النظام العشري والنظام الثنائي

تختلف أنظمة العد في العالم وأشهرها هو النظام العشري ولكن منذ اختراع الكمبيوتر (Computer) تم استخدام نظام عد يتناسب مع خواص الحاسوب التقنية، وهو النظام الثنائي، و يتكون أي نظام للعد من عدد معين من الرموز وحسب عدد الرموز يتم إطلاق الاسم الموافق على النظام، ونظام العد العشري سمي عشريا لأنه يستخدم عشرة رموز فقط ، والنظام الثنائي يستخدم رمزان فقط هما الصفر والواحد (٠،١).

● النظام العشري

يتم استخدام هذا النظام في الحياة اليومية و غي أكثر الأمور، و معنى هذا النظام بكل بساطة هو نظام الأرقام على الأساس العشري و يحتوي على: ٠ ١ ٢ ٣ ٤ ٥ ٦ ٧ ٨ ٩ و النظام العشري يتكون من عشرة أرقام و لهذا السبب تم تسميته بهذا الاسم، حيث أن هذا النظام يكبر من بعد كل عشرة أرقام، مثل ٠ ١ ٢ ٣ ٤ ٥ ٦ ٧ ٨ ٩ ١٠ ١١ و إذا لاحظ أحد الاختلاف الموجود بين الرقم ٩ و الرقم ١٠ حيث انه عندما تم الانتهاء من آخر رقم و هو ٩، فتم الرجوع إلى بداية الرقم الأول و هو صفر و تم إضافة واحد بجانبه، و إذا وصل العد فيتم الوصول إلى الرقم ١٩ و من ثم يتم رجوع الرقم ٩ إلى صفر، مع إضافة واحد إلى الرقم ١ فيكون الناتج ٢٠ و هكذا.

● النظام الثنائي

و كما تم ذكر أن النظام العشري يتكون من عشرة أرقام، فالمثل النظام الثنائي يتكون من رقمين و هما الصفر و الواحد، و مثل الطريقة العشرية عند انتهاء الرقم يتم إضافة الرقم صفر ثم يزيد بواحد، كما الحال في المثال:

٠ ١ ١٠ ١١ ١٠٠ ١٠١ ١١٠ ١١١

والملاحظ أن النظام يتكون من الرقمين و هما الصفر والواحد، فيتم البدء بالصفر ثم الواحد و بعد ذلك يتم إضافة واحد مكان الصفر، و يتم إضافة واحد بجانب الرقم بعد الانتهاء من الأرقام '' وفي هذه الحالة المقصود بالأرقام التي تنتهي هما الصفر و الواحد''

و ملحوظة مهمة انه عند كتابة الرقم ١٠١١٠٠ بالنظام الثنائي، فلا يقرأ بطريقة مئة وعشرة آلاف و مئة و لكن يقرأ واحد صفر واحد واحد صفر صفر.

و القاعدة هي: أنه عندما يتم الوصول إلى الرقم صاحب الترتيب وهو الذي يساوي أساس نظام العد، و هذا في النظام الثنائي فيتم وضع الرقم صفر في الخانة الحالية، مع إضافة الرقم واحد في الجهة التالية له.

تحديد العدد الثنائي إلى العدد العشري

في حالة تحويل الأعداد الثنائية إلى أعداد عشرية عن طريق استخدام مفهوم قيمة المرتبة، يتم ضرب كل رقم من أرقام الأعداد الثنائية بقيمة المرتبة المقابلة، ويتم تجميع الأعداد مع العلم أن قيمة المرتبة الأولى في نظام الأعداد الثنائية ، و الثانية ٢ و المرتبة الثالثة ٤ والرابعة ٨ و هكذا.

مثال

طريقة مفهوم القيمة المرتبة

الرقم (١١١١) وهو بالنظام الثنائي و المطلوب تحويله إلى النظام العشري:

$$(١× ١) + (١ × ٢) + (١ × ٤) + (١ × ٨) = ١٥$$

$$١ + ٢ + ٤ + ٨ = ١٥$$

مثال آخر:

المطلوب تحويل الرقم (١١٠٠١) إلى عشري باستخدام مفهوم قيمة المرتبة.

يتم كتابة : (١ × ١)+(٠ × ٢)+(٠ × ٤)+(١ × ٨) + (١ × ١٦) = ٢٥

١ + ٠ + ٠ + ٨ + ١٦ = ٢٥

- تحويل العدد العشري إلى عدد ثنائي

لتحويل العدد الثنائي إلى عدد عشري يوجد أكثر من طريقة، لكن في هذه الأمثلة سيتم استخدام طريقة الباقي، و هذه الطريقة تقوم على مبدأ القسمة على ٢ ، مع تكرار هذه العملية حتى يتم الانتهاء من العملية مع الاحتفاظ بالباقي، أما الباقي فهو يمثل الأعداد الثنائية المكافأة.

مثال:

استخدام طريقة الباقي

المطلوب تحويل الرقم ١٥ إلى النظام الثنائي

١٥ ٧ ٣ ١ ٠ العدد

٢ ٢ ٢ ٢ المقسوم عليه

١ ١ ١ ١ الباقي

الناتج هو : ١١١١

مثال آخر

تحويل الرقم العشري ٢٥ إلى النظام الثنائي

٢٥ ١٢ ٦ ٣ ١ ٠ العدد

٢ ٢ ٢ ٢ ٢ المقسوم عليه

١ ٠ ٠ ١ ١ الباقي

الناتج هو : ١١٠٠١

في النهاية إن أجهزة الكمبيوتر تعتمد على الأرقام الثنائية والحسابات الثنائية، لأنها تبسط المهام والأوامر إلى حد كبير، لأنه لا يوجد سوى احتمالين (٠ و ١) لكل رقم بدلا من عشرة أرقام، فمن الأسهل تخزين أو معالجة الأرقام فمثلا جهاز بسيط مثل الترانزستور له حالتين متميزتين، مثل ''أون'' و ''أوف''، يمكن أن يصبحا وحدة تخزين عددية أو جزء من آلة حاسبة، ومعروف أن أجهزة الكمبيوتر تحتاج إلى عدد كبير من الترانزستورات لإنجاز كل هذا، ولكن لا يزال من الأسهل والأقل تكلفة للقيام بالأشياء مع الأرقام الثنائية بدلا من الأرقام العشرية.

Programming in QBasic

Of all of high level languages, BASIC (Beginners All purpose Symbolic Instruction Code) is probably the easiest to learn. The beginning user soon discovers that small programs can be written and quickly entered into the computer, producing interesting results. The goal of our study is to learn how to write computer programs in QBASIC Language.

QBASIC language Contents

The following Contains are used by QBASIC System:
1. Letters of the alphabet(A,B,C,..........Z).
2. Digit Numbers (0,1,2....................9).
3. Characters and Symbols(+,-,*, /, =,^, ( ),<,> , >=,=< ,<>,@,#,!,?,",%   ).
4. Special Words (go to, if , read, print, input).

Constants In QBASIC

Constants In QBASIC division into two types:
1. *Numeric Constants*: there are two types of numeric constants:
- *Real:* the numbers used may be written in decimal form such as(6.9,-52.76,0.095, -3269.0)
- *Integer:* Whole numbers may be written without the decimal point such as (89,-132,7698)
- *Exponential Form:* this form requires a number fallowed by the letter E, such as (2.8E05,0.57E-03,0.07E-9, and 29.8E7).

String Constants. a string consists of a sequence of characters enclosed in double quote marks. strings usually consist of names or address or cities such as "Computer", "Baghdad".

Variables In QBASIC

Again Variables in QBASIC division into two types:
1. *Numeric Variables:* the variables used to represent numbers are the letters of the alphabet .these may followed by a digit or letter. including 0 .for example: (A,b,c.....,A0,b1,c2,Ab,ba,bv,zx).

2. *String Variables:* a string variables must consists of a letter of the alphabet followed by the $ character, such as (A$,BC$,A2$,ZW$).

Arithmetic Expressions

Expressions are used in QBASIC in order to perform calculations. in general ,an expression may consist of a single constant or a single variables, or of arithmetic operation involving two or more constants or two or more variables ,or of any arithmetic combination of constants and variables. Although complicated mathematical expressions will not occur frequently, some skill is required to translate mathematical expressions into QBASIC expressions. in performing this task ,it is necessary to know that the QBASIC compiler using the following order of precedence in performing arithmetic operations:

Order	Symbol	Remark
first	( )	Operations within parentheses are performed first.
second	^	Exponentiation is performed before other arithmetic operations.
third	*, /	Multiplication and division are equal in order of precedence.
forth	+, -	Addition and subtraction are performed last and are equal in order of precedence.

