***الفصل الاول***

***المصفوفات***

***المصفوفاتThe Matrix***

***تعرف المصفوفة: حسب لغات البرمجة بأنها تجمع المعطيات من نفس النوع. ويمكن الرجوع إلى أي عنصر من هذا التجمع بواسطته (أي من خلال مؤشر نسميه المميز). تتدرج المصفوفات في Fortran 90 مابين احادية المميز ( أحادية البعد), ومابين مصفوفات متعددة المميزات (متعددة الأبعاد).***

***1- المصفوفات ذات البعد الواحدOne Dimension Array***

 ***مصفوفة فيها عدد من العناصر مرتبة بشكل أفقي أو عمودي.***

***جملة الأبعاد (Dimension): هو المتغير الذي يكون صفآ.***

***Real, Dimension (First: Last)::Name***

***Integer, Dimension (First: Last)::Name***

***Logical, Dimension (First: Last)::YesNo***

***Character (Len = No.), Dimension (First: Last)::char-list***

***Real, Dimension (1:9)::X, Y***

 ***Character(Len =8), Dimension(0:17)::Char-list***

***Example (1): Write program to read in the element values of array X(10), then print out the array in descending order?***

***Solution:***

***Program descending***

***Implicit None***

***Integer:: I, J, K, L***

***Real, Dimension(1:10)::x***

***Real:: A***

***Do I = 1, 10***

***Print\*,"Input x", (I)***

***Read\*, x(I)***

***End Do***

***Do J =1, 9***

***Do K =J + 1, 10***

***If (x(J)< x(K)) then***

***A = x(J)***

***x(J) = x(K)***

***x(K) = A***

***End If***

***End Do***

***End Do***

***Do L = 1, 10***

***Print\*, "x(L) =", x(L)***

***End Do***

***End program descending***

***Example (2): The following program reads in the 12 monthly values from the terminal, computes the sum and average for the year, and prints the average out?***

***Solution:***

***Program Rainfall***

***Implicit None***

***Real, Dimension(1:12)::R***

***Real:: sun, average***

***Integer:: M***

***Do M =1, 12***

***Print\*,"Input the rainfall values"***

***Read\*, R(M)***

***End Do***

***Sum=0***

***Do M = 1, 12***

***sum = sum + R(M)***

***End Do***

***Average = sum/ 12***

***Print\*, "Average monthly rainfall was", Average***

***End Program Rainfall***

***المصفوفات ذات البعدين Two Dimension Array***

***تعتبر مجموعة البيانات (Data) من (أرقام, رموز,...) المرتبة على شكل عدد من الصفوف (ألأسطر) وعدد من الأعمدة بمثابة مصفوفة ذات بعدين.***

***1- Reading the matrix by Rows (Read Row by row)a) Do I = 1, 2***

***Do J = 1, 3***

***Read\*, x(I, J)***

***End Do***

***End Do***

***b)Do I =1, 2***

***Read\*, (x(I, J), J =1,3)***

***End Do***

***c)Read\*, ((x(I, J), J=1, 3), I=1, 2)***

***\* Print the matrix (Row by Row)***

***Do I =1, 2***

***Print\*, (x(I, J), J=1, 3)***

***End Do***

***2- Reading the matrix by columns***

***(Read column by column)***

***a)Do J = 1, 3***

***Do I = 1, 2***

***Read\*, x(I, J)***

***End Do***

***End Do***

***b)Do J=1, 3***

***Read\*, (x(I, J), I=1,2)***

***End Do***

***c) Read\*, ((x(I, J), I=1, 2), J=1, 3)***

***\* Print the matrix (column by column)***

***Do J =1, 3***

***Print\*, (x(I, J), I=1, 2)***

***End Do***

***Example (1): Write program to find the sum of matrix A(2, 3) and B(2, 3)to result the matrix C(2, 3)?***

***A=***$\begin{matrix}5&6&8\\3&52&4\end{matrix}$ ***B =*** $\begin{matrix}12&57&3\\5&6&9\end{matrix}$ ***Result the matrix C =*** $\begin{matrix}17&63&11\\8&58&13\end{matrix}$

***Answer:***

***Program matrix***

***Implicit None***

***Integer, Dimension (1:2, 1:3)::A, B, C***

***Integer:: I, J***

***Print\*, "Input the matrix A"***

***Read\*, ((A(I, J), J=1, 3), I=1, 2)***

***Print\*, "Input the matrix B"***

***Read\*, ((B(I, J), J=1, 3), I=1, 2)***

***Do I=1, 2***

***Do J=1, 3***

***C(I, J) = A(I, J) + B(I, J)***

***End Do***

***End Do***

***Print\*, "the matrix C is"***

***Do I = 1, 2***

***Print\*, (C(I, J), J=1, 3)***

***End Do***

***End program matrix***

***Example(2): Write program to find the magnitude of matrix multiplication A(2, 3) and B(3, 4)?***

***A(2, 3 )*** $\begin{matrix}2&1&3\\7&3&9\end{matrix}$ ***\* B(3, 4)***$\begin{matrix}2&1&6&5\\4&8&6&2\\8&5&4&2\end{matrix}$ ***= C(2, 4)*** $\begin{matrix}32&25&30&18\\98&76&96&59\end{matrix}$

