LAB-1

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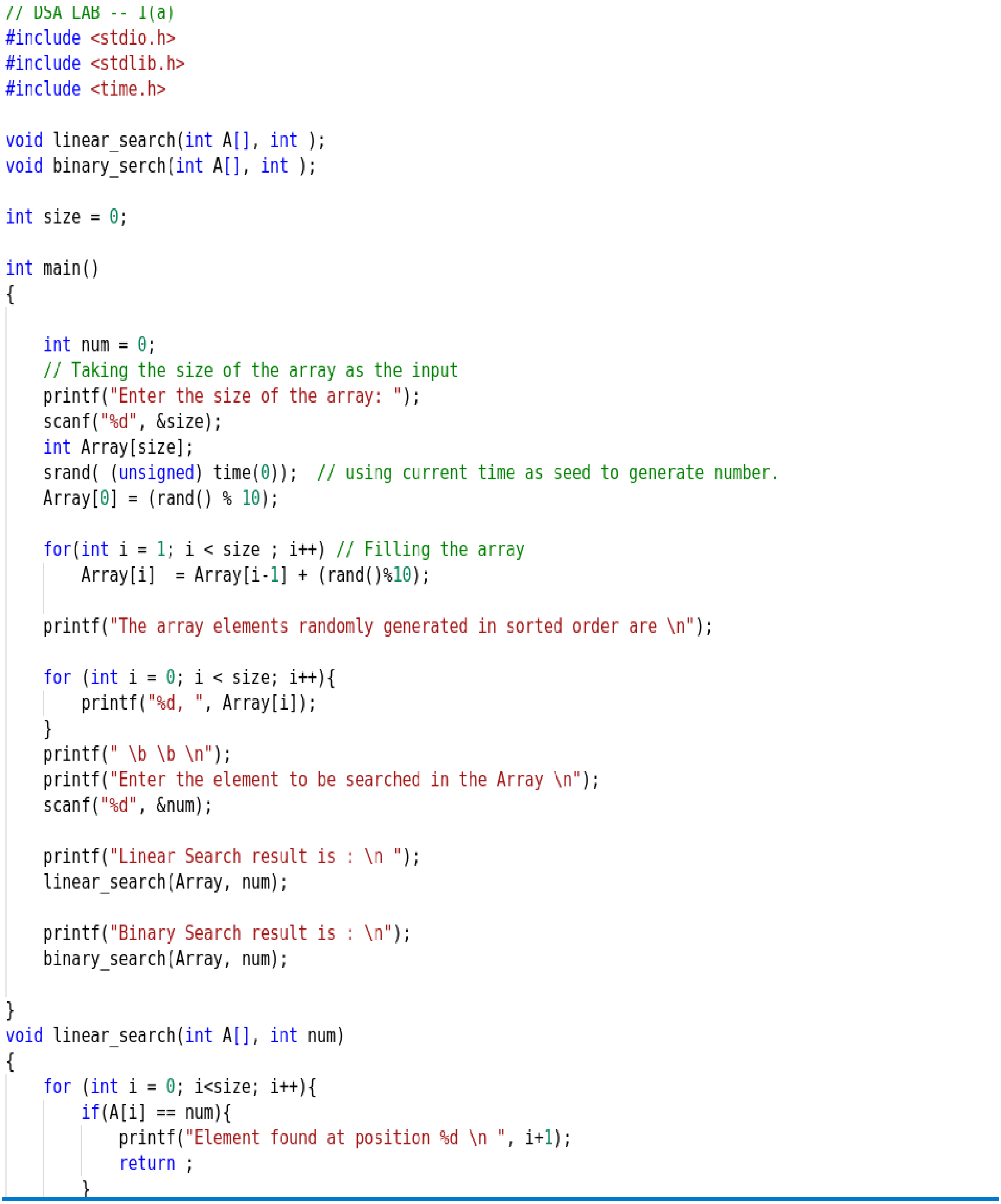
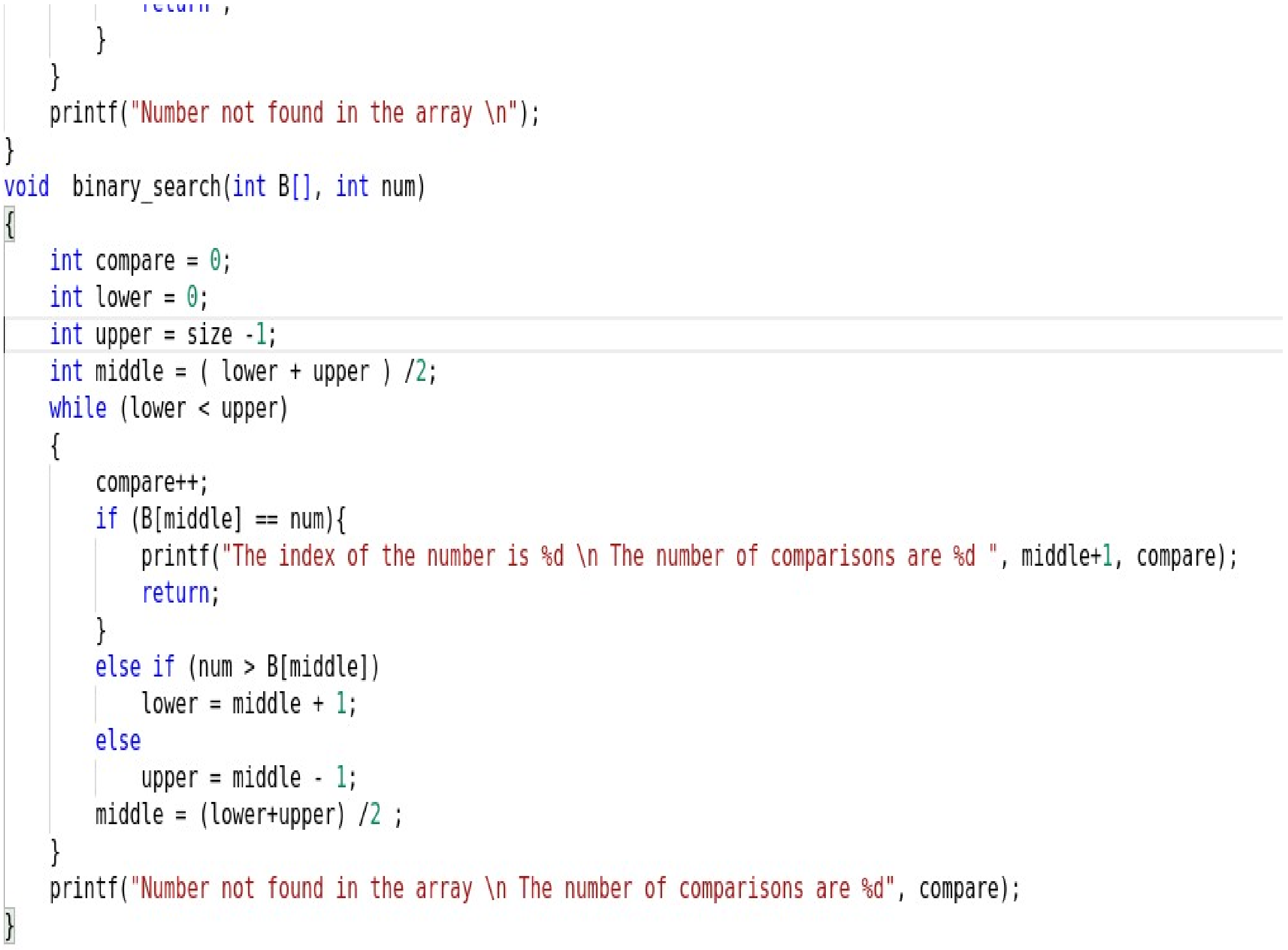
Program 1(a)

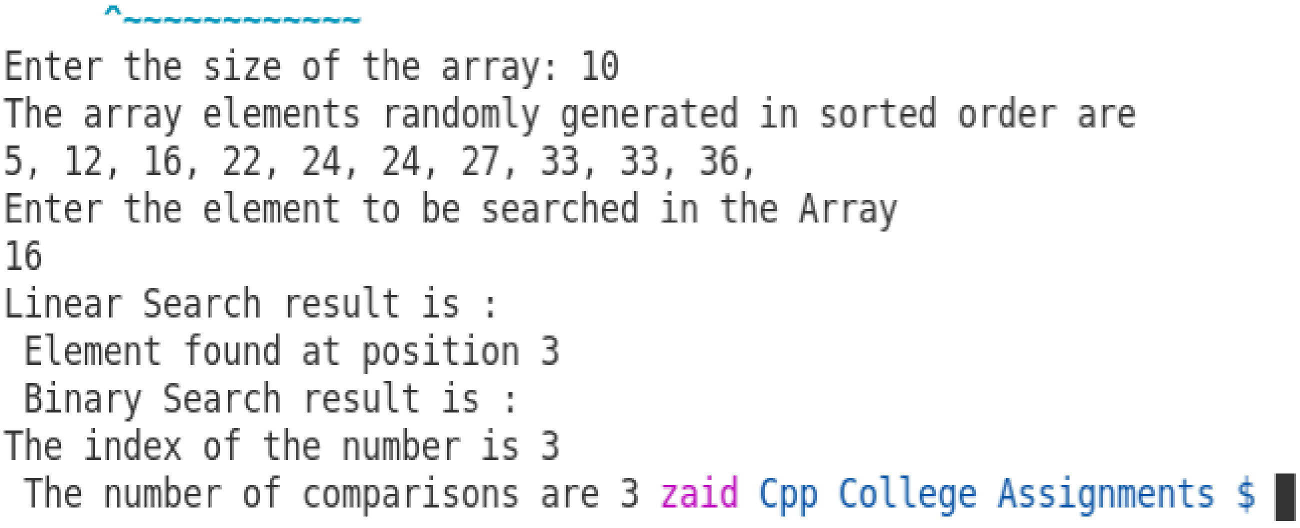


```
// DSA LAB -- 1(a)
#include <stdio.h>
#include <stdlib.h>
#include <time.h>

void linear_search(int A[], int );
void binary_serch(int A[], int );

int size = 0;

int main()
{

    int num = 0;
    // Taking the size of the array as the input
    printf("Enter the size of the array: ");
    scanf("%d", &size);
    int Array[size];
    srand( (unsigned) time(0));  // using current time as seed to generate number.
    Array[0] = (rand() % 10);

    for(int i = 1; i < size ; i++) // Filling the array
        Array[i]  = Array[i-1] + (rand()%10);

    printf("The array elements randomly generated in sorted order are \n");