Example-1

Suppose(a=5. b=4 ,c=2 ,i=2,j=1) Execute the following expressions in order of precedence:

? a + b + c / 12
?(a + b+ c) / 12
? a + b / c – I * j + a ^ 2
? a * b – c / I + j + a ^ b + c ^ 3
? a * j ^ b – I / c * j + 20
? j / (I + c)
? j / I +c
? (a * (b + I) * c) ^ 2
? (j + I * (b / c – a ^ 2)) + i
? (I + j) / a
? I + j / a
? (j * (a ^ 2 – 10)) / 2
? i + j ^ 2 – 3 * a
? ((I + j) / 3 * a) ^ 2 / 2

Example-2

Write following expressions in appropriate formula in QBASIC language:

$Y = a.b - r.s + r^2$ → Y=A*b-R*S+R^2

$P = (x+y)(x-y)/x^2$ → P=(X+Y)*(X-Y)/X^2

$Y = x^2 - 2x - 4$ → Y=X^2-2*X-4

$Y = x + \dfrac{r^2}{c.b} + s.r - b$ → Y=X+r^2/(C*B)+S*R-B

$T = t(1-d).y - t.(1-d)y$ → T=t*(1-d)*Y-t*(1-d)*Y

$A = s.r - y.z + x/5$ → A=S*R-Y*Z+X/5

$A = \dfrac{s.r - y.z + x}{5}$ → A=(S*R-Y*Z+X)/5

$A = s + r^2 - \dfrac{sr}{s} + 7$ → A=S+R^2-S*R/S+7

$A = s + r^2 - \dfrac{s.r}{S+7}$ $\qquad\qquad \rightarrow A=S+R^2-S*R/(S+7)$

$A = (s(x-2))(s^2-1)$ $\qquad\qquad \rightarrow A=(S*(X-2))*(S^2-1)$

$A = \dfrac{PQ}{CB}$ $\qquad\qquad \rightarrow A=P*Q/(C*B)$

$A = \dfrac{PQ}{C} . B$ $\qquad\qquad \rightarrow A=P*Q/C*b$

$A = (d-r)^2/(d+r)$ $\qquad\qquad \rightarrow A=(d-r)^2/(d+r)$

$P = a + \dfrac{bs-d}{J}$ $\qquad\qquad \rightarrow P=A+B*S/J-d$

$P = a + \dfrac{b.s}{j-d}$ $\qquad\qquad \rightarrow P=A+B*S/(J-D)$

$Q = i^2 - ba - \dfrac{a}{I}$ $\qquad\qquad \rightarrow Q=i^2-B*A-A/i$

$Q = I^2 - \dfrac{B.A-A}{I}$ $\qquad\qquad \rightarrow Q=I^2-B*A/I -A$

$AS = b/(j-a)$ $\qquad\qquad \rightarrow AS=B/(J-A)$

$AS = \dfrac{B-A}{J}$ $\qquad\qquad \rightarrow AS=B/J-A$

$R = \dfrac{(s+b)(a+d)}{B}$ $\qquad\qquad \rightarrow R=(S+B)*(A+D)/B$

$R = (S+B) . \dfrac{(A+D)}{B}$ $\qquad\qquad \rightarrow R=(S+B)*((A+D))/B$

$T = \dfrac{(a+b)}{M} .S$ $\qquad\qquad \rightarrow T=(A+B)/M*S$

$T = \dfrac{(A+B)}{M*S}$ $\qquad\qquad \rightarrow T= (A+B)/(M*S)$

4

Library Functions

Each basic interpreter has within it the capability of calculating certain special functions, some times called library functions. these functions are indicated by three letters naming the function, fallowed by argument enclosed in parentheses. the argument may be either a number, a variable, or a an expression. in the following table library functions as might be found in most basic interpreters.

Function	Description of function
ABS(x)	Absolute value of x , $\lvert x \rvert$.
SGN(x)	=(-1 or 0 or 1) for (x<0 or x=0 or x>0).
SQR(x)	Square root of x.
INT(x)	The largest integer not exceeding x.
RND(x)	Create random number value between 0 and 1.
Sin(x)	Sin of x, x in radians
Cos(x)	Cosine of x, x in radians
Tan(x)	Tangent of x, x in radians
Atn(x)	Arctangent of x, x in radians
Exp(x)	The value of e^x
Log(x)	The natural logarithm of x ,ln(x)
Mod	Modulus-Rest of division. Ex:10mod3=1
Div	Integer division. Ex:10div3=3

Example

convert following mathematical expressions in appropriate formula QBASIC language:

$S=\sin(x)^2+\cos^3(x)$ →S=sin((x*3.14/180)^2)+cos(x*3.14/180)^3

$D=\log(x)-\log x^2$ →D=log(x)/log(10)-log(x^2)/log(10)

$R=\left\lvert \dfrac{d-s}{n} \right\rvert$ →R=abs(d-s)/n

$Y=\dfrac{1-e^x}{1+e^x}$ →Y=(i-exp(x))/(1+exp(x))

$Y=s\sqrt{s}+4$ →Y=s*sqr(s)+4

$Y=\log b-\sin x+dr$ →Y=log(b)/log(10)-sin(x*3.14/180)=d*r

$P=\dfrac{\lvert x-y \rvert .c-3(y-x)(z-r)}{r+1}$ →P=abs(x-y)*c-3*(y-x)*(z-r)/(r+1)

$B=\ln x +b\ln y+b\ln x^2$ →B=log(x)+b*log(y)+b*log(x^2)

$D=\log x-b$ →D=log(x)/log(10)-b

$V=\log m-\log k$ →V=log(m)/log(10)-log(k)/log(10)

$Y=\text{Cos}(x)/2-\text{Sin}^2(x)$ $\rightarrow Y=\cos(x*3.14/180)/2-\sin(x*3.14/180)\char`^2$

$A=\dfrac{\text{Sin}(x).\text{Cos}(x)}{\text{Cos}^2(x)}$ $\rightarrow A=\sin(x*3.14/180)*\cos(x*3.14/180)/\cos(x*3.14/180)\char`^2$

$Z=\dfrac{|\,3m-1\,|}{\sqrt{n+1}}$ $\rightarrow Z=\text{abs}(3*m-1)/\text{sqr}(n+1)$

$Z=\dfrac{|\,3m-1\,|}{\sqrt{n}}+1$ $\rightarrow Z=\text{abs}(3*m-1)/\text{sqr}(n)+1$

$B=\tan x-x.\text{Sec}(x).\text{Cos}(x)$ $\rightarrow B=\tan(x*3.14/180)-x*1/\sin(x*3.14/180)*\cos(x*3.14/180)$

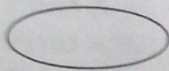$W=3.e^x.\sqrt{1+e^x}$ $\rightarrow w=3*\exp(x)*\text{sqr}(1+\exp(x))$

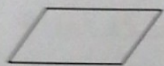$C=\dfrac{e^{x/a}+e^{-x/a}}{e^{x/a}-e^{-x/a}}$ $\rightarrow C=(\exp(x/a)+\exp(x/a))/(\exp(x/a)-\exp(x/a))$
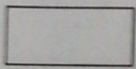
Flow Charts

Flow charts are drawing diagrams illustrates series steps must the program follows to Result the outputs. following the figures used in flow charts:
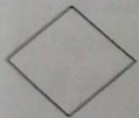
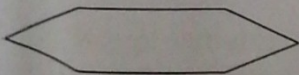The start and end of program symbol

Input and output symbol
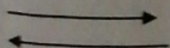
Arithmetic operation symbol

Decision symbol

Reparative symbol

Link symbol

Direction traffic

The QBasic language statement:

The REM Statement

The general form of the REMARK statement is:

<div align="center">

REM[remark]

</div>

Where remark may be any remark the programmer chooses to make to describe the program, to identify various parts of program, or even to serve as a blank line between parts of the program. for example:

REM this program is named calculate
Rem program written in 2010-03-30
Rem input modul
Rem output modul

Print Statement

The general form of the Print statement is:

<div align="center">

Print expression (, or ;) expression etc.

</div>

Where expression is any number, any string of words, any variable, or any combination of numbers and variables in an algebraic expression. commas or semicolons must be used to separate expressions. For example:

Print
Print X
Print a,b,c
Print s;t;u;r;v
Print "the sum is";s9
Print a$,B$,c$

Remark : the symbol " " use in print statement for print strings.

Input Instructions

There are three types of input instructions include:

1. **Let statement.**
2. **Input statement.**
3. **Read / Data statement.**

Let statement.

The general form of the Let statement is:

<div align="center">

Let variable = expression

</div>

Where variable may be either a numeric variable or a string variable and expression may be either an arithmetic expression or a string expression. strings cannot be placed into numeric variables, or vice versa. The following are examples of let statement:

Let X=25
Let A$="computer"
Let R3=5*x*(X-9)
Let M$=N$

Example-1

Write a program to compute the following functions:

$A = X^2 + Y^2$
$B = A^2 + XY$
$C = (A+B)^2$

Solution

        Let x=5
        Let y=7
        A=X^2+Y^2
        B=A^2+X*Y
        C=(A+B)^2
        Print a,b,c

Example-2

Write a program to compute the area and circumference of triangle it sides x=4,y=3,z=5.

Solution

        REM Program for compute triangle area and circumference
        x=3:y=4:z=5
        C=x+y+z
        S=C/2
        Ar=sqr(s*(s-x)*(s-y)*(s-z))
        Print "the circumference is";C
        Print "the area is";AR

Flowchart:
start
x=3,y=4,z=5
C=x+y+z
S=C/2
Ar=sqr(s*(s-x)*(s-y)*(s-z))
Print C,Ar
end
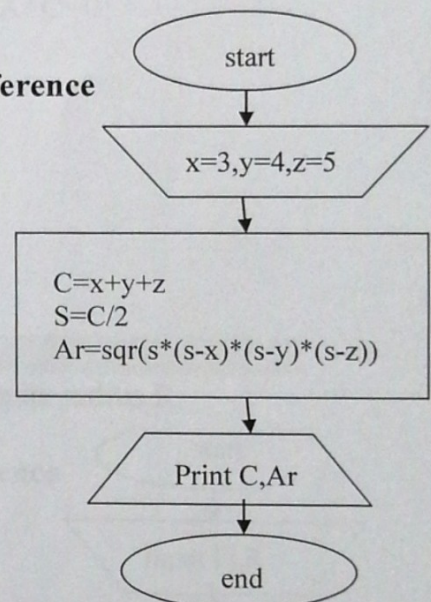
Example-3

Write a program to find horizontal component and vertical component and for force =70N slope 45° From x-axis.

Solution

        Rem program to force components
        F=70
        Th=45*3.141592/180
        Fx=F*cos(th)
        Fy=F*sin(th)
        ?Fx,Fy

8

Input statement

The general form of the input statement is

Input variable [,variable...]

Where variable stands for any suitable variable chosen by the programmer. Also it is the programmers option to use more than one variable ,separating them by commas, in order to enter additional values. When the program is running and control comes to an input statement, the computer print question mark (?) and pauses so that the user may enter the proper value for that variable. This opportunity to enter a value makes the program very flexible. The following are examples of Input statement:

Input X

Input A, B, C

Input A$, R$

Input M$,E$,F$,N

Example-1

Write a program to compute the real roots of a equation $AX^2+BX+C=0$

Solution

```
REM Program for compute roots of equation
Input A,B,C
X1=(-b+ SQR(b^2-4*a*c)) /(2*a)
X2=(-b-SQR (b^2-4*a*c)) /(2*a)
Print" the first root is";X1
Print " the second root is";X2
```

Example-2

Write a program to compute the area and circumference of circle its radius R.

