

Practical Workbook

**CT-175**

**PROGRAMMING  
FUNDAMENTALS**



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## EXERCISE Q# 01

Write a program that reads the numbers from user and store these numbers into an array of same size. Find and display the sum of all positive numbers and calculate the average.

```
#include<stdio.h>
int main(){
    int n;
    printf("Enter number of elements you want in an array: ");
    scanf("%d", &n);
    int arr[n];
    int sum=0;
    int tot=0;
    float avg;
    printf("\nEnter %d elements: \n", n);
    for(int i=0;i<n;i++){
        scanf("%d", &arr[i]);
    }
    printf("You entered: ");
    for(int i=0;i<n;i++){
        printf("\n%d", arr[i]);
        if(arr[i]>0){
            sum+=arr[i];
            tot++;
        }
    }
    if(tot>0){
        avg= (float)sum/tot;
        printf("\nThe sum of positive numbers: %d",sum);
        printf("\nAverage of positive numbers: %.2f\n", avg);
    }else{
        printf("\nNo positive numbers entered\n");
    }
    return 0;
}
```

**OUTPUT:**

```
Enter 3 elements:
1
2
3
You entered:
1
2
3
The sum of positive numbers: 6
Average of positive numbers: 2.00
```

```
Enter 3 elements:
-1
-2
-3
You entered:
-1
-2
-3
No positive numbers entered
```

## EXERCISE Q# 02

Write a C program to read elements in a matrix and check whether matrix is Sparse matrix or not. Logic: To check whether a matrix is sparse matrix we only need to check the total number of elements that are equal to zero. The matrix is sparse matrix if  $T \geq ((m * n) / 2)$  where T defines total number of zero elements where m and n are rows and columns respectively.

```
#include<stdio.h>
int main(){
    int m,n;
    printf("Enter number of rows:");
    scanf("%d", &m);
    printf("Enter number of columns:");
    scanf("%d", &n);
    int mat[m][n];
    int zeros=0;

    for(int i=0;i<m;i++){
        for(int j=0;j<n;j++){
            printf("Enter the Elements [%d][%d] ", i,j);
            scanf("%d", &mat[i][j]);
            if(mat[i][j]==0){
                zeros++;
            }
        }
    }
    if(zeros>=((m*n))/2){
        printf("The matrix is sparse ");
    }else{
        printf("The matrix is not sparse");
    }

    return 0;
}
```

## OUTPUTS:

```
Enter number of rows:2
Enter number of columns:2
Enter the Elements [0][0] 1
Enter the Elements [0][1] 2
Enter the Elements [1][0] 3
Enter the Elements [1][1] 4
The matrix is not sparse
```

---

```
Enter number of rows:2
Enter number of columns:2
Enter the Elements [0][0] 0
Enter the Elements [0][1] 0
Enter the Elements [1][0] 2
Enter the Elements [1][1] 1
The matrix is sparse
```

---

```
Enter number of rows:2
Enter number of columns:2
Enter the Elements [0][0] 1
Enter the Elements [0][1] 0
Enter the Elements [1][0] 0
Enter the Elements [1][1] 0
The matrix is sparse
```

---

```
Enter number of rows:2
Enter number of columns:2
Enter the Elements [0][0] 1
Enter the Elements [0][1] 1
Enter the Elements [1][0] 1
Enter the Elements [1][1] 0
The matrix is not sparse
```

---

## EXERCISE Q# 03

Write down a program which asks user to input his first name and last name in a separate array. After taking the input your program should be able to concatenate first name and last name and return it as full name. Count down number of characters in the full name as well. For example: First name: Muhammad, Second name: Ahmed, Full name: Muhammad Ahmed

```
#include<stdio.h>
#include<string.h>
int main(){
char firstname[100];
char lastname[100];
printf("Enter your first name: ");
scanf("%s", firstname);
printf("Enter your last name: ");
scanf("%s", lastname);
printf("\nFull name = %s %s",firstname,lastname);
int count=0;
for(int i=0;i<strlen(firstname);i++){
    count++;
}
    for(int j=0;j<strlen(lastname);j++){
count++;
    }
    printf("\nTotal characters excluding spaces includes :
%d", count);
    return 0;
}
```