    for (int i = 0; i < size; i++){
        printf("%d, ", Array[i]);
    }
    printf(" \b \b \n");
    printf("Enter the element to be searched in the Array \n");
    scanf("%d", &num);

    printf("Linear Search result is : \n ");
    linear_search(Array, num);

    printf("Binary Search result is : \n");
    binary_search(Array, num);

}
void linear_search(int A[], int num)
{
    for (int i = 0; i<size; i++){
        if(A[i] == num){
            printf("Element found at position %d \n ", i+1);
            return ;
        }
```



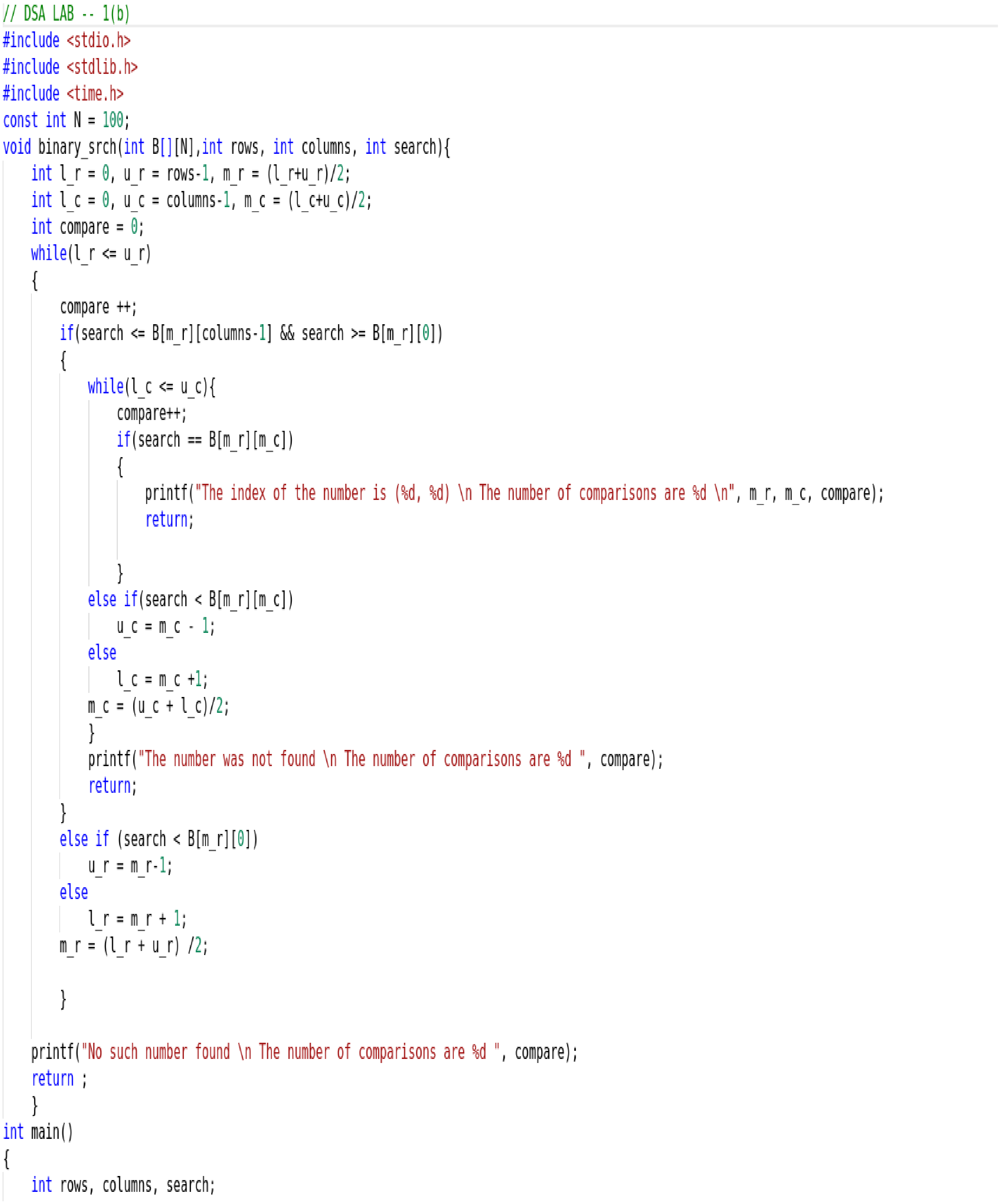
```c
            return ;
        }
    }
    printf("Number not found in the array \n");
}
void  binary_search(int B[], int num)
{
    int compare = 0;
    int lower = 0;
    int upper = size -1;
    int middle = ( lower + upper ) /2;
    while (lower < upper)
    {