Solution

```
REM Program for compute circle area and circumference
Pi = 3.141592
Input "radius of circleis";R
A=R^2*Pi
C= 2*pi*r
Print" the area is";A
Print"the circumference is";C
```
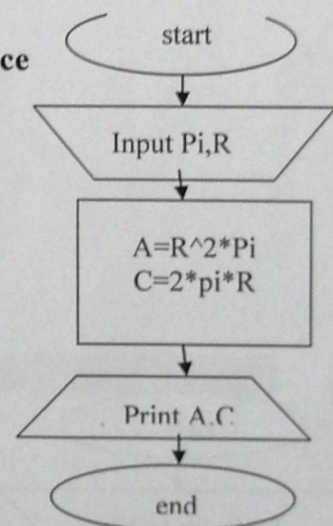

start

Input Pi,R

A=R^2*Pi
C=2*pi*R

Print A,C

end

Example-3

Write a program to input the length ,width, and high of wall then compute the number of bricks in wall ,if you know the brick sides is (24x8x12cm).

Solution

```
REM Program for compute bricks number
Input "the wall length";L
Input "the wall width";W
Input "the wall high"; H
V=L*W*H
N=V/(24x8x12)
?"bricks number is"N
```

Read / Data statement.

The general form of the Read and Data statements are:

$$\text{Read variable [,variable] etc.}$$
$$\text{Data datum \quad [,datum] etc.}$$

Where variable is any valid numeric variable or string variable and datum is any valid number or string constant. The following are examples of Read / Data statements:

```
Read X,Y,Z
Data 12.7,35,-29.75
```

```
Read A,N$,M$,T
Data 7.4, "address","telephone",66.7
```

Example-1

Write a program to read student name and 6 degree then compute and print the average of student degree.

Solution

```
Read A$,a,b,,c,d,e,f
S=a+b+c+d+e+f
AV=S/6
Print A$,AV
Data Ali,50,65,87,97,90,70
```

Example-2

Write a program to read 4 variables then compute arithmetic mean and geometric mean.

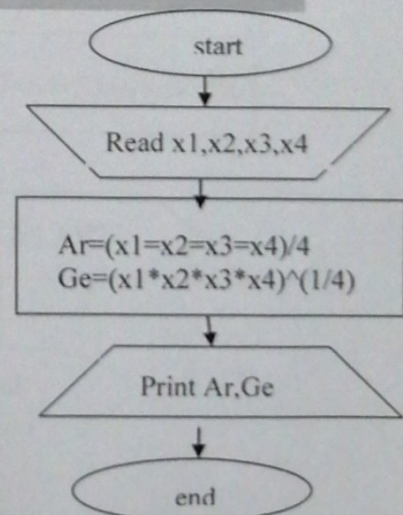### Solution

```
Read x1,x2,x3,x4
Ar= (x1+x2+x3+x4)/4
Ge=(x1*x2*x3*x4)^(1/4)
Print "arithmetic mean is";ar
Print "geometric mean is";ge
Data 50,67,80,77
```


start

Read x1,x2,x3,x4

$Ar=(x1=x2=x3=x4)/4$
$Ge=(x1*x2*x3*x4)^{(1/4)}$

Print Ar,Ge

end

The Restore Statement
The general form of the restore statement is

<div align="center">

Restore

</div>

Whenever control executes the restore statement, the system restores the data block pointer to the first item of data. then the next read statement starts the process of reading the data all over again from the very first data statement.

Example
Read a,b,c
Restore
Read x,y,z
Data 5,7,9

The x,y,z have the values5,7,9

Control Statements
Control statements include
1. **Go To statement**
2. **If Then statement**
3. **If Go To statement**
4. **On Go To statement**

1.The Go To Statement
The general form of the Go To statement is:

<div align="center">

Go To Line number

</div>

Where line number represents the next line number to which control will go instead of the following line number. the following are examples of the go to statement: Go to 10, Go to 5.this statement is sometimes called the unconditional go to statement.

Example-1
Write a program to compute the average of 6 subjects for number of students.
Solution

```
10  Input N$,S1,S2,S3,S4,S5,S6
    AV=(S1+S2+S3+S4+S5+S6)/6
    Print N$.AV
    Go To 10
```
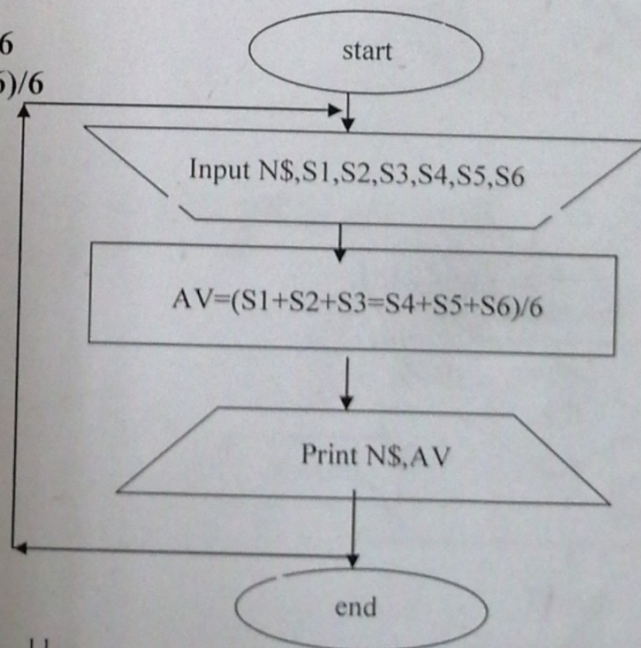
2. The IF ... THEN Statement

The general form of the If ... then Statement is:

IF Condition THEN Line Number

Where condition has the form :

| Arithmetic expression | relation | Arithmetic expression |

Or

| String expression | relation | String expression |

And relation represents one of the symbols from the following table:

Symbol	Example
=	A=B
<	A<B
>	A>B
<=	A<=B
>=	A>=B
<>	A<>B

Example-1

Write a program to compute the Summation (S) of values from 1 to 100 where:
S = 1+2+3+............100.

Solution

```
     S=0 : I=1
5    S=S+I
     I=I+1
     If  I <= 100 then 5
     Print S
```

Example-2

Write a program to compute the summation for even numbers from 0 to N.

Solution

```
     Input N
     S=0 : I=0
5    S=S+I
     I=I+2
     If  I < N then 5
     Print S
```
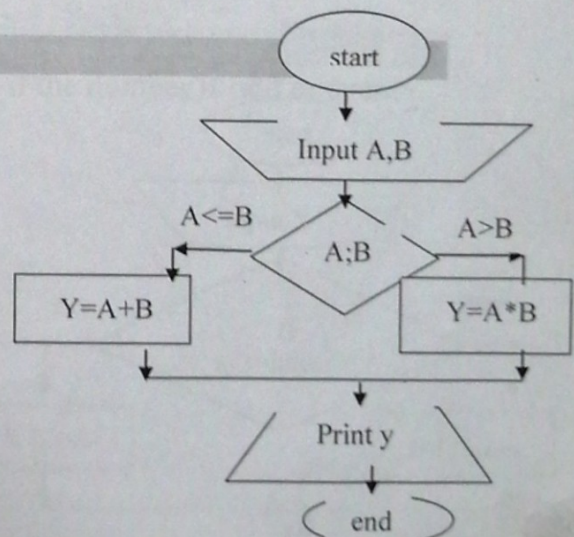
Example-3

Write a program to compute Y value where:

Y=A+B   if A<= B
Y=A*B   if A > B

Solution

```
     Input A,B
     If A> B then Y= A*B
     If A<= B then Y=A+B
     Print Y
```


12

Example-4

Write a program to compute Summation of X values from list of 10 different numbers.

Solution

```
        I=1
   5    Read X
        S=S+X
        I=I+1
        If I<= 10 then 5
        Print "sum=";S
        Data 5,12,15,18,20,30,7,5,57,75
```

Example-5

Write a program to compute S value where :$S=1-1/3+1/5-1/7+\ldots\ldots\ldots 1/n$.

Solution

```
        Input N
        I=1
        J=1
   5    T=1/I
        S=S+T*j
        I=I+2
        J=-J
        If I <=N then 5
        Print S
```

Example-6

Write a program to compute the summation of following series (use 20 terms)
$S=-3/5+7/10-11/15+15/20-\ldots\ldots\ldots\ldots$

Solution

```
        N=1: K=-1: i=3: j=5
   5    T=i/j
        S = S + T*k
        N=n+1: k=-k: i=i+4: j=j+5
        If n<=20 then 5
        Print S
```
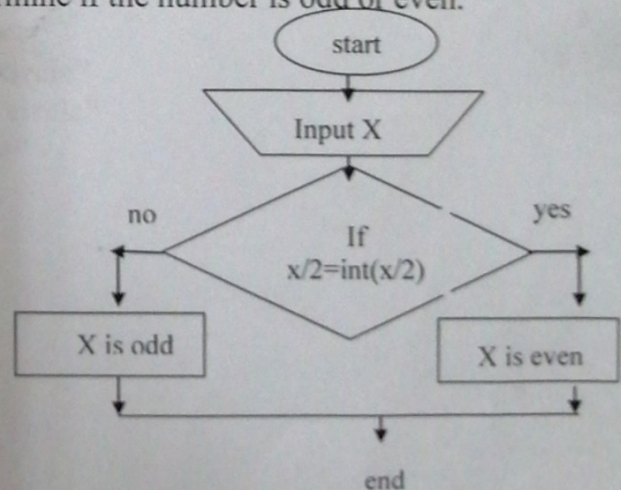
Example-7

Write a program to input any number then determine if the number is odd or even.

Solution
Input X
If $(x/2)= int(x/2)$ then print "x is even"
If $(x/2) <> int(x/2)$ then Print "x is odd"
Or
Input X
If x mod 2 =0 then print "x is even"
If x mod 2 <> 0 then print "x is odd"

13

Example-8

Write a program input any number then determine if the number is integer or not.

