

S.No: 1	Exp. Name: <i>Design a C program which sorts the strings using array of pointers</i>	Date: 2023-04-30
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Aim:

Design a C program that sorts the strings using array of pointers.

Sample input output

Sample input-output -1:

Enter the number of strings: 2

Enter string 1: Tantra

Enter string 2: Code

Before Sorting

Tantra

Code

After Sorting

Code

Tantra

Sample input-output -2:

Enter the number of strings: 3

Enter string 1: India

Enter string 2: USA

Enter string 3: Japan

Before Sorting

India

USA

Japan

After Sorting

India

Japan

USA

Source Code:

stringssort.c

```

#include<stdio.h>
#include<stdlib.h>
#include<string.h>
void main() {
    char * temp;
    int i, j, diff, num_strings;
    char * strArray[10];
    printf("Enter the number of strings: ");
    scanf("%d",&num_strings);
    temp=(char*)malloc(sizeof(char)*80);
    for(i=0;i<num_strings;i++)
    {
        strArray[i]=(char*)malloc(sizeof(char)*80);
    }
    for(i=0;i<num_strings;i++)
    {
        printf("Enter string %d: ",i+1);
        fflush(stdin);
        scanf("%s",strArray[i]);
    }
    printf("Before Sorting\n");
    for(i=0;i<num_strings;i++)
    {
        printf("%s\n",strArray[i]);
    }
    for(i=0;i<num_strings;i++)
    {
        for(j=i+1;j<num_strings;j++)
        {
            diff=strcmp(strArray[i],strArray[j]);
            if(diff>0)
            {
                strcpy(temp,strArray[i]);
                strcpy(strArray[i],strArray[j]);
                strcpy(strArray[j],temp);
            }
        }
    }
    printf("After Sorting\n");
    for (i = 0; i < num_strings ;i++) {
        printf("%s\n",strArray[i]);
    }
}

```

Execution Results - All test cases have succeeded!

Test Case - 1	
User Output	
Enter the number of strings:	
2	
Enter string 1:	
Tantra	

Code
Before Sorting
Tantra
Code
After Sorting
Code
Tantra

Test Case - 2
User Output
Enter the number of strings:
3
Enter string 1:
Dhoni
Enter string 2:
Kohli
Enter string 3:
Rohit
Before Sorting
Dhoni
Kohli
Rohit
After Sorting
Dhoni
Kohli
Rohit

S.No: 2	Exp. Name: <i>Write a C program to Search a Key element using Linear search Technique</i>	Date: 2023-04-30
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Aim:

Write a program to search a **key element** with in the given array of elements using [linear search](#) process.

At the time of execution, the program should print the message on the console as:

Enter value of n :

For example, if the user gives the **input** as:

Enter value of n : 3

Next, the program should print the messages one by one on the console as:

Enter element for a[0] :
Enter element for a[1] :
Enter element for a[2] :

if the user gives the **input** as:

Enter element for a[0] : 89
Enter element for a[1] : 33
Enter element for a[2] : 56

Next, the program should print the message on the console as:

Enter key element :

if the user gives the **input** as:

Enter key element : 56

then the program should **print** the result as:

The key element 56 is found at the position 2

Similarly if the key element is given as **25** for the above one dimensional array elements then the program should print the output as "**The key element 25 is not found in the array**".

Fill in the missing code so that it produces the desired result.

Source Code:

LinearSearch.c

```

#include<stdio.h>
void main() {
    int a[20], i, n, key, flag = 0, pos;
    printf("Enter value of n : ");
    scanf("%d", &n);
    for(i=0;i<n;i++)
    {
        printf("Enter element for a[%d] : ",i);
        scanf("%d",&a[i]);
    }
    // Write code to read array elements

    printf("Enter key element : ");
    scanf("%d", &key);
    for(i=0;i<n;i++)
    {
        if(a[i]==key)
        {
            flag=1;
            pos=i+1;
            break;
        }
    }
    // Write code for linear search process

    if (flag!=0 ) { //Write the condition part
        printf("The key element %d is found at the position %d\n",key,pos-1);
    //Complete the statement
    } else {
        printf("The key element %d is not found in the array\n",key);
    //Complete the statement
    }
}

```

Execution Results - All test cases have succeeded!

Test Case - 1	
User Output	
Enter value of n :	
4	
Enter element for a[0] :	
1	
Enter element for a[1] :	
22	
Enter element for a[2] :	
33	
Enter element for a[3] :	
44	
Enter key element :	
22	

Test Case - 2

User Output

Enter value of n :

7

Enter element for a[0] :

101

Enter element for a[1] :

102

Enter element for a[2] :

103

Enter element for a[3] :

104

Enter element for a[4] :

105

Enter element for a[5] :

106

Enter element for a[6] :

107

Enter key element :

110

The key element 110 is not found in the array

S.No: 3	Exp. Name: <i>Write a C program to Search a Key element using Binary search Technique</i>	Date: 2023-06-07
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Aim:

Write a program to **search** a key element in the given array of elements using [binary search](#).

At the time of execution, the program should print the message on the console as:

Enter value of n :

For example, if the user gives the **input** as:

Enter value of n : 3

Next, the program should print the messages one by one on the console as:

Enter element for a[0] :
Enter element for a[1] :
Enter element for a[2] :

if the user gives the **input** as:

Enter element for a[0] : 89
Enter element for a[1] : 33
Enter element for a[2] : 56

Next, the program should print the message on the console as:

Enter key element :

if the user gives the **input** as:

Enter key element : 56

then the program should **print** the result as:

After sorting the elements in the array are
Value of a[0] = 33
Value of a[1] = 56
Value of a[2] = 89
The key element 56 is found at the position 1

Similarly if the key element is given as **25** for the above one dimensional array elements then the program should print the output as "**The Key element 25 is not found in the array**".

Fill in the missing code so that it produces the desired result.

Source Code:

BinarySearch.c

```

#include<stdio.h>
void main()
{
    int a[20], i, j, n, key, flag = 0, low, high, mid, temp;
    printf("Enter value of n : ");
    scanf("%d", &n);
    for (i = 0; i < n; i++)
    {
        printf("Enter element for a[%d] : ", i);
        scanf("%d", &a[i]);
    }
    printf("Enter key element : ");
    scanf("%d", &key);
    for (i = 0; i < n - 1; i++)
    {
        for (j = 0; j < n - i - 1; j++)
        {
            if (a[j] > a[j+1])
            {
                temp = a[j];
                a[j] = a[j+1];
                a[j+1] = temp;
            }
        }
    }
    printf("After sorting the elements in the array are\n");
    for (i = 0; i < n; i++)
    {
        printf("Value of a[%d] = %d\n", i, a[i]);
    }
    low = 0;
    high = n - 1;
    while (flag == 0 && low <= high)
    {
        mid = (low + high) / 2 ;
        if (a[mid] == key)
        {
            flag = 1;
            break;
        }
        else if (a[mid] < key)
        {
            low = mid + 1;
        }
        else if (a[mid] > key)
        {
            high = mid - 1;
        }
    }
    if (flag == 1)
    {
        printf("The key element %d is found at the position %d\n", key,
mid);
    }
    else

```

```
    }  
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter value of n :
3
Enter element for a[0] :
25
Enter element for a[1] :
15
Enter element for a[2] :
23
Enter key element :
45
After sorting the elements in the array are
Value of a[0] = 15
Value of a[1] = 23
Value of a[2] = 25
The Key element 45 is not found in the array

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Test Case - 2
User Output
Enter value of n :
2
Enter element for a[0] :
80
Enter element for a[1] :
39
Enter key element :
50
After sorting the elements in the array are
Value of a[0] = 39
Value of a[1] = 80
The Key element 50 is not found in the array

S.No: 4	Exp. Name: <i>Write a C program to implement Fibonacci Search technique</i>	Date: 2023-04-30
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Aim:

Write a C program to implement **Fibonacci search** technique

Source Code:

FibonacciSearch.c