***Solution:***

***Program matrix***

***Integer, Dimension (1:2, 1:3)::A***

***Integer, Dimension (1:3, 1:4)::B***

***Integer, Dimension (1:2, 1:4)::C***

***Integer::I, J, K***

***Print\*, "Input the matrix A"***

***Read\*, ((A (I, J), J=1, 3), I=1, 2)***

***Print\*, "Input the matrix B"***

***Read\*,((B(I, J), J=1, 4), I=1,3)***

***Print\*, "the matrix C is"***

***Do I=1, 2***

***Do J=1, 4***

***C(I, J)=0***

***Do K = 1, 3***

***C(I, J) = C(I, J)+ A(I, K) \* B(K, J)***

***End Do***

***End Do***

***End Do***

***Do I=1, 2***

***Print\*, (C(I, J), J=1, 4)***

***End Do***

***End program matrix***

***Example(3):Write a program to integrate two array A and B in array C as following? A B C***

***a1***

***a2***

***a3***

***a4***

***a5***

***a6***

***b1***

***b2***

***b3***

***b4***

***b5***

***b6***

***a1***

***b1***

***a2***

***b2***

***a3***

***b3***

***a4***

***b4***

***a5***

***b5***

***a6***

***b6***

***Solution:***

***Program Q3***

***Implicit None***

***Real, Dimension(1:6)::A***

***Real, Dimension(1:6)::B***

***Real, Dimension(1:12)::C***

***Integer::I, J, K, L, M***

***Do I = 1, 6***

***Print\*,"Input A"***

***Read\*, A(I)***

***End Do***

***Do J = 1, 6***

***Print\*,"Input B"***

***Read\*, B(J)***

***End Do***

***L =0***

***Do K = 1, 12, 2***

***L =L+1***

***C(K) =A (L)***

***C(K+1) = B(L)***

***End Do***

***Do M =1, 12***

***Print\*," C(M) =", C(M)***

***End Do***

***End Program Q3***

***Example (4): Write program to print student name and his average for six marks after reading the name for each students and his degrees to eight students?***

***Solution:***

***Program Q4***

***Implicit None***

***Real, Dimension (1:6)::M***

***Character (Len=9), Dimension(1:8)::A$***

***Real, Dimension(1:8)::Average***

***Real::Sum***

***Integer::I, J***

***Do I =1, 8***

***Sum =0***

***Print\*, "Input A$"***

***Read\*, A$(I)***

***Do J=1, 6***

***Print\*,"Input M"***

***Read\*, M(J)***

***Sum = Sum + M(J)***

***End Do***

***Average(I) =Sum/6***

***Print\*,"A$(I)=", A$(I)***

***Print\*,"Average (I)=", Average (I)***

***End Do***

***End programQ4***

***Example (5): Write Program to find the array C, It ̓s elements represent sum of each row of array B(3, 4)?***

 ***B =*** $\begin{matrix}2&3&1&6\\5&7&0&2\\2&5&2&4\end{matrix}$

***Solution:***

***Program Q5***

***Implicit None***

***Integer, Dimension (1:3, 1:4)::B***

***Integer, Dimension (1:3)::C***

***Integer: I, J, K***

***Print\*, "Input the matrix B"***

***Read\*, ((B(I, J), J =1, 4), I=1, 3)***

***Do I =1, 3***

***C(I)=0***

***Do J =1, 4***

***C(I) =C(I) + B(I, J)***

***End Do***

***End Do***

***Do K =1, 3***

***Print\*, "C(K)=", C(K)***

***End Do***

***End Program Q5***

***Home Work***

***Q1: Write program to read in the element value of X(12), then add the value of D to become the 5th element in the new array X(13)?***

***Q2: Write program to input elements values of array A(6), then print the matrix B that represent inverse (inverted) values of array A?***

***Q3: Write program to read names of 50 students and 4 marks for each students, the program print name and average of less three students successful in average?***

***Q4: Write program to read elements of array A(N) their values are positive and negative, where the positive values in this array represent the matrix B and the negative values in array C, and then print the arrays B & C?***

***Q5: Write program to find fourth row for array B(3,4) their elements represent average of each column elements?***

***Q6: write program to make the array B their elements is large element value in each row and the array C their elements is smaller element value in each column form array A (4, 5)?***