Solution

```
Input X
If x= int(x) then print "x is integer"
If x<> int(x) then Print "x is not integer"
```

Example-9

Write a program to compute the result of following series, if you know the program stop when the term value less than 10^{-4}

$$Y = 1 - X^3 + 5 X^7 - 9 X^{11} + \text{--------------} \qquad \text{if } X \geq 0$$
$$Y = X^2 + 3 X^6 + 5 X^{10} + 7 X^{14} + \text{---------} \qquad \text{if } X < 0$$

Solution

```
        Read X
        If X < 0 then  20
        I =1 : K = -1 : Y = 1
10      T = K *I * X ^ (I + 2)
        If abs (T) >10^-4 then
        Y = Y+T
        I=I+4
        K = - K
        Go to 10
        If X < 0 then
        I= 1
20      T= I *X^ (2*I)
        If abs(T) > 10^-4 then
        Y = Y+T
        I =I+2
        Go to 20
        Print Y
        Data 1
```

Example-10

Write a program ask about point axis and circle radius, it is center the original point, then compute if the point is inside, or on or outside the circle.

Solution

```
        Input x,y ,r,m1,m2
        D= sqr((x-m1)^2+(y-m2)^2)
        If d<r then print "Point inside the circle"
        If d>r then print"Point outside the circle"
        If d=r then print"Point on the circle"
```

Example-11

write a program that read 5 forces in point with angle to x- axis, then compute the resultant of these forces in x and y axis if you know that $R = \sqrt{Rx^2 + Ry^2}$

Solution

```
     I =1
10  Read F,th
    Rx=F * Cos(th*3.14/180)
    Ry=F * Sin(th*3.14/180)
    S₁= S₁+Rx
    S₂= S₂+Ry
    I=I+1
    If I<=5 then  10
    R= SQR(S₁^2+S₂^2)
    PrintS1,S2,R
    Data 50,30,70,45,60,90,80,180,50,270
```

Example-12

(12) concrete cub be tested (cubic side 150x150x150) by reign power(P) on cubic .write a program for read P values then compute and print number of successful model and it is percentage ,if you know the cubic be successful in test if the stress equal or more than 20N/mm^2, and the stress equal the power divided by cub area.

Solution

```
      I = 1
10    Read P
      F = P / (150 * 150)
      If F > 20 then X = X+1
      Y = Y + 1
      I = I + 1
      If I <= 12 then 10
      N= X / 12 *100
      Print " successful model is"; X
      Print " the percentage is "; N
      Data
```

Example-13

for compute stress (Fc) of concrete cub it is side X , reign Power to cubic surface it is value (P), write a program to compute and print the average for stress when reign different value of powers (100,150,200,........,500),if you know Fc=P/A.

Solution

```
        Read X
        A = X*X
        S=0
        P=100
  10    Fc = P / A
        S = S + Fc
        I = I + 1
        P = P + 50
        If  P <= 500 then 10
        AV = S / I
        Print " the average is"; AV
        Data 10
```

Example-14

Write a program to compute A value: $\sqrt{A} = \sum_{x=1}^{x=10} \left| \dfrac{X^2 - 3X}{X + \cos^3 X} \right|$

Solution

```
        X=1
  10    S=S+abs((X^2-3*X)/(X+cos(x*3.14/180)^3)))
        X=X+1
        If X<=10 then 10
        A=S^2
        ? A
```

3.The IF ... Go To Statement

The general form of the If ... go to Statement is:

IF Condition Go To Line Number

Example-1

Write a program to compute the average of 50 students have 6 subjects.

Solution

```
        REM this program for compute the average
        I=0
  10    Input N$,S1,S2,S3,S4,S5,S6
        AV=(S1+S2+S3+S4+S5+S6)/6
        Print N$,AV
        I=I+1
        If I < 50 go to 10
        End
```

16

Example-2

Write a program to compute the (N!) value.
where N!=1*2*3....N

Solution

```
        REM this program for compute the factorial
        Input N
        I=1
        F=1
5       F=F*I
        I=I+1
        If I<=n go to 5
        Print F
```
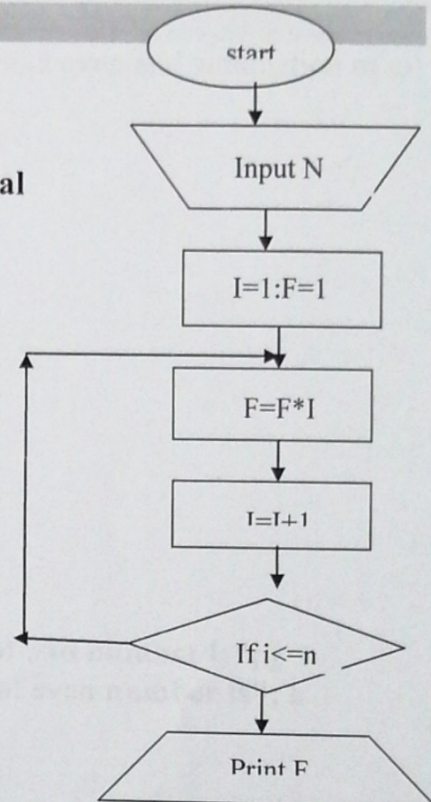

Example-3

Write a program to compute the sum and count of positive and negative numbers from list of (30) number.

Solution

```
        K=0: j=0
5       Read A
        If A > 0 go to 10
        SN=SN+A
        J=j+1
        Go to 20
10      SP=SP+A
        K=k+1
20      If j+k < 30 go to 5
        Print "Positive numbers" ;SP,k
        Print "negative number" ;SN, j
        Data 30,60,-70,,9,-5,.................
```

Example-4

Write a program to compute the sum and count of odd and even and summation of all values from list of (N) numbers.

Solution

```
        J=0 : k=0 : SE=0 : SO=0 : SX=0
        Read N
5       Read X
        Y=X/2
        If Y=INT(Y) go to 10
        SO = SO + X
        J=j+1
        Go to 20
10      SE = SE + X
        K =k +1
20      SX=SX+X
        If k+j < N go to 5
        Print " sum of odd number is ";SO, "count of odd number is"; j
        Print " sum of even number is ";SE, "count of even number is"; k
        Print "sum of all numbers is "; SX
        Data 10, 12,6,9,7,8,5,56,77,3,99
```

Example-5

Write a program to compute Y value from the following series, use 15 terms only.

$$\frac{Y^2}{\pi} = \frac{X^3+30}{2!} - \frac{X^5+29}{4!} + \frac{X^7+28}{6!} - \frac{X^9+27}{8!} + \ldots\ldots\ldots$$

Solution

```
        Read X
        p = 3.14
        I = 2: j = 30: l = 1: n = 1
5       f = 1
        k = 1
10 f = f * k
        k = k + 1
        If k <= i   Go To 10
        t = ((x ^ (i + 1) + j) / f) * l
        s = s + t
        i = i + 2
        j = j - 1
        l = - l
        n = n + 1
        If n < = 15 Go To 5
        Y= SQR (3.14*S)
        Print Y
        Data 1
```

I = 2 to N
step 2

x^(I+1)

B = 30 → B = B-1

Example-6

Write a program to compute S value from following series, use 20 terms.

$$S = 1 - \frac{2*1}{3} + \frac{5*3}{7} - \frac{8*7}{11} + \frac{11*15}{15} - \ldots\ldots$$

Solution

```
        N=1
        S=1
        L=-1
        I=2 : J=3 : K=1
    10  T= (I * K) / J
        S=S+T
        I= i+3
        J=j+4
        K= 2*k+1
        L=-L
        N=N+1
        If N <= 20 go to 10
        ? S
```

Example-7

Write a program to find y value from the equation y=X²-4X+6 for X value from 0-10.

Solution

```
        X=0
    5   Y= X^2-4*X+6
        ?"X=";X,"Y=";Y
        X=X+1
        If X<=10 go to 5
```

Example-8

Write a program to compute reaction of steel cable (R) to temperature (T) that equal (293,313,333,353) using the following equation:

$$R = 8.85 * 10^{-8}[1 + 6.5 * 10^{-3}(T - 237)]$$

Solution

```
        T=293
    10  R=8.85E-8(1+6.5E-3*(T-273))
        PRINT R
        T=T+20
        If T<= 353 go to 10
```

Compound IF ... then

The general form of compound if ...then is:

Simple relation (and, or) simple relation

The most logical operators are in following table:

Logical operators	Remark
X1 and X2	True if x1 and x2 are true other wise false.
X1 or X2	True if either x1 or x2 or both true otherwise false.

19

Example-1

Write a program to compute the Y value where:

X= (A+B) / 2

$Y=X^2+X-3$ if A=1 or B=3

$Y=X^2+3X+5$ if A >2 and B > 4

$Y=X^3+2X^2+X$ otherwise

Execute the program to N from A,B values.

Solution

```
        Print " A     B     X     Y": print "------------------"
        Read N
        I=1
5       Read A,B
        X=(A+B)/2
        If A=1 or B=3 go to 10
        If A>2 and B>4 go to 20
        Y=X^3+2*X^2+X
        Go to 30
10      Y= X^2 +X-3
        Go to 30
20      Y=X^2+3*X+5
        print A;"     ";B;"    ";X;"     ";Y
30      I=I+1
        If I<=N go to 5
        Data 5,1,3,2,4,3,5,1,2,5,4
```

Example-2

Write a program to input 3 numbers then find the maximum one.

Solution

```
        Input a,b,c
        Max=a
        If b>a and b>c then max=b
        If c>a and c>b then max =c
        Print "the maximum is";max
```

Example-3

Write a program ask about triangle sides ,and determine if it is right triangle, and compute it is area and circumference.

Solution

```
        Input x,y,z
        If x+y>z and y+z>x and x+z>y then ? "right triangle"
        C=x+y+z
        S=C/2
        Ar=sqr(s*(s-x)*(s-y)*(s-z))
        Print "the circumference is"C
        Print "the area is"ar
```

Example-4

Write a program to compute the F(x) value where:

$$F(x)= \begin{cases} 0.5\,x & \text{if } x<1 \\ 0.5(3-x) & \text{if } 1\le x \le 2 \\ 0.5 & \text{if } x >2 \end{cases}$$

Run the program for N of X values.