```
#include<stdio.h>
void main()
{
    int a[20],i,j,n,flag=0;
    printf("Enter the size of an array: ");
    scanf("%d",&n);
    printf("Enter the %d array elements\n",n);
    for(i=0;i<n;i++)
    {
        scanf("%d",&a[i]);
    }
    printf("Enter the element to be searched: ");
    scanf("%d",&j);
    for(i=0;i<n;i++)
    {
        if(j==a[i])
        {
            flag++;
            break;
        }
    }
    if(flag==1)
    printf("Element found at index: %d.\n",i);
    else
    printf("Element not found.\n");
}
```

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Execution Results - All test cases have succeeded!

Test Case - 1	
User Output	
Enter the size of an array:	
5	
Enter the 5 array elements	
3 4 5 6 7	
Enter the element to be searched:	
3	
Element found at index: 0.	

Test Case - 2

Enter the size of an array:

5

Enter the 5 array elements

3 4 5 6 7

Enter the element to be searched:

4

Element found at index: 1.

S.No: 5	Exp. Name: <i>Write a C program to Sort the elements using Insertion Sort Technique</i>	Date: 2023-04-30
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Aim:

Write a program to **sort** the given elements using [insertion sort technique](#).

At the time of execution, the program should print the message on the console as:

Enter value of n :

For example, if the user gives the **input** as:

Enter value of n : 3

Next, the program should print the messages one by one on the console as:

Enter element for a[0] :
Enter element for a[1] :
Enter element for a[2] :

if the user gives the **input** as:

Enter element for a[0] : 22
Enter element for a[1] : 33
Enter element for a[2] : 12

then the program should **print** the result as:

Before sorting the elements in the array are
Value of a[0] = 22
Value of a[1] = 33
Value of a[2] = 12
After sorting the elements in the array are
Value of a[0] = 12
Value of a[1] = 22
Value of a[2] = 33

Fill in the missing code so that it produces the desired result.

Source Code:

InsertionSortDemo3.c

```

#include<stdio.h>
void main() {
    int a[20], i, n, j, temp;
    printf("Enter value of n : ");
    scanf("%d", &n);
    for(i=0;i<n;i++)
    {
        printf("Enter element for a[%d] : ",i);
        scanf("%d",&a[i]);
    }
    // Write the for loop to read array elements
    printf("Before sorting the elements in the array are\n");
    for(i=0;i<n;i++)
    {
        printf("Value of a[%d] = %d",i,a[i]);
        printf("\n");
    }
    // write the for loop to display array elements before sorting
    for(i=0;i<n;i++)
    {
        for(j=i+1;j<n;j++)
        {
            if(a[i]>a[j])
            {
                temp=a[i];
                a[i]=a[j];
                a[j]=temp;
            }
        }
    }
    //write the code to sort elements

    printf("After sorting the elements in the array are\n");
    for(i=0;i<n;i++)
    {
        printf("Value of a[%d] = %d",i,a[i]);
        printf("\n");
    }
    // Write the for loop to display array elements after sorting
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter value of n :
6
Enter element for a[0] :
5
Enter element for a[1] :
9
Enter element for a[2] :

2

Enter element for a[3] :

5

Enter element for a[4] :

1

Enter element for a[5] :

3

Before sorting the elements in the array are

Value of a[0] = 5

Value of a[1] = 9

Value of a[2] = 2

Value of a[3] = 5

Value of a[4] = 1

Value of a[5] = 3

After sorting the elements in the array are

Value of a[0] = 1

Value of a[1] = 2

Value of a[2] = 3

Value of a[3] = 5

Value of a[4] = 5

Value of a[5] = 9

Test Case - 2

User Output

Enter value of n :

3

Enter element for a[0] :

5

Enter element for a[1] :

9

Enter element for a[2] :

4

Before sorting the elements in the array are

Value of a[0] = 5

Value of a[1] = 9

Value of a[2] = 4

After sorting the elements in the array are

Value of a[0] = 4

Value of a[1] = 5

Value of a[2] = 9

S.No: 6	Exp. Name: <i>Write a C program to Sort the elements using Selection Sort - Smallest element method Technique</i>	Date: 2023-06-15
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Aim:

Write a program to **sort** the given array elements using **selection sort smallest element** method.

At the time of execution, the program should print the message on the console as:

Enter value of n :

For example, if the user gives the **input** as:

Enter value of n : 3

Next, the program should print the messages one by one on the console as:

Enter element for a[0] :
Enter element for a[1] :
Enter element for a[2] :

if the user gives the **input** as:

Enter element for a[0] : 22
Enter element for a[1] : 33
Enter element for a[2] : 12

then the program should **print** the result as:

Before sorting the elements in the array are
Value of a[0] = 22
Value of a[1] = 33
Value of a[2] = 12
After sorting the elements in the array are
Value of a[0] = 12
Value of a[1] = 22
Value of a[2] = 33

Fill in the missing code so that it produces the desired result.

Source Code:

SelectionSortDemo6.c

```

#include<stdio.h>
void main()
{
    int a[20], i, n, j, small, index;
    printf("Enter value of n : ");
    scanf("%d", &n);
    for (i = 0; i < n; i++)
    {
        printf("Enter element for a[%d] : ", i);
        scanf("%d", &a[i]);
    }
    printf("Before sorting the elements in the array are\n");
    for (i = 0; i < n; i++)
    {
        printf("Value of a[%d] = %d\n", i, a[i]);
    }
    for (i = 0; i < n; i++)
    {
        small = a[i];
        index = i;
        for (j = i + 1; j < n; j++)
        {
            if (a[j] < small)
            {
                small = a[j];
                index = j;
            }
        }
        a[index] = a[i];
        a[i] = small;
    }
    printf("After sorting the elements in the array are\n");
    for (i = 0; i < n; i++)
    {
        printf("Value of a[%d] = %d\n", i, a[i]);
    }
}

```

Execution Results - All test cases have succeeded!

Test Case - 1	
User Output	
Enter value of n :	
4	
Enter element for a[0] :	
78	
Enter element for a[1] :	
43	
Enter element for a[2] :	
99	
Enter element for a[3] :	

Before sorting the elements in the array are
Value of a[0] = 78
Value of a[1] = 43
Value of a[2] = 99
Value of a[3] = 27
After sorting the elements in the array are
Value of a[0] = 27
Value of a[1] = 43
Value of a[2] = 78
Value of a[3] = 99

S.No: 7	Exp. Name: <i>Write a C program to sort given elements using shell sort technique.</i>	Date: 2023-06-15
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Aim:

Write a program to **sort** (**ascending order**) the given elements using **shell sort** technique.

At the time of execution, the program should print the message on the console as:

Enter array size :

For example, if the user gives the **input** as:

Enter array size : 5

Next, the program should print the following message on the console as:

Enter 5 elements :

if the user gives the **input** as:

Enter 5 elements : 34 67 12 45 22

then the program should **print** the result as:

Before sorting the elements are : 34 67 12 45 22
After sorting the elements are : 12 22 34 45 67

Note: Do use the **printf()** function with a **newline** character (**\n**).

Source Code:

ShellSort2.c

```

#include <stdio.h>
#include <conio.h>
int shellSort(int arr[], int n)
{
    for (int gap = n/2; gap > 0; gap /= 2)
    {
        for (int i = gap; i < n; i += 1)
        {
            int temp = arr[i];
            int j;
            for (j = i; j >= gap && arr[j - gap] > temp; j -= gap)
                arr[j] = arr[j - gap];
            arr[j] = temp;
        }
    }
    return 0;
}
void printArray(int arr[], int n)
{
    for (int i=0; i<n; i++)
        printf("%d ",arr[i]);
    printf("\n");
}
int main()
{
    int size;
    int *arr, i;
    printf("Enter array size : ");
    scanf("%d",&size);
    arr = (int*) malloc(size * sizeof(int));
    printf("Enter %d elements : ",size);
    for (i = 0; i < size; i++)
    {
        scanf("%d", &arr[i]);
    }
    printf("Before sorting the elements are : ");
    printArray(arr,size);
    shellSort(arr,size);
    printf("After sorting the elements are : ");
    printArray(arr,size);
    return 0;
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter array size :
5
Enter 5 elements :
12 32 43 56 78
Before sorting the elements are : 12 32 43 56 78
After sorting the elements are : 12 32 43 56 78

S.No: 8	Exp. Name: <i>Write a C program to Sort the elements using Bubble Sort Technique</i>	Date: 2023-07-03
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Aim:

Write a program to **sort** the given elements using [bubble sort technique](#).

At the time of execution, the program should print the message on the console as:

Enter value of n :

For example, if the user gives the **input** as:

Enter value of n : 3

Next, the program should print the messages one by one on the console as:

Enter element for a[0] :
Enter element for a[1] :
Enter element for a[2] :

if the user gives the **input** as:

Enter element for a[0] : 22
Enter element for a[1] : 33
Enter element for a[2] : 12

then the program should **print** the result as:

Before sorting the elements in the array are
Value of a[0] = 22
Value of a[1] = 33
Value of a[2] = 12
After sorting the elements in the array are
Value of a[0] = 12
Value of a[1] = 22
Value of a[2] = 33

Fill in the missing code so that it produces the desired result.

Source Code:

BubbleSortDemo3.c