        compare++;
        if (B[middle] == num){
            printf("The index of the number is %d \n The number of comparisons are %d ", middle+1, compare);
            return;
        }
        else if (num > B[middle])
            lower = middle + 1;
        else
            upper = middle - 1;
        middle = (lower+upper) /2 ;
    }
    printf("Number not found in the array \n The number of comparisons are %d", compare);
}
```

Output:

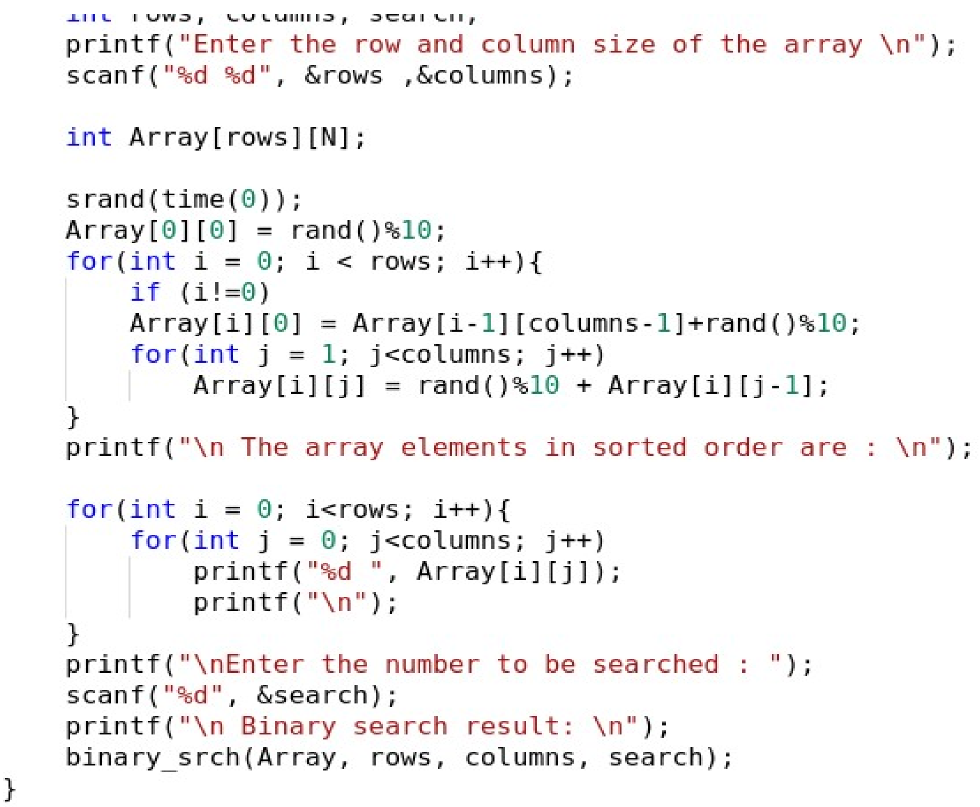


```
     ^~~~~~~~~~~~~
Enter the size of the array: 10
The array elements randomly generated in sorted order are
5, 12, 16, 22, 24, 24, 27, 33, 33, 36,
Enter the element to be searched in the Array
16
Linear Search result is :
 Element found at position 3
 Binary Search result is :
The index of the number is 3
 The number of comparisons are 3 zaid Cpp College Assignments $ █