Solution

```
        Print "X        Fx":  Print "-------------"
        Read N
        I=1
5       Read X
        If X<1 go to 20
        If X>= 1 and X<=2 go to 10
        Fx=0.5
        Go to 30
10      Fx=1/2*(3-x)
        Go to 30
20      Fx=x/2
        Print x,fx
30      I=I+1
        If I < N go to 5
        Data 10, 2,1,3,6,-2,3,1,2,6,7
```

4.The ON ... Go To Statement

the general form of the on ...go to statement is

ON expression Go To Line number[, line number] etc.

Where expression may be a single variable or any combination of variables and numbers. this expression must be evaluated, must be a positive number, and then must be truncated to a positive integer. if the integer is 1,then control goes to the first line number following the go to, if the integer is 2 , then control goes to the second line number following the go to, and so on. an expression less than 1 or greater than the number of line numbers given constitutes an error that will stop the program.

Example-1

Write a program to find Z value where :

$$Z \begin{cases} 2 & k=1 \\ 2K^{3}-3 & k=2 \\ -2 & k=3 \\ K & k<1 \text{ or } k>3 \end{cases}$$

    Read K
    On K go to 10,20,30
    Z=k
    Go to 40
10 **Z=2**
    Go to 40
20 **Z=2*k^3-3**
    Go to 40
30 **Z=-2**
40 **Print K,Z**
    Data 2

Example-2

Write a program to compute Q value where:

$$Q=\left|X^2+1\right| \qquad \text{if } k=1$$

$$Q=\sqrt{\left|X^2+Y\right|} \qquad \text{if } k=2$$

$$Q=\log\left(Y^2+3X\right) \qquad \text{if } k=3$$

Solution

    Read X,Y
    Read K
    On K go to 10 ,20,30
10 **Q=ABS(X^2+1)**
    Go to 40
20 **Q=SQR(ABS(X^2+Y))**
    Go to 40
30 **Q=log (Y^2+3*X)**
40 **Print Q**
    Data

Example-3

Sample taken from engineering students college departments, Building and construction, Software, Architecture, Material, write a program to classify the students by their departments, the size sample is(n),and the symbol for each department as fallows:

    K=1 for Building and construction students
    K=2 for Software students
    K=3 for Architecture students
    K=4 for Material students

Solution

```
        S1=0:S2=0:S3=0:S4=0
        Input n
        I=0
   5    Input k
        On k go to 10,20,30,40
  10    S1=S1+1
        Go to 50
  20    S2=S2+1
        Go to 50
  30    S3=S3+1
        Go to 50
  40    S4 = S4+1
  50    I=i+1
        If i < n go to 5
        Print S1,S2,S3,S4
```

The For and Next Statements

The general form of the for and next stamens are:

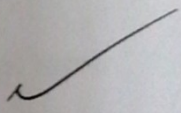**For loop variable = exp1 to exp2 [step exp3]**
Next loop variable

Where loop variable is a numeric variable, and must be the same variable in both of the statements. The expressions denoted by exp1,exp2,and exp3 may consist of numeric constants or variables , or combinations of numeric variables and constants with one condition. that is the value of exp3, when added repeatedly to exp1,must finally go beyond exp2.if the step has been omitted ,then exp3 is set equal to 1.
The purpose for the companion for and next statements is to guide control through the set of statements located between the for and next statements.

Example-1

Write a program to print the summation and multiplication of the numbers from 1 to 50.

Solution

```
    S=0:P=1
    For n=1 to 50
    S=S+n
    P=P*N
    Next n
    Print "the summation is"S
    Print the multiplication is"P
```

Example-2
Write a program to compute P value where: $P=(1)^2+(3)^2+(5)^2+\ldots\ldots+(25)^2$.
Solution
```
P=0
For i=1 to 25 step 2
P=P+i^2
Next i
Print P
```

Example-3
Write a program to find the maximum value from list of 10 numbers.
Solution
```
REM Program for find maximum value
READ x
MX=X
For i= 2 to 10
Read X
If X>MX then MX=X
Next i
Print "the maximum is";MX
Data 20,3,27,98,70,54,1,60,34,90
```

Example-4
Write a program to find the summation of 10 different numbers.
Solution
```
REM Program for find the summation
For i= 1 to 10
Read X
S=S+X
Next i
Print "summation is"; S
Data 5,8,90,67,45,3,2,88,6,1
```

Example-5
Write a program to compute the (N!) value. where N!=1*2*3….N
Solution
```
REM Program for find factorial value
Input N
F=1
For i= 1 to N
F=f*i
Next i
Print "the factorial is ";f
```

24

Example-6

Write a program to compute the summation of the series $S = \sum_{x=1}^{x=30} \frac{x}{x+1}$

Solution

```
For x=1 to 30
S=S+x/(x+1)
Next x
?S
```

serir

Example-7

Write a program to compute the mean and ST where:

$$\text{Mean} = \sum X_i / n \quad , V = \frac{\sum X_i^2 - (\sum X_i)^2 / n}{n-1}$$

Solution

```
Input N
For i=1 to n
Input x
S=S+x
SS=SS+x^2
Next i
Me = S/n
V=(SS-S^2/n)/(n-1)
ST=SQR(V)
Print "mean=";me
Print "var=";V
Print"STA=';ST
```

sories

Example-8

If N$ represent student name and X represent student degree ,write a program to print names and averages of the successful students only, if you know the successful degree 50% and the number of subject (5) and the number of students(150).

Solution

```
     For i= 1 to 150
     Input "name";N$
     S=0
     For K=1 to 5
     Input X
     If X<50 go to 10
     S=S+X
     Next K
     M=S/5
     Print "mean=';m
10   Next i
```

Example-9

Write a program to compute the summation of the series $S=1 +x+x^2/2!+x^3/3!$.

Solution

```
Read x
For i=0 to 3
F=1
For j=1 to i
F=f*j
Next j
S=S+x^i/f
Next i
Print S
Data 2
```

series //

Example-10

Write a program to compute the summation of following series(use 20 term)
$S=1+1/2!+1/3!+1/4!+1/5!+\ldots\ldots\ldots\ldots$

Solution

```
    N=1 : k=1
5   f=1
    For i=1 to k
    F=f*i
    Next i
    S=S+1/f
    K=k+1
    N=n+1
    If n<=20 then 5
    ? S
```

series //

Example-11

Write a program to compute cosx from the series :
$Cos(x)=1-x^2/2!+x^4/4!-x^6/6!+\ldots\ldots$,the program is stop when term value less than or equal 10^{-5}.

Solution

```
Read X
X=X*3.141592/180
K=1 : i=0
5 F=1
For j=1 to i: f=f*j :next j
T=x^i/f
If abs(t)>= 10^-5then
S=S+T*k
I=i+2 : k=-k
Go to 5
Print S
Data 3
```

series //

Example-12

Write a program read x value then compute S value from the following series:

$$S = \left(\frac{X-1}{X}\right) + \frac{1}{2}\left(\frac{X-1}{X}\right)^2 + \frac{1}{3}\left(\frac{X-1}{X}\right)^3 + \ldots\ldots + \frac{1}{10}\left(\frac{X-1}{X}\right)^{10}$$

Repeat the procedure to 4 of x values.

Solution

```
        I=1
10    Read X
        N= (x-1)/x
        For j=1 to 10
        S=S+n^j
        Next j
        Print X,S
        I=I+1
        If I<=4 then 10
        End
        Data 4
```

series

Example-13

write a program read x value then compute z value from the following series(use 20 term):

$$Z = X - \frac{X^2}{4!} + \frac{X^4}{8!} - \frac{X^6}{12!} + \ldots\ldots$$

Solution

```
        N=2 : j=1:k=1
        Read X
10    F=1
        For i=1 to n
        F=f*i
        Next i
        T=x^(n/2)/f
        Z=Z+T*k
        N=n+2
        j=j+1
        k=-k
        If j <=20 then 10
        Print Z
        Data 5
```

o.k series

<u>Do — Loop</u> : a control flow statement that repeat
a block of statements while condition is true or until a
condition becomes true.

* هذه من عباراتي التحكم، تقوم بتكرار الملية طالما الشرط، او حتى يكون
شرط معين.

لتعبير، عملية

Do { while : until} { Boolean expression} { statement block}
or → {statement block}
Loop

<u>or</u>

Do
{ statement block}
Loop { while : until} { Boolean expression}

* عبارات التكرار لها حالتين (while و until) لاتشير تأتي بعد كل while في
تتوقف العبارة والتكرار عند ما يتحقق الشرط false، اما تأتي بعد (until)
يعني تتوقف العبارة والتكرار عندما يتحقق الشرط true.

Until (false) ——→ عادي
      (true)   قف و غير العادي   false → true
While (true) ——→ عادي
      (false) قف و غير العادي   true → false

Boolean expression is an expression that will return non-zero
(true) or zero (false).

statement block is any number of statements on one or more
lines which are to be executed as long as Boolean expression
is true.

أمثلة ترضيخية

ex

```
sum = 0 : x = -1
do while x <> 0
input x
sum = sum + x
Loop
print sum
end
```

* تستمر الجملة بالبدء والتكرار طالما
قيمة x غير الصفر وتقوم بإضافة
هذه القيمة الى sum وتتوقف
الجملة عند ادخال قيمة صفر لـ x
عندما يتوقف الدوران .

ex

```
I = 0
do
I = I + 1
print I
Loop until I > 10
end
```

* في البداية نطبع العدد ١ وتستمر
بالدوران مالم تكن قيمة I اكبر من ١٠،
وتترتب على ذلك طبع الاعداد من ١ الى ١٠ .

ex

```
y = 1
do while y < 1000 and y <> 2 * (y \ 2)
input x
y = y * x
loop
print y
end
```

* حكمة ان يكون الشرط الذي يتوقف الدوران
مركبة ، كما هو موضح ،

ex write a program to compute the constant (π) according to the series: $[\pi = 4 (1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \dots)$.