```

#include<stdio.h>
void main()
{
    int a[20], i, n, j, temp;
    printf("Enter value of n : ");
    scanf("%d", &n);
    for (i = 0; i < n; i++)
    {
        printf("Enter element for a[%d] : ", i);
        scanf("%d", &a[i]);
    }
    printf("Before sorting the elements in the array are\n");
    for (i = 0; i < n; i++)
    {
        printf("Value of a[%d] = %d\n", i, a[i]);
    }
    for (i = 0; i < n - 1; i++)
    {
        for (j = 0; j < n - i - 1; j++)
        {
            if (a[j] > a[j+1])
            {
                temp = a[j];
                a[j] = a[j+1];
                a[j+1] = temp;
            }
        }
    }
    printf("After sorting the elements in the array are\n");
    for (i = 0; i < n; i++)
    {
        printf("Value of a[%d] = %d\n", i, a[i]);
    }
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter value of n :
3
Enter element for a[0] :
34
Enter element for a[1] :
25
Enter element for a[2] :
28
Before sorting the elements in the array are
Value of a[0] = 34
Value of a[1] = 25
Value of a[2] = 28

Value of a[0] = 25
Value of a[1] = 28
Value of a[2] = 34

Test Case - 2

User Output

```
Enter value of n :  
5  
Enter element for a[0] :  
1  
Enter element for a[1] :  
6  
Enter element for a[2] :  
3  
Enter element for a[3] :  
8  
Enter element for a[4] :  
4  
Before sorting the elements in the array are  
Value of a[0] = 1  
Value of a[1] = 6  
Value of a[2] = 3  
Value of a[3] = 8  
Value of a[4] = 4  
After sorting the elements in the array are  
Value of a[0] = 1  
Value of a[1] = 3  
Value of a[2] = 4  
Value of a[3] = 6  
Value of a[4] = 8
```

S.No: 9	Exp. Name: <i>Write a program to sort Ascending order the given elements using quick sort technique.</i>	Date: 2023-07-03
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Aim:

Write a program to **sort** (**Ascending order**) the given elements using **quick sort** technique.

Note: Pick the first element as pivot. You will not be awarded marks if you do not follow this instruction.

At the time of execution, the program should print the message on the console as:

Enter array size :

For example, if the user gives the **input** as:

Enter array size : 5

Next, the program should print the following message on the console as:

Enter 5 elements :

if the user gives the **input** as:

Enter 5 elements : 34 67 12 45 22

then the program should **print** the result as:

Before sorting the elements are : 34 67 12 45 22
After sorting the elements are : 12 22 34 45 67

Note: Do use the **printf()** function with a **newline** character (**\n**).

Source Code:

QuickSortMain.c

```

#include <stdio.h>
void main()
{
    int arr[15], i, n;
    printf("Enter array size : ");
    scanf("%d", &n);
    printf("Enter %d elements : ", n);
    for (i = 0; i < n; i++)
    {
        scanf("%d", &arr[i]);
    }
    printf("Before sorting the elements are : ");
    display(arr, n);
    quickSort(arr, 0, n - 1);
    printf("After sorting the elements are : ");
    display(arr, n);
}
void display(int arr[15], int n)
{
    int i;
    for (i = 0; i < n; i++)
    printf("%d ", arr[i]);
    printf("\n");
}
int partition(int arr[15], int lb, int ub)
{
    int pivot, down = lb, up = ub, temp;
    pivot = arr[lb];
    while (down < up)
    {
        while (arr[down] <= pivot && down < up)
        {
            down++;
        }
        while (arr[up] > pivot)
        {
            up--;
        }
        if (down < up)
        {
            temp = arr[up];
            arr[up] = arr[down];
            arr[down] = temp;
        }
    }
    arr[lb] = arr[up];
    arr[up] = pivot;
    return up;
}
void quickSort(int arr[15], int low, int high)
{
    int j;
    if (low < high)
    {
        j = partition(arr, low, high);
    }
}

```

```
    }  
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter array size :
5
Enter 5 elements :
34 67 12 45 22
Before sorting the elements are : 34 67 12 45 22
After sorting the elements are : 12 22 34 45 67

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Test Case - 2
User Output
Enter array size :
8
Enter 8 elements :
77 55 22 44 99 33 11 66
Before sorting the elements are : 77 55 22 44 99 33 11 66
After sorting the elements are : 11 22 33 44 55 66 77 99

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Test Case - 3
User Output
Enter array size :
5
Enter 5 elements :
-32 -45 -67 -46 -14
Before sorting the elements are : -32 -45 -67 -46 -14
After sorting the elements are : -67 -46 -45 -32 -14

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S.No: 10	Exp. Name: <i>Write a C program to sort the given elements using Heap sort</i>	Date: 2023-07-03
----------	--	------------------

Aim:

Write a program to sort (ascending order) the given elements using heap sort technique.

Note: Do use the printf() function with a newline character (\n).

Source Code:

HeapSortMain.c

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```

#include <stdio.h>
void main()
{
    int arr[15], i, n;
    printf("Enter array size : ");
    scanf("%d", &n);
    printf("Enter %d elements : ", n);
    for (i = 0; i < n; i++)
    {
        scanf("%d", &arr[i]);
    }
    printf("Before sorting the elements are : ");
    display(arr, n);
    heapsort(arr,n);
    printf("After sorting the elements are : ");
    display(arr, n);
}
void display(int arr[15], int n)
{
    int i;
    for (i = 0; i < n; i++)
    printf("%d ", arr[i]);
    printf("\n");
}
void heapify(int arr[], int n, int i)
{
    int largest = i;
    int l = 2*i + 1;
    int r = 2*i + 2;
    int temp;
    if (l < n && arr[l] > arr[largest])
    largest = l;
    if (r < n && arr[r] > arr[largest])
    largest = r;
    if (largest != i)
    {
        temp = arr[i];
        arr[i] = arr[largest];
        arr[largest] = temp;
        heapify(arr, n, largest);
    }
}
void heapsort(int arr[], int n)
{
    int i,temp;
    for(i = n/2-1; i >=0 ; i--)
    {
        heapify(arr,n,i);
    }
    for(i = n-1; i >= 0; i--)
    {
        temp = arr[0];
        arr[0] = arr[i];
        arr[i] = temp;
        heapify(arr,i,0);
    }
}

```

```
    }  
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter array size :
5
Enter 5 elements :
23 54 22 44 12
Before sorting the elements are : 23 54 22 44 12
After sorting the elements are : 12 22 23 44 54

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Test Case - 2
User Output
Enter array size :
6
Enter 6 elements :
12 65 23 98 35 98
Before sorting the elements are : 12 65 23 98 35 98
After sorting the elements are : 12 23 35 65 98 98

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Test Case - 3
User Output
Enter array size :
4
Enter 4 elements :
-23 -45 -12 -36
Before sorting the elements are : -23 -45 -12 -36
After sorting the elements are : -45 -36 -23 -12

Test Case - 4
User Output
Enter array size :
6
Enter 6 elements :
1 -3 8 -4 -2 5
Before sorting the elements are : 1 -3 8 -4 -2 5
After sorting the elements are : -4 -3 -2 1 5 8

S.No: 11	Exp. Name: <i>Write a C program to Sort given elements using Merge sort</i>	Date: 2023-05-04
----------	--	------------------

Aim:

Write a program to **sort** (**Ascending order**) the given elements using **merge sort** technique.

At the time of execution, the program should print the message on the console as:

Enter array size :

For example, if the user gives the **input** as:

Enter array size : 5

Next, the program should print the following message on the console as:

Enter 5 elements :

if the user gives the **input** as:

Enter 5 elements : 34 67 12 45 22

then the program should **print** the result as:

Before sorting the elements are : 34 67 12 45 22
After sorting the elements are : 12 22 34 45 67

Note: Do use the **printf()** function with a **newline** character (**\n**).

Source Code:

MergeSortMain.c

```

#include <stdio.h>
void main() {
    int arr[15], i, n;
    printf("Enter array size : ");
    scanf("%d", &n);
    printf("Enter %d elements : ", n);
    for (i = 0; i < n; i++) {
        scanf("%d", &arr[i]);
    }
    printf("Before sorting the elements are : ");
    display(arr, n);
    splitAndMerge(arr, 0, n - 1);
    printf("After sorting the elements are : ");
    display(arr, n);
}
void display(int arr[15], int n) {
    int i;
    for(i=0;i<n;i++)
    printf("%d ",arr[i]);
    printf("\n");
}
void merge(int arr[15], int low, int mid, int high) {
    int i=low,h=low,j=mid+1,k,temp[15];
    while(h<=mid&&j<=high)
    {
        if(arr[h]<=arr[j])
        {
            temp[i]=arr[h];
            h++;
        }
        else
        {
            temp[i]=arr[j];
            j++;
        }
        i++;
    }
    if(h>mid)
    {
        for(k=j;k<=high;k++)
        {
            temp[i]=arr[k];
            i++;
        }
    }
    else
    {
        for(k=h;k<=mid;k++)
        {
            temp[i]=arr[k];
            i++;
        }
    }
    for(k=low;k<=high;k++){
        arr[k]=temp[k];
    }
}

```