```

Program 1(b)

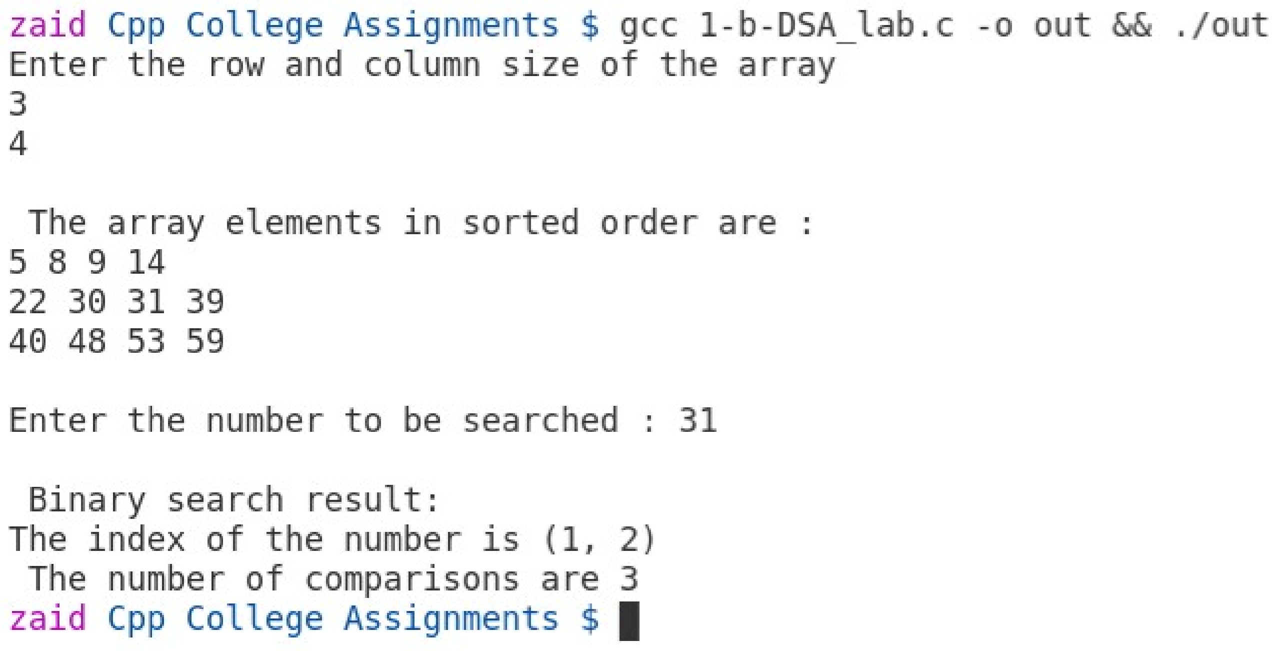


```c
// DSA LAB -- 1(b)
#include <stdio.h>
#include <stdlib.h>
#include <time.h>
const int N = 100;
void binary_srch(int B[][N],int rows, int columns, int search){
    int l_r = 0, u_r = rows-1, m_r = (l_r+u_r)/2;
    int l_c = 0, u_c = columns-1, m_c = (l_c+u_c)/2;
    int compare = 0;
    while(l_r <= u_r)
    {
        compare ++;
        if(search <= B[m_r][columns-1] && search >= B[m_r][0])
        {
            while(l_c <= u_c){
                compare++;
                if(search == B[m_r][m_c])
                {
                    printf("The index of the number is (%d, %d) \n The number of comparisons are %d \n", m_r, m_c, compare);
                    return;

                }
            else if(search < B[m_r][m_c])
                u_c = m_c - 1;