Sol:

```
Rem The constant π (PI)
CLS
P=0 : S=1
input N
for i=1 to N
P = P + S * 1/(2*I-1)
S=-S
Next
P = P*4
print P
End
```

N=10 → 3.04184
N=20 → 3.091624
N=100 → 3.131593
N=1000 → 3.140593
N=10000 → 3.141498
N=1000000 → 3.141595

ex write a program to comput the constant (π) according to the series $[\pi = 4 (1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \dots)$, the program to be terminated if the difference between the term of series and π is less than 0.0001.

Sol:

```
Rem The Constant π
CLS
Const PI = 3.14159
P = 0 : S = -1 : E = 0.0001 : K = 0
Do
K = K+1
S = -S
P = P + S * 1/(2*K-1)
R = Abs(PI - 4*P)
Loop while R > E
P = P*4
print P, K
End
```

0.01 → 3.131593 (100)
0.001 → 3.140591 (998)
0.0001 → 3.14149 (9224)
0.00001 → 3.14158 (62370)

$$=$$

ex Write a program to find the largest power of three, that final result is less than 5000.

Sol:

```
Rem Power of three
CLS
I=0
Do Until 3^I > 5000
I = I+1
Loop
print "the value of power = "; (I-1)  → 7
print " 3 power to "; (I-1) ; (3^(I-1))  → 2187
End                              ↓7
```

ex Write a program to compute the value of following series $y = \frac{1}{x}$, the program to be terminated if the difference between two successive terms is less than 0.001.

Sol:

```
Rem Series
CLS
Let x=0
Let y=0
Do
x = x+1
G1 = 1/x
y = y + G1
G2 = 1/(1+x)
I = ABS( G1 - G2)
Loop while I > 0.001
print "y="; y
print " the term of No.="; x
print " the difference between two terms ="; I
end
```

الحل

$y = 4.058496$
$x = 32$
$I = 9.469688 \times 10^{-4}$

ex write a program to compute the sum of series:

$$T = 5 + 6 + 8 + 11 + 15 + 20 + 26 + \ldots + N$$

and the value of N must be less than 1000.

Sol:

```
Rem Series
CLS
Let Total = 5 : N = 5 : I = 1
DO
N = N + I
Total = total + N
I = I + 1
Loop Until N >= 1000   ⟹  Loop while N < 1000
Print " Summation = " ; total
End
```

$$(Total = 500490)$$

---

ex Write a program to print out first even number greater than 100 and, the ranking and the summation of the series:

$$Total = 1 + 2 + 3 + 5 + 8 + 13 + 21 + 34 + 55 + 84 + 144 + 233 + 377 + \ldots$$

Sol:

```
Rem Series
CLS
A = 1 : B = 2 : Total = 3 : K = 2
Do while c < 100  or  c <> 2 * INT(c/2)
C = A + B
K = K + 1
Total = total + C
A = B : B = C
Loop
print Total, C, K
end
```

الناتج

375 = 144   11

ex write a program to compute the value of $Y = \sin(x)$ for
$x = 0$ to $2 \ast pi$, using Do - Loop.

sol :

```
Rem   Y = sin(x)
CLS
Let Pi = 3.14159
Let x = 0
Do
Y = sin(x)
print " sin ("; x; ") = "; y
x = x + Pi/10
Loop until x >= 2 * pi
end
```

$\sin(0) = 0$

$\sin(0.314159) = -.3090167$

$\sin(.628318) = .5877848$

$\vdots$

$\sin(5.96902) = -.3090224$

$\sin(6.283179) = -6.024038 \ast$

10^{-6}

ex Write a program to compute the sum of the series:

$$y = \frac{2}{x} + \frac{6}{x^2} + \frac{18}{x^4} + \frac{54}{x^8} \cdots + 0.001$$

the program to be terminated if the last term of the series
will be less 0.001, where the value of x is greater than 1.

sol:

```
Rem the series
Let K = 2 : y = 0        cls
Input x
Do
Y = Y + (K/x)
x = x^2
K = K * 3
Loop until (K/x) <= 0.001    [ or while >= ]
print Y
end
```

Arrays and Matrices   المصفوفات او المتغيرات المصفوفية

* عند تسمية المتغير البسيط سواء أكان عدديا او رمزيا او متغير مقيد فانه يحجز موقعاً
واحداً في الذاكرة. وعند اعطاء المتغير عدة قيم فان القيمة الاخيرة هي التي تستقر في موقع
وتلغي القيم التي قبلها. ونظرا للحاجة الى القيم المتعددة الثابتة فذلها المتغيرات في البرنامج
جاءت المتغيرات المصفوفية لحل كل و المسالة.

* يستخدم الامر Dim لتعريف المتغيرات المصفوفية وحجز مواقع متجاورة لهاني للذاكرة. ويجب
ان تسبق جملة Dim اية جملة تنفيذية تحتوي المتغيرات المصفوفية المعرفة. علماً انه اذا
كانت المواقع محجوزة في صف واحد فنسمي المتغير المصفوفي احادي البعد (متجه) واما اذا
كانت المواقع بهيئة صفوف واعمدة فنسمي المتغير المصفوفي ثنائي البعد ، وهناك هناك و
متغيرات مصفوفية ثلاثية الابعاد.

* يجب ان تكون ابعاد المصفوفات ارقام محددة وموجبة دائماً   A (5,8)
* يجب ان يكون ، تعجيم الحاسبي واقل، لاقواس (داخلي رقم صحيح موجب)   x (K)
* ممكن ان تضم تعبير حسابي جمعي   M (K+2)
* ممكن ان تضم تعبير حسابي ضربي   AB (3×J)
* ممكن ان تضم تعبير حسابي متعدد   A (2×K+1)
* لا يجوز ان يكون البعد للمصفوفة رقم صحيح سالب   B (−10)
* ، ، ، ، ، ، ، ، ، صفر   B (∅)
* ، ، ، ، ، ، ، داخل ابعا دوصفوفة اخرى   B (2 × A (i))
* لا يجب زا استخدام اسم متغير للمصفوفة قدتم استخدام كمتغير اعتيادي   A (10) , A

<u>ex</u>   Dim x (10)

1	2	3	4	5	6	7	8	9	10
92	−11	·25	80	100	——	——	——	——	200

$$x (1) = 92$$
$$x (5) = 100$$

<u>ex</u>   Dim name$ (8)

1	2	3	4	5	....	8
ahmed	lyma	rana	walid	ali		faris

ex   b(3,4)   x(3,3)

10   15   -3   2.5   2   6   8
2   1   1.5   90   5   9   1
5   10   10   2   5   1   7

b(2,1) = 2
b(2,4) = 90
x(2,3) = 1
x(3,1) = 5

ex   ٨ قيمة العناصر في المصفوفة

```
dim a(10)
for i=1 to 10
read a(i)
next
data 4, 7, -2, 3.5, 20, 7, 12, 9, 2, 15
```

ex   for i=1 to 10   طباعة المصفوفة
```
print a(i)
next
```

ex   dim x(12)
```
for k=1 to 12
read x(i)
next
data 90, 67, 89, 54, 34, 80, 70, 66, 40, 100, 60, 50
for k=1 to 10
print x(k)
next
```

ex
```
s=0
dim a(15)
for i=1 to 15
input a(i)
s = s + a(i)
next
print s
end
```

يشمل هذا المثال ادخال عناصر
المصفوفة ثم القيام بجمعها
وطباعتها

ex
```
dim (10)
for k=1 to 8
read x(k)
next
data 90, 68, 79, 45, 88, 70, 79, 56
for k=1 to 8
if x(k) >= 50 then
print x(k)
end if
next
end
```

يقوم هذا المثال بادخال عشرة اعداد C
ثم القيام بطباعة الارقام التي
هي فوق الـ 50.

ex Write a program to input the student's names and their
degrees and then print out the names of successful students
and their degrees.

sol
```
Rem Names & Degree
Dim name$(12), x(12)
for i=1 to 12
input Name$(i), x(i)
next
for i=1 to 12
if x(i) >= 50 then
print name$(i), x(i)
end if
next          end
```

ex write a program to input one dimensional array of 11
    elements then reverse it in order.

sol

```
Rem array
dim A (11)
CLS
for i=1 to 11
input "inter number", A(11)
next
for i=1 to 5
K = A(i)
A(i) = A(12-i)
A(12-i) = K
next
for i=1 to 11
print a(i)
next i
end
```

ex Write a program to compute the value Y.
$$Y = \sqrt{\sum_{i=1}^{N} (A_i - B_i)^3}$$

Sol:
```
Rem Value Y  → input n
Dim A(n), B(n)
for i=1 to n
sum = sum + a(i) - b(i)
next
sum = (sum)^(3/2)
print sum
end
```

ex: write a program to find the positive, negative and zeros numbers and their summation in one dimensional array of N elements.

solution

```
Rem S1 : summation of positive numbers
Rem S2 : summation of negative numbers
Rem post : no. of positive numbers
Rem negt : no. of negative numbers
Rem zer : no. of zeros
input "N=", N
Dim a(n)
for i=1 to n
input a(i)
next
for i=1 to n
if a(i) >0 then
Post = post + 1
S1 = S1 + a(i)
elseif A(i) <0 then
negt = negt + 1
S2 = S2 + a(i)
else
zer = zer + 1
endif
next
print " positive number = "; Post
print " negative number = "; negt
print " zeros = "; zer
print " summation of positive number = "; S1
print " summation of negative number = "; S2
end
```

ex ~~find~~ Write a program to find the largest number in array of N elements.

Sol:

```
Rem Largest Number of in Array
CLS
input " Dimension of Array"; N
Dim a(n)
for i=1 to n
input "number="; a(I)
next
Let Large = a(I)
for i= 2 to n
if Large < A(i) then large = a(i)
next i
print "Large number ="; Large
end
```

ex If A & B are both one dimensional arrays of same size. It i desire to create a third array C whose entities are arrange in th following orders A1, B1, A2, B2, A3, B3, ...