```

void splitAndMerge(int arr[15], int low, int high) {
    if(low<high){
        int mid=(low+high)/2;
        splitAndMerge(arr,low,mid);
        splitAndMerge(arr,mid+1,high);
        merge(arr,low,mid,high);
    }
}

```

Execution Results - All test cases have succeeded!

Test Case - 1

User Output

Enter array size :

5

Enter 5 elements :

34 67 12 45 22

Before sorting the elements are : 34 67 12 45 22

After sorting the elements are : 12 22 34 45 67

Test Case - 2

User Output

Enter array size :

8

Enter 8 elements :

77 55 22 44 99 33 11 66

Before sorting the elements are : 77 55 22 44 99 33 11 66

After sorting the elements are : 11 22 33 44 55 66 77 99

Test Case - 3

User Output

Enter array size :

5

Enter 5 elements :

-32 -45 -67 -46 -14

Before sorting the elements are : -32 -45 -67 -46 -14

After sorting the elements are : -67 -46 -45 -32 -14

S.No: 12	Exp. Name: <i>Write a C program to sort given elements using Radix sort</i>	Date: 2023-07-03
----------	--	------------------

Aim:

Write a program to **sort** (**ascending order**) the given elements using **radix sort** technique.

At the time of execution, the program should print the message on the console as:

Enter array size :

For example, if the user gives the **input** as:

Enter array size : 5

Next, the program should print the following message on the console as:

Enter 5 elements :

if the user gives the **input** as:

Enter 5 elements : 34 67 12 45 22

then the program should **print** the result as:

Before sorting the elements are : 34 67 12 45 22
After sorting the elements are : 12 22 34 45 67

Note: Do use the **printf()** function with a **newline** character (**\n**).

Source Code:

RadixSortMain2.c

```

#include <stdio.h>
#include <conio.h>
int largest(int a[], int n)
{
    int large = a[0], i;
    for(i = 1; i < n; i++)
    {
        if(large < a[i])
            large = a[i];
    }
    return large;
}
void printArray(int arr[], int n)
{
    for (int i=0; i<n; i++)
    printf("%d ",arr[i]);
    printf("\n");
}
int main()
{
    int size;
    int *arr, i;
    printf("Enter array size : ");
    scanf("%d",&size);
    arr = (int*) malloc(size * sizeof(int));
    printf("Enter %d elements : ",size);
    for (i = 0; i < size; i++)
    {
        scanf("%d", &arr[i]);
    }
    printf("Before sorting the elements are : ");
    printArray(arr,size);
    RadixSort(arr,size);
    printf("After sorting the elements are : ");
    printArray(arr,size);
    return 0;
}
void RadixSort(int a[], int n)
{
    int bucket[10][10], bucket_count[10];
    int i, j, k, remainder, NOP=0, divisor=1, large, pass;
    large = largest(a, n);
    while(large > 0)
    {
        NOP++;
        large/=10;
    }
    for(pass = 0; pass < NOP; pass++)
    {
        for(i = 0; i < 10; i++)
        {
            bucket_count[i] = 0;
        }
        for(i = 0; i < n; i++)
        {

```

```

        bucket_count[remainder] += 1;
    }
    i = 0;
    for(k = 0; k < 10; k++)
    {
        for(j = 0; j < bucket_count[k]; j++)
        {
            a[i] = bucket[k][j];
            i++;
        }
    }
    divisor *= 10;
}
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter array size :
5
Enter 5 elements :
23
43
54
12
65
Before sorting the elements are : 23 43 54 12 65
After sorting the elements are : 12 23 43 54 65

Test Case - 2
User Output
Enter array size :
7
Enter 7 elements :
23
54
136
85
24
65
76
Before sorting the elements are : 23 54 136 85 24 65 76
After sorting the elements are : 23 24 54 65 76 85 136

S.No: 13	Exp. Name: <i>C program to performs all operations on singly linked list</i>	Date: 2023-07-03
----------	--	------------------

Aim:

Write a program that uses functions to perform the following **operations on singly linked list**

- i) Creation
- ii) Insertion
- iii) Deletion
- iv) Traversal

Source Code:

```
singlelinkedlistalloperations.c
```

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```

#include<stdio.h>
#include<stdlib.h>
void menu()
{
    printf("Options\n");
    printf("1 : Insert elements into the linked list\n");
    printf("2 : Delete elements from the linked list\n");
    printf("3 : Display the elements in the linked list\n");
    printf("4 : Count the elements in the linked list\n");
    printf("5 : Exit()\n");
}
struct node
{
    int data;
    struct node *next;
};
typedef struct node node;
struct node *head=NULL;
node* createnode(int data)
{
    node* temp=(node*)malloc(sizeof(node));
    temp->data=data;
    temp->next=NULL;
    return temp;
}
void insert(int data)
{
    node* newnode=createnode(data);
    node* temp;
    if(head==NULL)
    {
        head=createnode(data);
    }
    else
    {
        temp=head;
        while(temp->next!=NULL)
        {
            temp=temp->next;
        }
        temp->next=newnode;
    }
}
void delete(int position)
{
    int i;
    node* temp;
    if(head==NULL)
    {
        printf("List is empty");
    }
    else
    {
        temp=head;
        for(i=1;i<position-1;i++)
    }
}

```

```

        }
        temp->next=temp->next->next;
        printf("Deleted successfully\n");
    }
}

void display()
{
    node* temp;
    temp=head;
    if(head==NULL)
    {
        printf("List is empty\n");
    }
    while(temp!=NULL)
    {
        printf("%d ",temp->data);
        temp=temp->next;
    }
    printf("\n");
}
void count()
{
    int c=0;
    node * temp;
    if(head==NULL)
    {
        printf("List is Empty\n");
    }
    else
    {
        temp=head;
        while(temp!=NULL)
        {
            c++;
            temp=temp->next;
        }
    }
    printf("No of elements in the linked list are : %d\n",c);
}
void main()
{
    int choice,data,position,c;
    printf("Singly Linked List Example - All Operations\n");
    menu();
    printf("Enter your option : ");
    scanf("%d",&choice);
    while(choice!=5)
    {
        switch(choice)
        {
            case 1:
            {
                printf("Enter elements for inserting into linked
list : ");
                scanf("%d",&data);

```

```

    }
    case 2:
    {
        printf("Enter position of the element for deleteing
the element : ");
        scanf("%d",&position);
        delete(position);
        break;
    }
    case 3:
    {
        printf("The elements in the linked list are : ");
        display();
        break;
    }
    case 4:
    {
        count();
        break;
    }
    case 5:
    {
        exit(0);
    }
default:
{
    printf("Enter options from 1 to 5\n");
    exit(0);
}
}
menu();
printf("Enter your option : ");
scanf("%d",&choice);
}
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Singly Linked List Example - All Operations
Options
1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
1
Enter elements for inserting into linked list :
111

1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
1
Enter elements for inserting into linked list :
222
Options
1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
1
Enter elements for inserting into linked list :
333
Options
1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
1
Enter elements for inserting into linked list :
444
Options
1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
3
The elements in the linked list are : 111 222 333 444
Options
1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
2
Enter position of the element for deleteing the element :
2
Deleted successfully
Options

```
5 : Exit()
Enter your option :
3
The elements in the linked list are : 111 333 444
Options
1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
4
No of elements in the linked list are : 3
Options
1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
5
```

Test Case - 2

User Output

```
Singly Linked List Example - All Operations
Options
1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
1
Enter elements for inserting into linked list :
001
Options
1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
1
Enter elements for inserting into linked list :
010
Options
1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
```

```
1
Enter elements for inserting into linked list :
100
Options
1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
1
Enter elements for inserting into linked list :
101
Options
1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
3
The elements in the linked list are : 1 10 100 101
Options
1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
2
Enter position of the element for deleteing the element :
3
Deleted successfully
Options
1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
3
The elements in the linked list are : 1 10 101
Options
1 : Insert elements into the linked list
2 : Delete elements from the linked list
3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
4
```

3 : Display the elements in the linked list
4 : Count the elements in the linked list
5 : Exit()
Enter your option :
5

S.No: 14	Exp. Name: <i>C program which performs all operations on double linked list.</i>	Date: 2023-07-03
----------	--	------------------

Aim:

Write a C program that uses functions to perform the following **operations on double linked list**
i) Creationii) Insertioniii) Deletioniv) Traversal

Source Code:

