"Ss. Cyril and Methodius" University in Skopje
FACULTY OF COMPUTER SCIENCE AND ENGINEERING

Lesson 5

Arrays and matrices

Structured Programming

Contents

Problem 1

Write a program that for two arrays read from SI will check if they are equal. Print out the result from the comparison.
The maximum size of arrays is 100.

Solution 1 part

```
#include<stdio.h>
#define MAX 100
int main() {
    int n1, n2, element, i;
    int a[MAX], b[MAX];
    printf("First array size:  ");
    scanf("%d", &n1);
    printf("Second array size:  ");
    scanf("%d", &n2);
    if (n1 != n2)
        printf("Arrays are equal\n");
```

Problem 1

Solution 2 part

Solution 2 part

```
    else {
        printf("Elements of the first array: \n");
        for (i = 0; i < n1; ++i) {
            printf("a[%d] = ", i);
            scanf("%d", &a[i]);
        }
        printf("Elements of the second array: \n");
        for (i = 0; i < n2; ++i) {
            printf("b[%d] = ", i);
            scanf("%d", &b[i]);
        }
        // check if arrays are equal:
        for (i = 0; i < n1; ++i)
            if (a[i] != b[i])
                break;
        if (i == n1)
            printf("Arrays are equal\n");
        else
            printf("Arrays are not equal\n");
    }
    return 0;
}
```

Problem 2

Write a program that for an array read from SI, will compute the sum of even elements, the sum of odd elements and will compute the ratio even/odd.

Example

For array:

3 2 7 6 2 5 1

Will print:

```
sum_even = 8
suma_odd = 16
ratio = 0.75
```

Problem 2

Solution

Solution

```
#include <stdio.h>
#define MAX 100
int main() {
    int i, n, a[MAX], brNep = 0, brPar = 0, sumNep = 0, sumPar = 0;
    scanf("%d", &n);
    for (i = 0; i < n; ++i)
        scanf("%d", &a[i]);
    for (i = 0; i < n; ++i) {
        if (a[i] % 2) {
            brNep++;
            sumNep += a[i];
        } else {
            brPar++;
            sumPar += a[i];
        }
    }
    printf("Sum of odd elements: %d\nSum of even elements: %d\n", sumPar, sumNep
        );
    printf("The ratio is %.2f\n", (float)brPar / brNep);
    return 0;
}
```

Problem 3

Write a program that will compute the scalar product of two vectors with n coordinates. The number of coordinates n and the coordinates are read from SI. Print the result.

Problem 3
Solution

Solution

```c
#include<stdio.h>
#define MAX 100
int main() {
    int a[MAX], b[MAX], n, i, scalar = 0;
    scanf("%d", &n);
    for (i = 0; i < n; ++i)
        scanf("%d", &a[i]);
    for (i = 0; i < n; ++i)
        scanf("%d", &b[i]);
    for (i = 0; i < n; ++i)
        scalar += a[i] * b[i];
    printf("The scalar product is: %d\n", scalar);
    return 0;
}
```

Задача 4

Write a progra that will check if a given array with n elements read from SI is increasing, decreasing or nothing. Print the result.

Problem 4

Solution

Solution

```c
#include <stdio.h>
#define MAX 100
int main() {
    int n, element, a[MAX], i;
    short rastecka = 1, opagacka = 1;
    scanf("%d", &n);
    for (i = 0; i < n; ++i)
        scanf("%d", &a[i]);
    for (i = 0; i < n - 1; ++i) {
        if (a[i] >= a[i + 1]) {
            rastecka = 0;
            break;
        }
    }
    for (i = 0; i < n - 1; ++i) {
        if (a[i] <= a[i + 1]) {
            opagacka = 0;
            break;
        }
    }
    if (!opagacka && !rastecka)
        printf("Array is not increasing and not decreasing\n");
    else if (opagacka)
        printf("Array is decreasing\n");
    else if (rastecka)
        printf("Array is increasing\n");
    return 0;
}
```

Problem 5

Write a program that will remove duplicate from an array. After the operation print the array.

Problem 5
Solution

Solution

```
#include <stdio.h>
#define MAX 100
int main() {
    int a[MAX], n, i, j, k, izbrisani = 0;
    scanf("%d", &n);
    for (i = 0; i < n; ++i)
        scanf("%d", &a[i]);
    for (i = 0; i < n - izbrisani; ++i)
        for (j = i + 1; j < n - izbrisani; ++j)
            if (a[i] == a[j]) {
                for (k = j; k < n - 1 - izbrisani; ++k)
                    a[k] = a[k + 1];
                izbrisani++;
            }
    n -= izbrisani;
    for (i = 0; i < n; ++i)
        printf("%d\t", a[i]);
    return 0;
}
```

Contents

Problem 6

Write a program that will print on screen if a given matrix is symetric based on the main diagonal. Dimensions and the matrix are read from SI.

Problem 6
Solution

Solution

```
# include <stdio.h>
# define MAX 100
int main () {
    int a[MAX][MAX], n, i, j, flag = 0;
    printf ("Read the matrix dimensions: \n");
    scanf ("%d", &n);
    printf ("Read the matrix elements: \n");
    for (i = 0; i < n; ++i)
        for (j = 0; j < n; ++j)
            scanf ("%d", &a[i][j]);
    for (i = 0; i < n - 1; ++i) {
        for (j = i + 1; j < n; ++j)
            if (a[i][j] != a[j][i]) {
                flag = 1;
                break;
            }
        if (flag) break;
    }
    if (!flag)
        printf ("Matrix is SYMETRIC on the main diagonal\n");
    else
        printf ("Matrix is NOT SYMETRIC on the main diagonal\n");
    return 0;
}
```

Problem 7

Write a program that for a given matrix read from SI will replace the elements from the main diagonal with the difference between the maximum and minimum element from the matrix. Print the result matrix.

Problem 7
Solution

Solution

```
#include<stdio.h>
#define MAX 100
int main() {
    int a[MAX][MAX], n, i, j, max, min;
    scanf("%d", &n);
    for (i = 0; i < n; ++i)
        for (j = 0; j < n; ++j) {
            scanf("%d", &a[i][j]);
            if (i == 0 && j == 0)
                max = min = a[i][j];
            else if (max < a[i][j])
                max = a[i][j];
            else if (min > a[i][j])
                min = a[i][j];
        }

    for (i = 0; i < n; ++i)
        a[i][i] = max - min;

    for (i = 0; i < n; ++i) {
        printf("\n");
        for (j = 0; j < n; ++j)
            printf("%d\t", a[i][j]);
    }
    return 0;
}
```

Problem 8

On matrix read from SI compute the difference of sum of elements of odd columns and sum of elements of even rows. Print the result.

Problem 8
Solution

Solution

```
#include<stdio.h>
#define MAX 100
int main() {
    int a[MAX][MAX], n, m, i, j, sumKol = 0, sumRed = 0;
    scanf("%d %d", &n, &m);
    for (i = 0; i < n; ++i)
        for (j = 0; j < m; ++j)
            scanf("%d", &a[i][j]);

    for (i = 0; i < n; ++i)
        for (j = 0; j < m; ++j) {
            if ((j + 1) % 2)
                sumKol += a[i][j];
            if (!((i + 1) % 2))
                sumRed += a[i][j];
        }
    printf("%d", sumKol - sumRed);
    return 0;
}
```

Materials and Questions

Lectures, exsercises and announcements
courses.finki.ukim.mk

Source code of all examples and problems
https://github.com/tdelev/SP/tree/master/latex/src

Questions and discussion
forum.finki.ukim.mk