Solution

```
Rem Three arrays
CLS
input " Array Dimension"; N
Dim A(N), B(N), C(2×N)
for i=1 to N
input "A "; A(i)
input "B"; B(i)
next
for i = 1 to N
C(2×I-1) = A(i)
C(2×I) = B(i)
next
```

```
for i=1 to (2*n)
print C(i)
next
end
```

ex   Write a program to rearrange two arrays that contain the
     name and degree of 10 students in descending order.

Sol :

```
Rem Student Degree
CLS
Dim A(10), Name$(10)
for i=1 to 10
input " The name of student = "; Name$(i)
input " The degree of student = "; a(i)
next i
for i=1 to 9
for j= (i+1) to 10
if a(j) > a(i) then
K = a(i)
a(i) = a(j)      } swap a(i), a(j)
a(j) = K
L$ = name$(i)
name$(i) = name$(j)   } swap name$(i), name$(j)
name$(j) = L$
endif
next
next
for i=1 to 10
print" the name of Student ", Name$(i)
print " the degree of student "; A(i)
next
end
```

ex Write a program that reads a variable A from the user and put it as the first element in one dimensional array (x(10) , then calculate other element as each element is double its pre/m value.

Sol :

```
Rem X(10)
CLS
Dim x(10)
input A
x(1) = A
for i = 2 to 10
x(i) = x(i-1) * 2
next
for i = 1 to 10
print x(i)
next
end
```

another solution

```
Rem x(10)
CLS
Dim x(10)
input A
x(1) = A
for i = 2 to 10
x(i) = A * 2 ^ (i-1)
Next
for 1 to 10
print x(i)
next
end
```

ex   Write a program to read the array A(15), then remove
all zeros from A(15) and print out the new B(15).

sol:

```
Rem  Zero Array
CLS
Dim A(15), B(15)
for i=1 to 15
input A(i)
next
K=0
for i=1 to 15
if A(i)=0 then 10
K=K+1
B(K)= A(i)
10 next
for i=1 to K
print B(i)
next
end
```

ex Write a program to searching a number inside a one dimensional
array a(10) then print out the number and its position.

sol:

```
Dim a(10)
input x
for i=1 to 10
read a(i)
data 5,6,7,8,9,5,1,2,3,4
next
for i=1 to 10
if a(i) <> x then 10
print x , i
10  next
end
```

quiz "section A"

ex Write a program to compute the following series ($Log(x)$)
, where x is greater than x, the program to be terminated
when the last value of the series is less than 0.001.
using Do Loop statement.

$$T = 2 \left[\left(\frac{x-1}{x+1}\right) + \frac{1}{3}\left(\frac{x-1}{x+1}\right)^3 + \frac{1}{5}\left(\frac{x-1}{x+1}\right)^5 + \cdots + \frac{1}{(2n-1)}\left(\frac{x-1}{x+1}\right)^{(2n-1)} \right.$$

```
CLS
y=0
input x
Do
i=i+1
a=x-1 ; b=x+1
T=1/(2*i-1) * (a/b)^(2*i-1)
y=y+T
Loop while (T > 0.001)
y=y*2
print y
end
```

~~~~~~~~~~~~~~~~~~~~~~~~~~~~

```
y=0
input x,n
for i=1 to n
a=x-1 ; b=x+1
y=y+1/(2*i-1) * (a/b)^(2*i-1)
next
y=y*2
print y
end
```

☞ Write a program to compute the value y according to the following series:

$$y = \frac{2A}{8!} - \frac{3B}{7!} + \frac{2A}{6!} - \frac{3B}{5!} + \cdots\cdots - \frac{3B}{1!}$$

```
y = 0
input a, b
Do
i = i + 1
w = 9 - i
f = 1
for j = 1 to w
f = f * j
next
if f = 2 * (i/2) then
y = y - 3 * b/f
else
y = y + 2*a/f
endif
Loop while i < 8
print y
end
```

```
y = 0
input a, b
for i = 1 to 8
w = 9 - i
f = 1
for j = 1 to w
f = f * j
next
if i <> 2 * (i/2) then
y = y + 2*a/f
else
y = y - 3*b/f
end if
next
print y
end
```

ex Write a program to compute the sin(x) value according to the following series: $\sin(x) = x - \dfrac{x^3}{x!} + \dfrac{x^5}{5!} - \dfrac{x^7}{7!} + \cdots + \dfrac{(-1)^{N-1} x^{(2N-1)}}{(2N-1)!}$,

the program to be terminated until the difference between the value of series and the value of sin(x) is less than (.001), Using Do Loop Statement.

```
Let pi = 3.14159
Let T = 0 : S = 1
input x
d = x
x = x * pi/180
r = sin(x)
Do
i = i + 1
F = 1
  for j = (2*i-1) to 1 step -1
  f = f*j
  next
T = T + S* x^(2*i-1)/f
S = -S
e = ABS(T-r)
Loop while e > 0.001
print "sin(" ; d ; ") = " ; T
end
```

```
const Pi = 3.14159
T = 0 : S = 1
input x, n
d = x
x = x * pi/180
for i = 1 to n
f = 1
for j = 1 to i
f = f*j
next
T = T + S* x^(2*i-1)/f
S = -S
next
print T
end
```

ex. Write a program to compute the $\cos(x)$ value according to the following series: $\cos = 1 - \dfrac{x^2}{2!} + \dfrac{x^4}{4!} - \dfrac{x^6}{6!} + \dots \dfrac{(-1)^{n-1} x^{6n}}{(2N-2)!}$

→ the difference between

the program to be terminated until the value of series and the value $\cos(x)$ is less than (0.001) & Using Do Loop Statement.

```
let pi = 3.14159
let T=0 ; S=1
input x
d=x
x = x * pi/180
Y = cos(x)
do
i = i+1
f=1
for j = (2*i-2) to 1 step -1
if j=0 then
f=1
end if
f = f*j
next
T = T + S * x ^(2*i-2)/f
S=-S
e = ABS (t-r)
loop until e < 0.001
print "Cos ("; d;") = "; t
end
```

```
Const pi = 3.14159
T=0
input x, n
d = x
x = x * pi/180
for i=1 to n
f = 1
for j = (2*i-2) to 1 step -1
if j=0 then
F=1
end if
f = f*j
next
T = T +(-1)^(i-1) *
            x ^(2*i-2)/f
next
print T
end
```

quiz (A)   ex Write a program to read the array a(10), then put the second
five elements in the beging and put the first five
elements in the last in the array b(10).

```
CLS
dim  a(10), b(10)
for i=1 to 10
input a(i)
next
for i=1 to 10
if i>5 then
b(i) = a(i-5)
else
b(i) = a(i+5)
endif
next
for i=1 to 10
print b(i)
next
end
```

ex Write a program to read the array a(n)
and put the odd nos. in the array b(n) and
the even nos. in the array c(n).

quiz [C 8D]

```
CLS
dim a(n) , b(n), c(n)
for i=1 to n
input a(i)
next
ev=0 : od=0
for i=1 to n
if a(i) = 2 * int(a(i)/2) then
ev = ev+1
C(ev) = a(i)
else
od = od+1
b(od) = a(i)
end if
next
for i=1 to ev
print c(i)
next
for i= 1 to od
print b(i)
next
end
```

المصفوفة ذات البعدين (Two - Dimensional Array)

* قراءة وطباعة مصفوفة ذات بعدين :

```
CLS
input n, m
Dim a(n, m)
for i=1 to n
for j=1 to m
  input a(i,j)
next : next
```
قراءة المصفوفة

```
for i=1 to n
for j=1 to m
print a(i,j)
next : next
```
طباعة المصفوفة

أيضا لكل المصفوفة ثنائية الأبعاد

$$a(4,4) = \begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix}$$

القطر الثانوي —

القطر الرئيسي →

* عناصر القطر الرئيسي ← $i = j$
* عناصر القطر الثانوي ← $i + j = N+1$
* عناصر المثلث فوق القطر الرئيسي ← $i < j$
* عناصر المثلث تحت القطر الرئيسي ← $i > j$
* عناصر المثلث فوق القطر الثانوي ← $i + j < N+1$
* عناصر المثلث تحت القطر الثانوي ← $i + j > N+1$

ex Write a program to read the array a(3,3), and then find max. no. in the array and its position.

```
CLS
dim a(3,3)
for i=1 to 3
for j=1 to 3
input a(i,j)
next : next
max = a(1,1) : L=1 : k=1
for i=1 to 3
for j=1 to 3
if max < a(i,j) then
max = a(i,j)
L=i : k=j
endif
next : next
print max, L, k
end
```

ex Write a program to find the summation of array elements. a(3,3).

```
CLS
dim a(3,3)
for i=1 to3
for j=1 to 3
input a(i,j)
next : next
sum = 0
for i=1 to3
for j=1 to3
sum = sum + a(i,j)
next : next
print sum
end
```

ex. Write a program to read the array a(4,4) and replace the main diagonal with the secondary diagonal and then print it out.

```
CLS
dim a(4,4)
for i=1 to 4
for j=1 to 4
input a(i,j)
next : next
for i=1 to 4
swap a(i,i), a(i,5-i)
next
for i=1 to 4
for j=1 to 4
print a(i,j);
next : next
end    print:
```

```
CLS
dim a(4,4)
for i=1 to 4
for j=1 to 4
input a(i,j)
next : next
for i=1 to 4
for j=1 to 4
if i=j then
swap a(i,i), a(i,5-i)
end if
next : next
for i=1 to 4
for j=1 to 4
print a(i,j);
next : next
end    → print:
```

ex. Write a program to read the array a(6,6) and replace the fifth row with the first row and replace the second column with fourth column.

```
CLS
dim a(6,6)
for i=1 to 6
for j=1 to 6
input a(i,j)
next : next
for i=1 to 6
swap a(1,j), a(5,i)
next
```

```
for i=1 to 6
swap a(i,2), a(i,4)
next
for i=1 to 6
for j=1 to 6
print a(i,j);
next : print: next
end
```

ex Write a program to read the array a(4,4) and replace the first
 row with fifth row and replace the second row with third row.

```
CLS
dim a(4,4)
for i=1 to 4
for j=1 to 4
input a(i,j)
next : next
 for i=1 to 4
swap a(2,i), a(3,i)
swap a (1,i) , a(4,i)
next
 for i=1 to 4
 for j=1 to 4
 print a(i,j)
next : next
end
```

ex Write a program to read the array (n,n) and put the triangular
 elements upper the main diagonal with zeros nos.