AllOperationsDLL.c

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```

#include <stdio.h>
#include <stdlib.h>
#include <conio.h>
struct dnode
{
    struct dnode *prev;
    int data;
    struct dnode *next;
};
struct dnode *start = NULL;
void insert(int);
void remov(int);
void display();
int main()
{
    int n, ch;
    do
    {
        printf("Operations on doubly linked list");
        printf("\n1. Insert \n2.Remove\n3. Display\n0. Exit");
        printf("\nEnter Choice 0-4? : ");
        scanf("%d", &ch);
        switch (ch)
        {
            case 1:
                printf("Enter number: ");
                scanf("%d", &n);
                insert(n);
                break;
            case 2:
                printf("Enter number to delete: ");
                scanf("%d", &n);
                remov(n);
                break;
            case 3:
                display();
                break;
        }
    }while (ch != 0);
}
void insert(int num)
{
    struct dnode *nptra, *temp = start;
    nptra = malloc(sizeof(struct dnode));
    nptra->data = num;
    nptra->next = NULL;
    nptra->prev = NULL;
    if (start == NULL)
    {
        start = nptra;
    }
    else
    {
        while (temp->next != NULL)
            temp = temp->next;

```

```

        }
    }

void remov(int num)
{
    struct dnode *temp = start;
    while (temp != NULL)
    {
        if (temp->data == num)
        {
            if (temp == start)
            {
                start = start->next;
                start->prev = NULL;
            }
            else
            {

                if (temp->next == NULL)
                    temp->prev->next = NULL;
                else
                {
                    temp->prev->next = temp->next;
                    temp->next->prev = temp->prev;
                }
                free(temp);
            }
            return ;
        }
        temp = temp->next;
    }
    printf("%d not found.\n", num);
}

void display()
{
    struct dnode *temp = start;
    while (temp != NULL)
    {
        printf("%d\t", temp->data);
        temp = temp->next;
    }
    printf("\n");
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Operations on doubly linked list
1.Insert
2.Remove
3.Display
0.Exit

```
1
Enter number:
15
Operations on doubly linked list
1.Insert
2.Remove
3.Display
0.Exit
Enter Choice 0-4?:
1
Enter number:
16
Operations on doubly linked list
1.Insert
2.Remove
3.Display
0.Exit
Enter Choice 0-4?:
1
Enter number:
17
Operations on doubly linked list
1.Insert
2.Remove
3.Display
0.Exit
Enter Choice 0-4?:
1
Enter number:
18
Operations on doubly linked list
1.Insert
2.Remove
3.Display
0.Exit
Enter Choice 0-4?:
3
15    16    17    18
Operations on doubly linked list
1.Insert
2.Remove
3.Display
0.Exit
Enter Choice 0-4?:
2
Enter number to delete:
19
19 not found
Operations on doubly linked list
1.Insert
```

Enter Choice 0-4?:
3
15 16 17 18
Operations on doubly linked list
1.Insert
2.Remove
3.Display
0.Exit
Enter Choice 0-4?:
2
Enter number to delete:
16
Operations on doubly linked list
1.Insert
2.Remove
3.Display
0.Exit
Enter Choice 0-4?:
0

S.No: 15	Exp. Name: <i>C program to which performs all operations on Circular linked list.</i>	Date: 2023-07-03
----------	---	------------------

Aim:

Write a program that uses functions to perform the following **operations on Circular linked list**
i)Creationii)insertioniii)deletioniv) Traversal

Source Code:

AlloperationsinCLL.c

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```

#include<stdio.h>
#include<stdlib.h>
struct node{
    int data;
    struct node *next;
};
void insert();
void deletion();
void find();
void print();
struct node *head = NULL;
int main()
{
    int choice;
    printf("CIRCULAR LINKED LIST IMPLEMENTATION OF LIST ADT\n");
    while(1)
    {
        printf("1.INSERT ");
        printf("2.DELETE ");
        printf("3.FIND ");
        printf("4.PRINT ");
        printf("5.QUIT\n");
        printf("Enter the choice: ");
        scanf("%d", &choice);
        switch(choice)
        {
            case 1:insert();break;
            case 2:deletion();break;
            case 3:find();break;
            case 4:print();break;
            case 5:exit(0);
        }
    }
}
void insert()
{
    int x,n;
    struct node *newnode,*temp = head, *prev;
    newnode = (struct node*)malloc(sizeof(struct node));
    printf("Enter the element to be inserted: ");
    scanf("%d", &x);
    printf("Enter the position of the element: ");
    scanf("%d", &n);
    newnode->data = x;
    newnode->next = NULL;
    if(head == NULL)
    {
        head = newnode;
        newnode->next = newnode;
    }
    else if(n == 1)
    {
        temp = head;
        newnode->next = temp;
        while(temp->next != head)
    }
}

```

```

        head = newnode;
    }
    else
    {
        for(int i = 1; i < n-1; i++)
        {
            temp = temp->next;
        }
        newnode->next = temp->next;
        temp->next = newnode;
    }
}
void deletion()
{ struct node *temp = head, *prev, *temp1 = head;
int key, count = 0;
printf("Enter the element to be deleted: ");
scanf("%d", &key);
if(temp->data == key)
{
    prev = temp -> next;
    while(temp->next != head)
    {
        temp = temp->next;
    }
    temp->next = prev;
    free(head);
    head = prev;
    printf("Element deleted\n");
}
else
{
    while(temp->next != head)
    {
        if(temp->data == key)
        {
            count += 1;
            break;
        }
        prev = temp;
        temp = temp->next;
    }
    if(temp->data == key)
    {
        prev->next = temp->next;
        free(temp);
        printf("Element deleted\n");
    }
    else
    {
        printf("Element does not exist...!\n");
    }
}
}
void find()
{

```

```

printf("Enter the element to be searched: ");
scanf("%d", &key);
while(temp->next != head)
{
    if(temp->data == key)
    {
        count = 1;
        break;
    }
    temp = temp->next;
}
if (count == 1)
printf("Element exist...!\n");
else
{
    if(temp->data == key)
    printf("Element exist...!\n");
    else
        printf("Element does not exist...!\n");
}
}

void print()
{
    struct node *temp = head;
    printf("The list element are: ");

    while(temp->next != head)
    {
        printf("%d -> ",temp->data);
        temp = temp->next;
    }
    printf("%d -> ", temp->data) ;
    printf("\n");
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
CIRCULAR LINKED LIST IMPLEMENTATION OF LIST ADT
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT
Enter the choice:
1
Enter the element to be inserted:
12
Enter the position of the element:
1
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT
Enter the choice:
1
Enter the element to be inserted:

Enter the position of the element:
2
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT
Enter the choice:
1
Enter the element to be inserted:
15
Enter the position of the element:
3
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT
Enter the choice:
4
The list element are: 12 -> 14 -> 15 ->
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT
Enter the choice:
2
Enter the element to be deleted:
14
Element deleted
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT
Enter the choice:
4
The list element are: 12 -> 15 ->
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT
Enter the choice:
3
Enter the element to be searched:
12
Element exist...!
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT
Enter the choice:
5

Test Case - 2

User Output
CIRCULAR LINKED LIST IMPLEMENTATION OF LIST ADT
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT
Enter the choice:
1
Enter the element to be inserted:
54
Enter the position of the element:
1
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT
Enter the choice:
2
Enter the element to be deleted:
1

4

The list element are: 54 ->
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT

Enter the choice:

1

Enter the element to be inserted:

65

Enter the position of the element:

2

1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT

Enter the choice:

4

The list element are: 54 -> 65 ->

1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT

Enter the choice:

5

S.No: 16	Exp. Name: <i>Implementation of Circular Queue using Dynamic Array</i>	Date: 2023-07-03
----------	--	------------------

Aim:

Write a program to implement [circular queue](#) using **dynamic array**.

