**Homework 11**

**( Select three at least, more will be extra points任選三題,多作當成加分題)**

**( You can use dynamic array or static array in the following problems.**

**But dynamic array prefer)**

**第一題:Design a program to simulate 100 rolls of a six-sided die:**

**Count the number of times each side of die appears and for**

**each count use “\*” to print out. The output format will be:**

**1.:\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**2.:\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**3.:\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**4.:\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**5.:\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**6.:\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**第二題: Design a program to print out the result of matrix multiplication.**

**Example:**

** ×  = **

**第三題:**

**We have the following score data, the last one represents the end of mark, not the data.**

**72,23,38,86,62,29,99,96,67,78,87,76,65,58,86,69,93,34,45,55**

**52, 7,74,48,83,39,90,18,82,26,65,53,39,96,66,-1**

**(a). Calculate the average score of the data.**

**(b). Count the number of data in each interval. The difference between each interval is 10 point. ( 統計各區間人數, 區間差距為10分) That is**

**0~9, 10~19, 20~29, 30~39, 40~49,50~59, 60~69,70~79, 80~89, 90~100**

**(c). Count the number of data above the average and below the average.**

**(d).The output format will be:**

**\*\*\*\*\*SCORE REPORT\*\*\*\*\***

**MEAN = ##.###**

**ABOVE MEAN = ##**

**BELOW MEAN = ##**

**0~ 9: \***

**10~ 19: \***

**20~ 29: \*\*\***

**30~ 39: \*\*\*\***

**40~ 49: \*\***

**50~ 59: \*\*\*\***

**60~ 69: \*\*\*\*\*\***

**70~ 79: \*\*\*\***

**80~ 89: \*\*\*\***

**90~ 100: \*\*\*\*\***

**第四題:**

**Find specified-length palindromic sequences of nucleotide pairs in a portion of a DNA molecule whose complementary strands are represented as strings. Note that palindromic regions are of great interest to researched studying the transmission of the genetic information encoded in DNA.**

**Although we recall that a palindrome is a string that reads the same forward and backward, such as “Madam, I’m Adam” or “Able was I ere I saw Elba”, we must first see how closely this definition applies to the palindromes of DNA molecules.**

**DNA is a double-stranded molecule composed of pairs of the nucleotide Adenine, Thymine, Cytosine, and Guanine. Adenine always pairs with Thymine and Cytosine pairs with Guanine. The following figure shows a portion of a DNA molecule in which the complementary strands are ATCGCAT… and TAGCGTA…**

**A-T-C-G-C-A-T-G-C-G-T-A-G**

**T-A-G-C-G-T-A-C-G-C-A-T-C**

**The molecule portion shown contains a palindromic sequence of 8 nucleotide pairs.This region is palindromic because the sequence of nucleotides along the top strand, C-G-C-A-T-G-C-G, is exactly the reverse of the sequence along the bottom strand, G-C-G-T-A-C-G-C.**

**Given string representing the complementary strands and a length value, find all palindromic sequences of the specified length.**

**Execution:**

**Enter on strand of DNA molecule segment:**

**ATCGCATGCGTAG**

**Enter complementary strand:**

**TAGCGTACGCATC**

**Enter length of palindromic sequence: 8**

**The DNA:**

**ATCGCATGCGTAG**

**TAGCGTACGCATC**

**Palindromes of length is 8**

**Palindrome at position 2**

**CGCATGCG**

**GCGTACGC**

**第五題:**

**Write a program to generate all possible permutations of n distinct numbers.**

For example, there are six permutations of the set {1,2,3}, namely (1,2,3),

(1,3,2), (2,1,3), (2,3,1), (3,1,2), and (3,2,1).

**第六題:**

**An interesting method of encoding data is to load a message to be encoded into a two-dimensional array and then interchange rows and interchange columns a number of times. The resulting sequence of characters is the encoded message.**

**In order to decode the message, the sequence of steps used in the encoding process is followed in reverse order. For example, consider the message I HAVE BUT ONE LIFE TO GIVE FOR MY COUNTRY.**

**Let us load the message into a 6×7 array:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **I** |  | **H** | **A** | **V** | **E** |  |
| **B** | **U** | **T** |  | **O** | **N** | **E** |
|  | **L** | **I** | **F** | **E** |  | **T** |
| **O** |  | **G** | **I** | **V** | **E** |  |
| **F** | **O** | **R** |  | **M** | **Y** |  |
| **C** | **O** | **U** | **N** | **T** | **R** | **Y** |

**Now consider the following encoding process:**

**(1). Interchange rows 1 and 3 (2) Interchange columns 2 and 5**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **L** | **I** | **F** | **E** |  | **T** |
| **B** | **U** | **T** |  | **O** | **N** | **E** |
| **I** |  | **H** | **A** | **V** | **E** |  |
| **O** |  | **G** | **I** | **V** | **E** |  |
| **F** | **O** | **R** |  | **M** | **Y** |  |
| **C** | **O** | **U** | **N** | **T** | **R** | **Y** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **E** | **I** | **F** | **L** |  | **T** |
| **B** | **O** | **T** |  | **U** | **N** | **E** |
| **I** | **V** | **H** | **A** |  | **E** |  |
| **O** | **V** | **G** | **I** |  | **E** |  |
| **F** | **M** | **R** |  | **O** | **Y** |  |
| **C** | **T** | **U** | **N** | **O** | **R** | **Y** |