```
CLS                              for i=1 to n
input n                          for j=1 to n
dim a(n,n)                       print a(i,j);
for i=1 to n                     next : print : next
for j=1 to n                     end
input a(n,n)
next : next
for i=1 to n
for j=1 to n
if i<j then a(i,j)=0
next : next
```

ex Write a program to read the array a (6,6) , then calculate the average for each row and put the averages in one dimensional array b(6).

```
CLS
Dim a(6,6) , b(6)
for i=1 to 6
for j=1 to 6
input a(i,j)
next & next
for i=1 to 6
S=0
for j=1 to 6
S=S+a(i,j)
next
ave = S/6
b(i)= ave
next
for i=1 to 6
print b(i)
next
end
```

ex write a program to read the array a (6,6) , and then calculate the nos. positive, negative and zeros nos.

```
CLS
n=0; p=0 & z=0
Dim a (6,6)
for i=1 to 6
for j=1 to 6
input a(i,j)
next & next
for i=1 to 6
for j=1 to 6
if a(i,j) >0 then p=p+1
if a(i,j) <0 then n=n+1
if a(i,j) =0 then z=z+1
next & next
print p,n,z
end
```

and printout

ex Write a program to read the array a(4,4) and find max. no. in each row and print its position.

```
CLS
Dim a(4,4)
for i=1 to 4
for j=1 to 4
input a(i,j)
next s next
for i=1 to 4
Max= -1E30
for j=1 to 4
if a(i,j) > max then
                              Max= a(i,j)
                              L=i : K=j
                              end if
                              next
                              print max, k, K
                              next
                              end
```

ex Write a program to compute multiply table.

```
CLS
input n
Dim a(n,n)
for i=1 to n
a(i,j) = i*j
next s next
for i=1 to n
for j=1 to n
print a(i,j);
next s print s next
end
```

ex: Write a program to read the array b(n,n) and find the max and min value in lower ~~triangular~~ triangular of ~~in~~ the main diagonal.

```
input n
dim b(n,n)
for i=1 to n
for j=1 to n
input b(n,n)
next : next
max = b(2,1) : min=b(2,1)
for i=1 to n
for j=1 to n
```

```
if i>j and b(i,j) > max then
  max = b(i,j)
elseif i>j and b(i,j) < min then
  min = b(i,j)
endif
next : next
print max, min
end
```

إذا كان المطلوب إيجاد أكبر وأصغر قيمة في أعلى القطر

```
max= b(1,2) : min = b(1,2)
if i<j and b(i,j) > max then
```

ex: Write a program to read the array b(4,4) and replace the elements of upper triangular ~~of~~ with the elements of lower triangular of the secondary diagonal.

```
CLS
dim b(4,4)
for i=1 to 4
for j=1 to 4
input b(i,j)
next : next
for i=1 to 4
for j=1 to 4
if i+j<5 then swap b(i,j), b(5-j,5-i)
next : next
```

```
for i=1 to 4
for j=1 to 4
print b(i,j);
next : print : next
end
```

$$j = N+1-j$$

$$N+1-j$$

ex Write aprogram to read the array a(4,4) and searching
about the min value of the rows and print out the position
Summation of this
and summation of the row.

```
dim a(4,4)                    if s > min then
for i=1 to 4                  r=i
for j=1 to 4                  min = s
input a(i,j)                  endif
next & next                   next
min = 1.0 E 30                print "Row no=" ; R , "Sum=" ; min
for i=1 to4
s=0
for j=1 to4
s= s+a(i,j)
next
```

ex Create the array b(m,m) , where the element of
main diagonal equal to one and the other elements
is equal to zero.

```
input m
dim b(m,m)
for i=1 to m
for j= to m
if i=j then b(i,j)=1
if i<>j then b(i,j)=0
next & next
for i=1 to m
for j=1 to m
print b(i,j);
next & print & next
end
```

ex: Write a program to read the array a(n,m) and print out the max & min value in each row.

```
input n,m
dim a(n,m), max(n), min(n)
for i=1 to n
for j=1 to m
input a(i,j)
next : next
for i=1 to n
min(i) = a(i,1) : max(i) = a(i,1)
for j=1 to m
if a(i,j) < min(i) then
min(i) = a(i,j)
elseif a(i,j) > max(i) then
max(i) = a(i,j)
endif
next
print min(i), max(i)
next
end
```

نفس السؤال السابقة a(n,m) ولكن المطلوب استخراج الكبرى والصغرى في كل عمود

```
for j=1 to m
min(j) = a(1,j) : max(j) = a(1,j)
for i=1 to n
if a(i,j) < min(j) then
min(j) = a(i,j)
elseif a(i,j) > max(j) then
max(j) = a(i,j)
endif
next
print max(j), min(j)
next : end
```

ex Write a program to read the array x(n,m) and print out the array after replace $ the max value with min value, and print out these two nos.

```
input n, m
dim x(n, m)
for i=1 to n
for j=1 to m
  input x(i, j)
next : next
max = x(1,1) : min(1,1)
for i=1 to n
for j=1 to m
  if x(i,j) > max then
  max = x(i,j)
  cl = j : rl = i
  elseif x(i,j) < min then
  min = x(i,j)
  cs = j : rs = i
  endif
next : next
swap x(rl, cl), x(rs, cs)
for i=1 to n
for j=1 to m
print x(i,j);
next : print : next
print min, max
end
```

الجمع الجبري للمصفوفات

* حتى يتم جمع المصفوفات يجب ان تكون متماثلة الابعاد. وتكون المصفوفة الناتجة بنفس ابعاد المصفوفات المراد جمعها. ويتم جمع العناصر المتماثلة في المصفوفتين معا جبريا. فالاجراء الجبري يجري للمصفوفات A,B ولا يستخرج المصفوفة الناتجة

$$A(2,3) + B(2,3) = C(2,3)$$

* تكوّن حلقة لمعالجة الشيء في بعد ترتيب العناصر للمصفوفات A,B وكالاتي:

```
For i=1 to 2
for j=1 to 3
c(i,j)= a(i,j) + b(i,j)
next : next
```

* وبنفس الطرح تغير الاشارة لعملية الطرح السالبة ونستمر في نفس الحلول اكل.
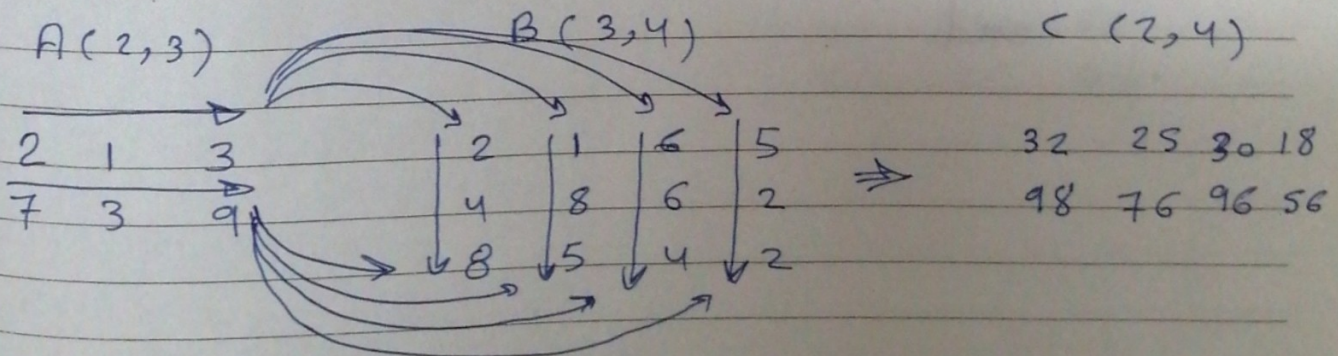
ضرب المصفوفات

* حتى تضرب المصفوفات يجب ان تكون عدد V صفوف في المصفوفة الاولى مساوياً الى عدد الصفوف في المصفوفة الثانية. وتكون المصفوفة الناتجة لها عدد صفوف الاولى وعدد اعمدة المصفوفة الثانية.

$$\underset{\text{مشتريات}}{A(2,3)} * \underset{}{B(3,4)} \implies C(2,4)$$

ابعاد المصفوفة الجديدة

A(2,3)   B(3,4)   C(2,4)

2	1	3
7	3	9

2	1	6	5
4	8	6	2
8	5	4	2

$\implies$

32	25	30	18
98	76	96	56

ex Write a program to input two dimensional arrays
A(2,3), B(3,4) and find the multiplication array A
with array B.

Sol.

```
Dim A(2,3), B(3,4), C(2,4)
for i=1 to 2
for j=1 to 3
read a(i,j)
next: next
data 2,1,3,7,3,9
for i=1 to 3
for j=1 to 4
read b(i,j)
next: next
data 2,1,6,5,4,8,6,2,8,5,4,2
for i=1 to 2
c(i,j)=0
for j=1 to 4
for k=1 to 3
c(i,j)= c(i,j)+ a(i,k)*b(k,j)
next: next: next
for i=1 to 2
for j=1 to 4
print c(i,j);
next: print: next
end
```

ex Write a program to read the array a(3,4) and print out its transpose at(4,3).

Sol

```
dim a(3,4), at(4,3)
for i=1 to 3
for j=1 to 4
read a(i,j)
next : next
data 60, 25, 40, 80, 28, 75
data 42, 36, 92, 50, 66, 90
for i=1 to 4
for j=1 to 3
at(i,j) = a(j,i)
next : next
for i=1 to 4
for j=1 to 3
print at(i,j);
next : print : next
end
```

a(3,4)

at(4,3)

$$\begin{bmatrix} 60 & 25 & 40 & 80 \\ 28 & 75 & 42 & 36 \\ 92 & 50 & 66 & 90 \end{bmatrix} \Longrightarrow \begin{bmatrix} 60 & 28 & 92 \\ 25 & 75 & 50 \\ 40 & 42 & 66 \\ 80 & 36 & 90 \end{bmatrix}$$