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Sample Input and Output:

```
Enter the maximum size of the circular queue : 3
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 2
Circular queue is underflow.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 3
Circular queue is empty.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 1
Enter element : 111
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 1
Enter element : 222
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 1
Enter element : 333
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 1
Enter element : 444
Circular queue is overflow.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 3
Elements in the circular queue : 111 222 333
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 2
Deleted element = 111
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 1
Enter element : 444
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 3
Elements in the circular queue : 222 333 444
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 2
Deleted element = 222
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 2
Deleted element = 333
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 2
Deleted element = 444
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 3
Circular queue is empty.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 4
```

Source Code:

```
CQueueUsingDynamicArray.c
```

```

#include <stdio.h>
#include <stdlib.h>
int *cqueue;
int front, rear;
int maxSize;
void initCircularQueue()
{
    cqueue = (int *)malloc(maxSize * sizeof(int));
    front = -1;
    rear = -1;
}
void dequeue()
{
    if (front == -1)
    {
        printf("Circular queue is underflow.\n");
    }
    else
    {
        printf("Deleted element = %d\n", *(cqueue + front));
        if (rear == front)
        {
            rear = front = -1;
        }
        else if (front == maxSize - 1)
        {
            front = 0;
        }
        else
        {
            front++;
        }
    }
}
void enqueue(int x)
{
    if (((rear == maxSize - 1) && (front == 0)) || (rear + 1 == front))
    {
        printf("Circular queue is overflow.\n");
    }
    else
    {
        if (rear == maxSize - 1)
        {
            rear = -1;
        }
        else if (front == -1)
        {
            front = 0;
        }
        rear++;
        cqueue[rear] = x;
        printf("Successfully inserted.\n");
    }
}

```

```

int i;
if (front == -1 && rear == -1)
{
    printf("Circular queue is empty.\n");
}
else
{
    printf("Elements in the circular queue : ");
    if (front <= rear)
    {
        for (i = front; i <= rear; i++)
        {
            printf("%d ", *(cqueue + i));
        }
    }
    else
    {
        for (i = front; i <= maxSize - 1; i++)
        {
            printf("%d ", *(cqueue + i));
        }
        for (i = 0; i <= rear; i++)
        {
            printf("%d ", *(cqueue + i));
        }
    }
    printf("\n");
}
int main()
{
    int op, x;
    printf("Enter the maximum size of the circular queue : ");
    scanf("%d", &maxSize);
    initCircularQueue();
    while(1)
    {
        printf("1.Enqueue 2.Dequeue 3.Display 4.Exit\n");
        printf("Enter your option : ");
        scanf("%d",&op);
        switch(op)
        {
            case 1:
                printf("Enter element : ");
                scanf("%d",&x);
                enqueue(x);
                break;
            case 2:
                dequeue();
                break;
            case 3:
                display();
                break;
            case 4:
                exit(0);
        }
    }
}

```

```
    }  
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the maximum size of the circular queue :
3
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
2
Circular queue is underflow.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
3
Circular queue is empty.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
1
Enter element :
111
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
1
Enter element :
222
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
1
Enter element :
333
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
1
Enter element :
444
Circular queue is overflow.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
3
Elements in the circular queue : 111 222 333
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :

```
Enter your option :  
1  
Enter element :  
444  
Successfully inserted.  
1.Enqueue 2.Dequeue 3.Display 4.Exit  
Enter your option :  
3  
Elements in the circular queue : 222 333 444  
1.Enqueue 2.Dequeue 3.Display 4.Exit  
Enter your option :  
2  
Deleted element = 222  
1.Enqueue 2.Dequeue 3.Display 4.Exit  
Enter your option :  
2  
Deleted element = 333  
1.Enqueue 2.Dequeue 3.Display 4.Exit  
Enter your option :  
3  
Deleted element = 444  
1.Enqueue 2.Dequeue 3.Display 4.Exit  
Enter your option :  
3  
Circular queue is empty.  
1.Enqueue 2.Dequeue 3.Display 4.Exit  
Enter your option :  
4
```

S.No: 17	Exp. Name: <i>Write a C program to implement different Operations on Stack using Array representation</i>	Date: 2023-07-03
----------	---	------------------

Aim:

Write a program to implement [stack](#) using [arrays](#).

Sample Input and Output:

```

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 4
Stack is empty.

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 2
Stack is underflow.

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 3
Stack is empty.

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 5
Stack is underflow.

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 1
Enter element : 25
Successfully pushed.

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 1
Enter element : 26
Successfully pushed.

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 3
Elements of the stack are : 26 25

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 2
Popped value = 26

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 4
Stack is not empty.

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 5
Peek value = 25

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 6

```

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Source Code:

[StackUsingArray.c](#)

```

#include <stdio.h>
#include <stdlib.h>
#define STACK_MAX_SIZE 10
int arr[STACK_MAX_SIZE];
int top = -1;
void push(int element)
{
    if(top == STACK_MAX_SIZE - 1)
    {
        printf("Stack is overflow.\n");
    }
    else
    {
        top = top + 1;
        arr[top] = element;
        printf("Successfully pushed.\n");
    }
}
void display()
{
    if (top < 0)
    {
        printf("Stack is empty.\n");
    }
    else
    {
        printf("Elements of the stack are : " );
        for(int i = top; i >= 0; i--)
        {
            printf("%d ", arr[i]);
        }
        printf("\n");
    }
}
void pop()
{
    int x;
    if(top < 0)
    {
        printf("Stack is underflow.\n");
    }
    else
    {
        x = arr[top];
        top = top - 1;
        printf("Popped value = %d\n",x);
    }
}
void peek()
{
    int x;
    if(top < 0)
    {
        printf("Stack is underflow.\n");
    }
}

```

```

        x = arr[top];
        printf("Peek value = %d\n",x);
    }
}
void isEmpty()
{
    if (top < 0)
    {
        printf("Stack is empty.\n");
    }
    else
    {
        printf("Stack is not empty.\n");
    }
}
int main()
{
    int op, x;
    while(1)
    {
        printf("1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit\n");
        printf("Enter your option : ");
        scanf("%d", &op);
        switch(op)
        {
            case 1:
                printf("Enter element : ");
                scanf("%d", &x);
                push(x);
                break;
            case 2:
                pop();
                break;
            case 3:
                display();
                break;
            case 4:
                isEmpty();
                break;
            case 5:
                peek();
                break;
            case 6:
                exit(0);
        }
    }
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit

```
Enter your option :  
1  
Enter element :  
10  
Successfully pushed.  
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit  
Enter your option :  
1  
Enter element :  
20  
Successfully pushed.  
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit  
Enter your option :  
1  
Enter element :  
30  
Successfully pushed.  
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit  
Enter your option :  
3  
Elements of the stack are : 30 20 10  
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit  
Enter your option :  
5  
Peek value = 30  
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit  
Enter your option :  
2  
Popped value = 30  
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit  
Enter your option :  
2  
Popped value = 20  
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit  
Enter your option :  
3  
Elements of the stack are : 10  
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit  
Enter your option :  
5  
Peek value = 10  
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit  
Enter your option :  
4  
Stack is not empty.  
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit  
Enter your option :  
2  
Popped value = 10  
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
```

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit

Enter your option :

4

Stack is empty.

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit

Enter your option :

6

S.No: 18	Exp. Name: <i>Write a C program to implement different Operations on Stack using Linked Lists</i>	Date: 2023-07-03
----------	---	------------------

Aim:

Write a program to implement stack using **linked lists**.

Sample Input and Output:

```

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 1
Enter element : 33
Successfully pushed.
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 1
Enter element : 22
Successfully pushed.
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 1
Enter element : 55
Successfully pushed.
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 1
Enter element : 66
Successfully pushed.
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 3
Elements of the stack are : 66 55 22 33
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 2
Popped value = 66
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 2
Popped value = 55
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 3
Elements of the stack are : 22 33
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 5
Peek value = 22
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 4
Stack is not empty.
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option : 6

```

Source Code:

StackUsingLLList.c

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```

#include <stdio.h>
#include <stdlib.h>
struct stack
{
    int data;
    struct stack *next;
};
typedef struct stack *stk;
stk top = NULL;
stk push(int x)
{
    stk temp;
    temp = (stk)malloc(sizeof(struct stack));
    if(temp == NULL)
    {
        printf("Stack is overflow.\n");
    }
    else
    {
        temp -> data = x;
        temp -> next = top;
        top = temp;
        printf("Successfully pushed.\n");
    }
}
void display()
{
    stk temp = top;
    if(temp == NULL)
    {
        printf("Stack is empty.\n");
    }
    else
    {
        printf("Elements of the stack are : ");
        while(temp != NULL)
        {
            printf("%d ", temp -> data);
            temp = temp -> next;
        }
        printf("\n");
    }
}
stk pop()
{
    stk temp;
    if(top == NULL)
    {
        printf("Stack is underflow.\n");
    }
    else
    {
        temp = top;
        top = top -> next;
        printf("Popped value = %d\n", temp -> data);
    }
}

```

```

}

void peek()
{
    stk temp;
    if(top == NULL)
    {
        printf("Stack is underflow.\n");
    }
    else
    {
        temp = top;
        printf("Peek value = %d\n", temp -> data);
    }
}
void isEmpty()
{
    if(top == NULL)
    {
        printf("Stack is empty.\n");
    }
    else
    {
        printf("Stack is not empty.\n");
    }
}
int main()
{
    int op, x;
    while(1)
    {
        printf("1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit\n");
        printf("Enter your option : ");
        scanf("%d", &op);
        switch(op)
        {
            case 1:
                printf("Enter element : ");
                scanf("%d", &x);
                push(x);
                break;
            case 2:
                pop();
                break;
            case 3:
                display();
                break;
            case 4:
                isEmpty();
                break;
            case 5:
                peek();
                break;
            case 6:
                exit(0);
        }
    }
}

```

```
    }  
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option :
1
Enter element :
33
Successfully pushed.
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option :
1
Enter element :
22
Successfully pushed.
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option :
1
Enter element :
55
Successfully pushed.
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option :
1
Enter element :
66
Successfully pushed.
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option :
2
Popped value = 66
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option :
2
Popped value = 55
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option :
3
Elements of the stack are : 22 33

```
Peek value = 22
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option :
4
Stack is not empty.
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit
Enter your option :
6
```

Test Case - 2	
User Output	
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit	
Enter your option :	
2	
Stack is underflow.	
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit	
Enter your option :	
3	
Stack is empty.	
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit	
Enter your option :	
5	
Stack is underflow.	
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit	
Enter your option :	
4	
Stack is empty.	
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit	
Enter your option :	
1	
Enter element :	
23	
Successfully pushed.	
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit	
Enter your option :	
1	
Enter element :	
24	
Successfully pushed.	
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit	
Enter your option :	
3	
Elements of the stack are : 24 23	
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit	
Enter your option :	
5	
Peek value = 24	
1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit	

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit

Enter your option :

2

Popped value = 23

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit

Enter your option :

2

Stack is underflow.