**(3). Interchange rows 4 and 6 (2) Interchange columns 1 and 5**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **E** | **I** | **F** | **L** |  | **T** |
| **B** | **O** | **T** |  | **U** | **N** | **E** |
| **I** | **V** | **H** | **A** |  | **E** |  |
| **C** | **T** | **U** | **N** | **O** | **R** | **Y** |
| **F** | **M** | **R** |  | **O** | **Y** |  |
| **O** | **V** | **G** | **I** |  | **E** |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **L** | **E** | **I** | **F** |  |  | **T** |
| **U** | **O** | **T** |  | **B** | **N** | **E** |
|  | **V** | **H** | **A** | **I** | **E** |  |
| **O** | **T** | **U** | **N** | **C** | **R** | **Y** |
| **O** | **M** | **R** |  | **F** | **Y** |  |
|  | **V** | **G** | **I** | **O** | **E** |  |

**The resulting string is LEIF TUOT BNE VHAIE OTUNCRYOMR FY**

**VGIOE. In order to decode the message, the encoding process is reversed; i.e., the encoded message would be loaded into a 6×7 array**

**And then the following interchanges would be performed:**

**Columns 1 and 5**

**Rows 4 and 6**

**Columns 2 and 5**

**Rows 1 and 3**

**Write a main program to encode and decode messages, using subroutines to perform the column interchange and row interchange operations.**

**第七題:**

**Please define the following functions:**

**1. Input data for one vector ( 1-d array 1×m or n×1 )**

**2. Output data for one vector ( 1-d array 1×m or n×1 )**

**3. Input data for a matrix ( 2-d array n×m )**

**4. Output data for a matrix ( 2-d array n×m )**

**5. Multiplying a matrix by a vector:**

**(a). Multiplying on the right**

**   ×  ＝ **

**(b) Multiplying on the left.**

**   ×    =   **

**6. The transpose of a matrix.**

**A =  =   **

**7. Matrix Addition**

**8. Matrix Multiplication**

**9. You can define other operations for the vector and matrix**

**10. Please write a main program (using the switch structure) and let the user to choose the operation that he wants to execute.**

**11. You can put all the functions in 1 ~ 9 to create your heading file and include this heading file in the main program to execute.**

**第八題:**

**Plotting a graph**

**The plotting function is**

**f(x)= (Π ) 0≦ x ≦ 10**

**Plotting a Graph**

**1. Generate a table of number pairs :**

***t* *p(t)***

**0 30.0**

**1 27.1**

**2 22.6**

**… … (for *t*= 0,…, n-1)**

**Or**

***i* *x y***

**0 0.0 0.0**

**1 2.0 32.0**

**2 3.0 72.0**

**… … … (*x, y*for i=0,…, n-1)**

**These numbers may represent experimental data, say position *p(t)***

**vs. time *t* for a falling object or may be generated from a particular**

**functional relation between *x* and *y* as *y(x*)=8*x***

**2. Determine the range of both *x*and *y***

**A determination of both the minimum and maximum values**

**of *x* and *y* in the data set :**

**(Range)=(*x - x*)**

**(Range)= (*y - y*)**

**These values are then used for scaling the *x* and *y* axes.**

**That is, adjusting the scales of the axes so that the graph fits neatly**

**on the graph paper.**

**3. Step through the points and graph them one by one.**

Y

**| \***  **|**

**| \* |**

X

**| \* |**

**| \* |**

**| \* |**

**| \* |**

**| \* |**

Note:

1.When one line is displayed, 80 or so characters will be printed for a particular value of ***x*.**

**2. A**ll of these characters will be blanks except one.

**3.** The position corresponding to ***y*** will contain some symbol --- e.g.,an asterisk.

**4.** To determine the proper placement of asterisk, consider the following:

***y* = 16.38 *y*= –7.21**

so

**(Range)= 16.38 – (–7.21) =23.59**

**Problem:**

**If at x= 3.0, y(3.0)=12.2,**

**where in the horizontal line is the asterisk to be printed?**

**If the y axis is to be 81 columns wide, we could first define**

**Ratio = **

Notice that ratio is between 0.0 and 1.0.

The appropriate column(position) for the asterisk is

IY = ceil ( 80 \* Ratio)

For the particular choice of numbers above , y(3) =12.2

We obtain:

**Ratio =  = 0.82281**

IY =ceil( 80 \* 0.82281) = ceil(65.8248) =66

Where double ceil(double x)

Return 大於x值的最小整數

Note:

1. When y(i)= ***y* Ratio =0 then IY=80\*0=0**

**2.** When y(i)= ***y* Ratio =1 then IY=80\*1=80**

**3. 最小值落在第0行, 最大值落在第80行**

**因此總共有81行**