            else
                l_c = m_c +1;
            m_c = (u_c + l_c)/2;
            }
            printf("The number was not found \n The number of comparisons are %d ", compare);
            return;
        }
        else if (search < B[m_r][0])
            u_r = m_r-1;
        else
            l_r = m_r + 1;
        m_r = (l_r + u_r) /2;

        }

    printf("No such number found \n The number of comparisons are %d ", compare);
    return ;
    }
int main()
{
    int rows, columns, search;
```



```
    int rows, columns, search;
    printf("Enter the row and column size of the array \n");
    scanf("%d %d", &rows ,&columns);

    int Array[rows][N];

    srand(time(0));
    Array[0][0] = rand()%10;
    for(int i = 0; i < rows; i++){
        if (i!=0)
        Array[i][0] = Array[i-1][columns-1]+rand()%10;
        for(int j = 1; j<columns; j++)
            Array[i][j] = rand()%10 + Array[i][j-1];
    }
    printf("\n The array elements in sorted order are : \n");

    for(int i = 0; i<rows; i++){
        for(int j = 0; j<columns; j++)
            printf("%d ", Array[i][j]);
            printf("\n");
    }
    printf("\nEnter the number to be searched : ");
    scanf("%d", &search);
    printf("\n Binary search result: \n");
    binary_srch(Array, rows, columns, search);
}
```

Output:



```
zaid Cpp College Assignments $ gcc 1-b-DSA_lab.c -o out && ./out
Enter the row and column size of the array
3
4

 The array elements in sorted order are :
5 8 9 14
22 30 31 39
40 48 53 59

Enter the number to be searched : 31

 Binary search result:
The index of the number is (1, 2)
 The number of comparisons are 3
zaid Cpp College Assignments $ █
```