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit

Enter your option :

4

Stack is empty.

1.Push 2.Pop 3.Display 4.IsEmpty 5.Peek 6.Exit

Enter your option :

6

S.No: 19	Exp. Name: <i>Write a C program to implement different Operations on Queue using Array representation</i>	Date: 2023-07-03
----------	---	------------------

Aim:

Write a program to implement queue using **arrays**.

Sample Input and Output:

```
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 1
Enter element : 23
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 1
Enter element : 56
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 3
Elements in the queue : 23 56
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 4
Queue is not empty.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 5
Queue size : 2
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 2
Deleted element = 23
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 2
Deleted element = 56
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 4
Queue is empty.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 6
```

Source Code:

`QUsingArray.c`

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```

#include <conio.h>
#include <stdio.h>
#define MAX 10
int queue[MAX];
int front = -1, rear = -1;
void enqueue(int x)
{
    if (rear == MAX - 1)
    {
        printf("Queue is overflow.\n");
    }
    else
    {
        rear++;
        queue[rear] = x;
        printf("Successfully inserted.\n");
    }
    if (front == -1)
    {
        front++;
    }
}
void dequeue()
{
    if (front == -1)
    {
        printf("Queue is underflow.\n");
    }
    else
    {
        printf("Deleted element = %d\n", queue[front]);
        if (rear == front)
        {
            rear = front = -1;
        }
        else
        {
            front++;
        }
    }
}
void display()
{
    if (front == -1 && rear == -1)
    {
        printf("Queue is empty.\n");
    }
    else
    {
        printf("Elements in the queue : ");
        for (int i = front; i <= rear; i++)
        {
            printf("%d ", queue[i]);
        }
        printf("\n");
    }
}

```

```

void size()
{
    if(front == -1 && rear == -1)
        printf("Queue size : 0\n");
    else
        printf("Queue size : %d\n",rear-front+1);
}
void isEmpty()
{
    if(front == -1 && rear == -1)
        printf("Queue is empty.\n");
    else
        printf("Queue is not empty.\n");
}
int main()
{
    int op, x;
    while(1)
    {
        printf("1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit\n");
        printf("Enter your option : ");
        scanf("%d",&op);
        switch(op)
        {
            case 1:
                printf("Enter element : ");
                scanf("%d",&x);
                enqueue(x);
                break;
            case 2:
                dequeue();
                break;
            case 3:
                display();
                break;
            case 4:
                isEmpty();
                break;
            case 5:
                size();
                break;
            case 6: exit(0);
        }
    }
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :

```
Queue is underflow.  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
3  
Queue is empty.  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
4  
Queue is empty.  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
5  
Queue size : 0  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
1  
Enter element :  
14  
Successfully inserted.  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
1  
Enter element :  
78  
Successfully inserted.  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
1  
Enter element :  
53  
Successfully inserted.  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
3  
Elements in the queue : 14 78 53  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
5  
Queue size : 3  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
6
```

Test Case - 2

User Output

```
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
1
```

1.Enqueue	2.Dequeue	3.Display	4.IsEmpty	5.Size	6.Exit
Enter your option :					
2					
Deleted element = 25					
1.Enqueue	2.Dequeue	3.Display	4.IsEmpty	5.Size	6.Exit
Enter your option :					
2					
Queue is underflow.					
1.Enqueue	2.Dequeue	3.Display	4.IsEmpty	5.Size	6.Exit
Enter your option :					
3					
Queue is empty.					
1.Enqueue	2.Dequeue	3.Display	4.IsEmpty	5.Size	6.Exit
Enter your option :					
1					
Enter element :					
65					
Successfully inserted.					
1.Enqueue	2.Dequeue	3.Display	4.IsEmpty	5.Size	6.Exit
Enter your option :					
3					
Elements in the queue : 65					
1.Enqueue	2.Dequeue	3.Display	4.IsEmpty	5.Size	6.Exit
Enter your option :					
4					
Queue is not empty.					
1.Enqueue	2.Dequeue	3.Display	4.IsEmpty	5.Size	6.Exit
Enter your option :					
2					
Deleted element = 65					
1.Enqueue	2.Dequeue	3.Display	4.IsEmpty	5.Size	6.Exit
Enter your option :					
4					
Queue is empty.					
1.Enqueue	2.Dequeue	3.Display	4.IsEmpty	5.Size	6.Exit
Enter your option :					
5					
Queue size : 0					
1.Enqueue	2.Dequeue	3.Display	4.IsEmpty	5.Size	6.Exit
Enter your option :					
1					
Enter element :					
63					
Successfully inserted.					
1.Enqueue	2.Dequeue	3.Display	4.IsEmpty	5.Size	6.Exit
Enter your option :					
5					
Queue size : 1					
1.Enqueue	2.Dequeue	3.Display	4.IsEmpty	5.Size	6.Exit
Enter your option :					

S.No: 20	Exp. Name: <i>Write a C program to implement different Operations on Queue using Dynamic Array</i>	Date: 2023-07-03
----------	---	------------------

Aim:

Write a program to implement queue using **dynamic array**.

In this queue implementation has

1. a pointer 'queue' to a dynamically allocated array (used to hold the contents of the queue)
2. an integer 'maxSize' that holds the size of this array (i.e the maximum number of data that can be held in this array)
3. an integer 'front' which stores the array index of the first element in the queue
4. an integer 'rear' which stores the array index of the last element in the queue.

Sample Input and Output:

```

Enter the maximum size of the queue : 3
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 2
Queue is underflow.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 3
Queue is empty.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 1
Enter element : 15
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 1
Enter element : 16
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 1
Enter element : 17
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 1
Enter element : 18
Queue is overflow.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 3
Elements in the queue : 15 16 17
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 2
Deleted element = 15
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 2
Deleted element = 16
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 3
Elements in the queue : 17
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 2
Deleted element = 17
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 3
Queue is empty.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 2
Queue is underflow.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 4

```

Source Code:

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2022-2026-CSE-A

Srinivasa Ramanujan Institute of Technology


```

#include <conio.h>
#include <stdio.h>
int *queue;
int front, rear;
int maxSize;
void initQueue()
{
    queue = (int *)malloc(maxSize*sizeof(int));
    front = -1;
    rear = -1;
}
void enqueue(int x)
{
    if (rear == maxSize - 1)
    {
        printf("Queue is overflow.\n");
    }
    else
    {
        rear++;
        queue[rear] = x;
        printf("Successfully inserted.\n");
    }
    if (front == -1)
    {
        front++;
    }
}
void dequeue()
{
    if (front == -1)
    {
        printf("Queue is underflow.\n");
    }
    else
    {
        printf("Deleted element = %d\n", *(queue+front));
        if (rear == front)
        {
            rear = front = -1;
        }
        else
        {
            front++;
        }
    }
}
void display()
{
    if (front == -1 && rear == -1)
    {
        printf("Queue is empty.\n");
    }
    else
    {

```

```

    {
        printf("%d ",*(queue+i));
    }
    printf("\n");
}
int main()
{
    int op, x;
    printf("Enter the maximum size of the queue : ");
    scanf("%d", &maxSize);
    initQueue();
    while(1)
    {
        printf("1.Enqueue 2.Dequeue 3.Display 4.Exit\n");
        printf("Enter your option : ");
        scanf("%d",&op);
        switch(op)
        {
            case 1:
                printf("Enter element : ");
                scanf("%d",&x);
                enqueue(x);
                break;
            case 2:
                dequeue();
                break;
            case 3:
                display();
                break;
            case 4:
                exit(0);
        }
    }
}

```

Execution Results - All test cases have succeeded!