### OUTPUT:

```
Enter your first name: Muhammad
Enter your last name: Ahmed
```

```
Full name = Muhammad Ahmed
Total characters excluding spaces includes : 13
```

## EXERCISE Q#03

You taking a square matrix as input from keyboard and then you transpose the same matrix after meeting the requirements you are also interested to find out whether original Matrix A and transpose of Matrix A are equal are not. If the answer is yes, then you print the matrix along with message “matrix is symmetric” otherwise you print the “matrix is asymmetric”.

```
#include<stdio.h>
int main(){
int matrix[2][2];
int trans[2][2];
int m,n;
printf("\nEnter the elements\n");
for(int m=0;m<2;m++){
    for(int n=0;n<2;n++){
        printf("Enter elements [%d][%d]", m,n);
        scanf("%d", &matrix[m][n]);
    }
}

printf("\nEntered matrix\n");
for(int m=0;m<2;m++){
    for(int n=0;n<2;n++){
        printf("%d ", matrix[m][n]);
    }

    printf("\n");
}

for(int m=0;m<2;m++){
    for(int n=0;n<2;n++){
        trans[m][n]=matrix[n][m];
    }
}
printf("\nTranspose of matrix is:\n");
for(int m=0;m<2;m++){
    for(int n=0;n<2;n++){
        printf("%d ", trans[m][n]);
    }

    printf("\n");
}
```

```
    }
    int issymmetric=1;
    for(int m=0;m<2;m++){
        for(int n=0;n<2;n++){
            if(trans[m][n]!=matrix[m][n]){
                issymmetric=0;
                break;
            }
            if(!issymmetric){
                break;
            }
        }
    }

    if(issymmetric){
        printf("This is a symmetric matrix");
    }else{
        printf("This is a non-symmetric matrix");
    }

    return 0;
}
```



**OUTPUTS:**

```
Enter the elements
Enter elements [0][0]1
Enter elements [0][1]2
Enter elements [1][0]2
Enter elements [1][1]3

Entered matrix
1 2
2 3

Transpose of matrix is:
1 2
2 3
This is a symmetric matrix
```

```
Enter the elements
Enter elements [0][0]1
Enter elements [0][1]2
Enter elements [1][0]3
Enter elements [1][1]4

Entered matrix
1 2
3 4

Transpose of matrix is:
1 3
2 4
This is a non-symmetric matrix
```

## EXERCISE Q# 05

Write a program which takes a matrix of any size as user input and returns the maximum element of matrix as output. Your code should also show the entered matrix on the screen.

```
#include<stdio.h>
int main(){
int mat[100][100],n,m,max;
printf("Enter no of rows of matrix: ");
scanf("%d", &m);
printf("Enter no of columns of matrix: ");
scanf("%d", &n);

for(int i=0;i<m;i++){
    for(int j=0;j<n;j++){
        printf("Elements [%d][%d] = ", i,j);
scanf("%d", &mat[i][j]);
        if(i==0 && j==0){
            max=mat[i][j];
        }else if(mat[i][j]>max){
            max=mat[i][j];
        }
    }
}

printf("\n");
printf("The elements you entered are = \n");
for(int i=0;i<m;i++){
    for(int j=0;j<n;j++){
        printf("%d ", mat[i][j] );

    }
    printf("\n");
}

printf("\nThe maximum number among the entered elements in the matrix = %d ",
max);

return 0;
}
```

**OUTPUT:**

```
Enter no of rows of matrix: 2
Enter no of columns of matrix: 2
Elements [0][0] = 1
Elements [0][1] = 2
Elements [1][0] = 3
Elements [1][1] = 4
```

```
The elements you entered are =
1 2
3 4
```

```
The maximum number among the entered elements in the matrix = 4
```