**Full name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ID: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Duration: 90’**

**LAB TEST**

**Question 1:**

Write a program to input an array of n x n from the console and check whether it is a scalar matrix; given that scalar matrix is a square matrix with the following form:

A picture containing object, photo, water, large

Description automatically generated

**Brainstorm (10 points)** (at least 3 steps)

First, I let the user enter the array

Then I will append an H value equal to the number of columns and rows in the array

Use the for function to run each row and column to find out if the numbers in the array are the same diagonally

If yes, print yes. No print no

**-Algorithms:** Draw the flow chart of receiving the input from the console to a 2D array **(10 points):**

-Write and explain the codes (**line by line**) to check **whether it is a scalar matrix** to the table below **(30 points):**

|  |  |
| --- | --- |
| **Your code** | **Comments** |
| **int main(){**    **int a[100][100];**  **int m, n;**  **printf("Enter the number of rows: ");**  **scanf("%d", &m);**  **printf("Enter the number of columns(must equal to row): ");**  **scanf("%d", &n);**  **printf("Enter element of the array:\n");**  **for(int i=0; i<m; i++){**  **for(int j=0; j<n;j++){**  **printf("a[%d][%d]=", i, j);**  **scanf("%d", &a[i][j]);**  **}**  **}**  **printf("The array that you input:\n");**  **for(int i=0; i<m; i++){**  **for(int j=0; j<n; j++){**  **printf(" %d ", a[i][j]);**  **}**    **printf("\n");**  **}**  **int H = n;**    **bool isScalarmatrix(int a[m][n])**  **{**  **for (int i = 0; i < H; i++)**  **for (int j = 0; j < H; j++)**    **if ((i != j) && (a[i,j] != 0))**  **return false;**    **return true;**  **}**  **if (isScalarmatrix(a))**  **printf("Yes");**  **else**  **printf("No" );**  **return 0;**  **}** | **// Input array.**  **#Check is slacar or not**  **// condition to check**  **// other elements**  **// except main scalar**  **// are true or false.**  **//out put** |

**Question 2:**

1. Write a program to input an array of **n** integers from the console (**n** is even). Sort the first half of that array in increasing order and second half in decreasing order. **(20 points)**

Your code:

#include<stdio.h>

#include<stdlib.h>

double a,b;

int main()

{

int n, i, j, temp;

int a1[100];

printf("Enter the size of array(size is even only): ");

scanf("%d",&n);

printf("Enter array\n");

for(i=0; i<n; i++)

{

printf("a1[%d]=", i);

scanf("%d", &a1[i]);

}

for(int i=0; i<n/2; ++i){

for(int j=0; j<n/2; ++j){

if(a1[i]<a1[j]){

temp=a1[i];

a1[i]=a1[j];

a1[j]=temp;

}

}

}

for(int i=n/2; i<n; ++i){

for(int j=n/2; j<n; ++j){

if(a1[i]>a1[j]){

temp=a1[i];

a1[i]=a1[j];

a1[j]=temp;

}

}

}

for(int i=0; i<n/2; ++i){

printf(" %d ", a1[i]);

}

printf("|");

for(int i=n/2; i<n; ++i){

printf(" %d ", a1[i]);

}

1. (continue from question 2a.) Write a program to ask users to input another increasing order array **(force the user to input the array’s elements in increasing order)**. **(10 points)**

Your code:

printf("Enter the new array\n");

int as[100];

int k;

printf("Enter new array similar to array 1:\n"); // Em goi lại array mới gióng array 1 để chạy tạo array 3

printf("Enter the size of array(size is even only): ");

scanf("%d",&k);

printf("Enter array\n");

for(i=0; i<k; i++)

{

printf("as[%d]=", i);

scanf("%d", &as[i]);

}

int m;

int a2[100];

printf("Enter the size of new array: ");

scanf("%d",&m);

printf("Enter the array's elements in increasing order\n");

for(i=0; i<m; i++)

{

printf("a2[%d]=", i);

scanf("%d", &a2[i]);

}

Then perform these requirements:

* Merge two arrays (the first half sorted array of question 2a and the new array of question 2b) into one array. The merged array must be sorted. **(10 points)**

Your code:

int arr3[m+k];

for(i=0; i<k; i++)

arr3[i]=a1[i];

for(i=0; i<m; i++)

arr3[i+k]=a2[i];

for(i=0; i<m+k; i++){

for(j=0; j<m+k; j++){

if(arr3[i]<arr3[j]){

temp=arr3[i];

arr3[i]=arr3[j];

arr3[j]=temp;

}

}

}

printf("Array 3 is sorted: ", arr3);

* Show the median of the new array. If the number of values is odd, the median is the middle value. If the number of values is even, the median is the average of the two middle values. **(10 points)**

Your code:

for(i=0; i<m+k; i++)

printf("%d ",arr3[i]);

if((m+k) % 2 == 1)

printf("\nMedian is %d",arr3[(k+m)/2]);

else

{

a=arr3[(k+m)/2-1]+0.0;

b=arr3[(k+m)/2]+0.0;

printf("\nMedian is %.2f",(a+b)/2);

}

}

**===The End===**