = 1 TO 10 STEP 2

20 PRINT “ALI”

30 NEXT I

40 END

When run this program the name ALI will print 5 times due to effect of step 2.

**Example1 :** write a program to print the odd value between 0 and 20.

10 FOR I = 1 TO 20 STEP 2

RUN

1 3 5 7 9 11 13 15 17 19

20 PRINT I;

30 NEXT I

40 END

**Example2 :** write a program to print the even value between 0 and 20.

10 FOR I = 2 TO 20 STEP 2

20 PRINT I;

RUN

2 4 6 8 10 12 14 16 18 20

30 NEXT I

40 END

**Rules about use FOR …. NEXT statement :**

1. When the value of STEP equal 1 we can delete STEP from FOR statement.
2. The first value must be less than final value except when the value of step is negative value (**10 FOR I = 10 TO 1 STEP -1**).
3. The name of variable in FOR statement must be the same in NEXT statement.
4. Cannot use string variables in FOR statement (error : **10 FOR I$ = 1 TO 10**).
5. The value of variable in FOR statement must not changed inside the loop.
6. Can transfer from statement to another inside the loop.
7. Can transfer from inside loop to outside and the opposite is error.
8. Can use mathematical expression as a first value or as a finial value and as a step value in FOR statement **( 10 FOR I = A+2 TO B+3 STEP (C/2)).**

**Example1 :** Write a program to find the multiplication and summation of numbers from 1 to 50 and then print the results.

10 REM THIS PROGRAM FOR SUMMATION AND MULTIPLICATION OF 50 NUMBERS

20 N=1:SUM=0

**30 FOR I = 1 TO 50**

40 SUM = SUM+I

50 N=N\*I

**60 NEXT I**

70 PRINT “SUM=”;SUM, “N=”;N

80 END

**Example2 :** write a program to find the result of the following sequence:

S= 2+22+23+24+…….2n

10 INPUT N

**20 FOR I = 1 TO N**

30 S=S+(2)^I

**40 NEXT I**

50 ? S

60 END

**Example3 :** write a program to find the result of the following sequence:

S= 1+22+33+44+…….nn

**Example4 :** Write a program to find the summation of numbers that accept to divided by 3 and raged between 50 and 100.

10 FOR I = 50 TO 100

20 IF I MODE 3=0 THEN 40

30 GOTO 50

40 SUM=SUM+I

50 NEXT I

60 ? SUM

70 END

**Example5 :** Write a program to find the result of the sequence below :

$$S=\sum\_{I=1}^{10}\sum\_{J=1}^{15}(I\*J)$$

10 FOR I = 1 TO 10

20 FOR J = 1 TO 15

Important note :

The loops must be not interrupted

30 S=S+(I\*J)

40 NEXT J

50 NEXT I

60 ? S

70 END

**Example6 :** Write a program to find the result of the sequence below :

$$S=\sum\_{I=1}^{10}\sum\_{J=1}^{15}\sum\_{K=1}^{20}(I\*J\*K)$$

**Example7 :** Write a program to find the result of the sequence below :

$$S=\frac{1}{1!}\left(\frac{x-1}{x}\right)+\frac{1}{2!}\left(\frac{x-2}{x}\right)^{2}+\frac{1}{3!}\left(\frac{x-3}{x}\right)^{3}+ ………..+\frac{1}{N!}\left(\frac{x-N}{x}\right)^{N}$$

10 INPUT N,X

The factorial for any number can be calculated in BASIC program by the following constant steps :

**F=1**

**FOR J=1 TO I**

**F=F\*I**

**NEXT J**

Where **I** represent the number which required to find its factorial.

20 FOR I = 1 TO N

30 A=((X-I)/X)^I

40 F=1

50 FOR J = 1 TO I

60 F=F\*J

70 NEXT J

80 S=S+(A/F)

90 NEXT I

100 ? “S=”;S

110 END

**Example8 :** Write a program to find the result of the sequence below :

$$S=\frac{1}{1!}\left(\frac{x-1}{2x}\right)+\frac{1}{2!}\left(\frac{x+2}{3x}\right)^{2}+\frac{1}{3!}\left(\frac{x-3}{4x}\right)^{3}+ ………..+\frac{1}{N!}\left(\frac{x-N}{Nx}\right)^{N}$$