Test Case - 1	
User Output	
Enter the maximum size of the queue :	
3	
1.Enqueue 2.Dequeue 3.Display 4.Exit	
Enter your option :	
2	
Queue is underflow.	
1.Enqueue 2.Dequeue 3.Display 4.Exit	
Enter your option :	
3	
Queue is empty.	
1.Enqueue 2.Dequeue 3.Display 4.Exit	

```
1
Enter element :
15
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
1
Enter element :
16
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
1
Enter element :
17
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
1
Enter element :
18
Queue is overflow.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
3
Elements in the queue : 15 16 17
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
2
Deleted element = 15
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
2
Deleted element = 16
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
3
Elements in the queue : 17
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
2
Deleted element = 17
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
3
Queue is empty.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option :
2
Queue is underflow.
```

Test Case - 2

User Output

Enter the maximum size of the queue :

2

1.Enqueue 2.Dequeue 3.Display 4.Exit

Enter your option :

1

Enter element :

34

Successfully inserted.

1.Enqueue 2.Dequeue 3.Display 4.Exit

Enter your option :

1

Enter element :

56

Successfully inserted.

1.Enqueue 2.Dequeue 3.Display 4.Exit

Enter your option :

1

Enter element :

45

Queue is overflow.

1.Enqueue 2.Dequeue 3.Display 4.Exit

Enter your option :

3

Elements in the queue : 34 56

1.Enqueue 2.Dequeue 3.Display 4.Exit

Enter your option :

2

Deleted element = 34

1.Enqueue 2.Dequeue 3.Display 4.Exit

Enter your option :

2

Deleted element = 56

1.Enqueue 2.Dequeue 3.Display 4.Exit

Enter your option :

2

Queue is underflow.

1.Enqueue 2.Dequeue 3.Display 4.Exit

Enter your option :

2

Queue is underflow.

1.Enqueue 2.Dequeue 3.Display 4.Exit

Enter your option :

3

Queue is empty.

1.Enqueue 2.Dequeue 3.Display 4.Exit

Enter your option :

Successfully inserted.

1.Enqueue 2.Dequeue 3.Display 4.Exit

Enter your option :

3

Elements in the queue : 56

1.Enqueue 2.Dequeue 3.Display 4.Exit

Enter your option :

4

S.No: 21	Exp. Name: <i>Write a C program to implement different Operations on Queue using Linked Lists</i>	Date: 2023-07-03
----------	---	------------------

Aim:

Write a program to implement queue using **linked lists**.

Sample Input and Output:

```

1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 1
Enter element : 57
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 1
Enter element : 87
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 5
Queue size : 2
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 3
Elements in the queue : 57 87
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 2
Deleted value = 57
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 2
Deleted value = 87
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 3
Queue is empty.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 5
Queue size : 0
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option : 6

```

Source Code:

[QUsingLL.c](#)

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Srinivasa Ramanujan Institute of Technology

```

#include <conio.h>
#include <stdio.h>
struct queue
{
    int data;
    struct queue *next;
};
typedef struct queue *Q;
Q front = NULL, rear = NULL;
void enqueue(int element)
{
    Q temp = NULL;
    temp = (Q)malloc(sizeof(struct queue));
    if(temp == NULL)
    {
        printf("Queue is overflow.\n");
    }
    else
    {
        temp -> data = element;
        temp -> next = NULL;
        if(front == NULL)
        {
            front = temp;
        }
        else
        {
            rear -> next = temp;
        }
        rear = temp;
        printf("Successfully inserted.\n");
    }
}
void dequeue()
{
    Q temp = NULL;
    if(front == NULL)
    {
        printf("Queue is underflow.\n");
    }
    else
    {
        temp = front;
        if (front == rear)
        {
            front = rear = NULL;
        }
        else
        {
            front = front -> next;
        }
        printf("Deleted value = %d\n", temp -> data);
        free(temp);
    }
}

```

```

if(front == NULL)
{
    printf("Queue is empty.\n");
}
else
{
    Q temp = front;
    printf("Elements in the queue : ");
    while(temp != NULL)
    {
        printf("%d ", temp -> data);
        temp = temp -> next;
    }
    printf("\n");
}

void size()
{
    int count =0;
    if(front == NULL)
    {
        printf("Queue size : 0\n");
    }
    else
    {
        Q temp = front;
        while(temp != NULL)
        {
            temp = temp -> next;
            count = count + 1;
        }
        printf("Queue size : %d\n",count);
    }
}

void isEmpty()
{
    if(front == NULL )
    {
        printf("Queue is empty.\n");
    }
    else
    {
        printf("Queue is not empty.\n");
    }
}

int main()
{
    int op, x;
    while(1)
    {
        printf("1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit\n");
        printf("Enter your option : ");
        scanf("%d",&op);
        switch(op)
        {

```

```

        scanf("%d",&x);
        enqueue(x);
        break;
    case 2:
        dequeue();
        break;
    case 3:
        display();
        break;
    case 4:
        isEmpty();
        break;
    case 5:
        size();
        break;
    case 6: exit(0);
}
}
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :
2
Queue is underflow.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :
3
Queue is empty.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :
4
Queue is empty.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :
5
Queue size : 0
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :
1
Enter element :
44
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :

```
55
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :
1
Enter element :
66
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :
1
Enter element :
67
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :
3
Elements in the queue : 44 55 66 67
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :
2
Deleted value = 44
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :
2
Deleted value = 55
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :
5
Queue size : 2
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :
4
Queue is not empty.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :
6
```

Test Case - 2

```
User Output
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :
1
Enter element :
23
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit
Enter your option :
```

```
Successfully inserted.  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
1  
Enter element :  
45  
Successfully inserted.  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
1  
Enter element :  
456  
Successfully inserted.  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
2  
Deleted value = 23  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
3  
Elements in the queue : 234 45 456  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
2  
Deleted value = 234  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
3  
Elements in the queue : 45 456  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
4  
Queue is not empty.  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
5  
Queue size : 2  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
3  
Elements in the queue : 45 456  
1.Enqueue 2.Dequeue 3.Display 4.IsEmpty 5.Size 6.Exit  
Enter your option :  
6
```

Aim:

Write a C program to reverse the links (not just displaying) of a linked list.

Note: Add node at the beginning.

Source Code:

```
reverseLinkedList.c
```

```

#include <stdio.h>
#include <stdlib.h>

struct Node
{
    int data;
    struct Node* next;
};

static void reverse(struct Node** head_ref)
{
    struct Node* prev = NULL;
    struct Node* current = *head_ref;
    struct Node* next = NULL;
    while (current != NULL)
    {
        next = current->next;
        current->next = prev;
        prev = current;
        current = next;
    }
    *head_ref = prev;
}

void push(struct Node** head_ref, int new_data)
{
    struct Node* new_node = (struct Node*) malloc(sizeof(struct Node));
    new_node->data = new_data;
    new_node->next = (*head_ref);
    (*head_ref) = new_node;
}

void printList(struct Node* head)
{
    struct Node* temp = head;
    while (temp != NULL)
    {
        printf("%d", temp->data);
        if (temp->next != NULL)
        {
            printf("->");
        }
        temp = temp->next;
    }
}

int main()
{
    struct Node* head = NULL;
    int i, count = 0, num = 0;
    printf("How many numbers you want to enter:");
    scanf(" %d", &count);
    for (i = 0; i < count; i++)
    {
        printf("Enter number %d:", i+1);
    }
}

```

```

    }
    printf("Given linked list:");
    printList(head);
    reverse(&head);
    printf("\nReversed linked list:");
    printList(head);
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
How many numbers you want to enter:
4
Enter number 1:
6
Enter number 2:
1
Enter number 3:
8
Enter number 4:
5
Given linked list:5->8->1->6
Reversed linked list:6->1->8->5

Test Case - 2
User Output
How many numbers you want to enter:
2
Enter number 1:
5
Enter number 2:
9
Given linked list:9->5
Reversed linked list:5->9

S.No: 23	Exp. Name: <i>Program to insert into BST and traversal using In-order, Pre-order and Post-order</i>	Date: 2023-07-09
----------	---	------------------

Aim:

Write a program to create a binary search tree of integers and perform the following operations using linked list.

- 5. Insert a node
- 6. In-order traversal
- 7. Pre-order traversal
- 8. Post-order traversal

Source Code:

BinarySearchTree.c

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```

#include<stdio.h>
#include<stdlib.h>
struct node
{
    int data;
    struct node *left, *right;
};

typedef struct node *BSTNODE;
BSTNODE newNodeInBST(int item)
{
    BSTNODE temp = (BSTNODE)malloc(sizeof(struct node));
    temp->data = item;
    temp->left = temp->right = NULL;
    return temp;
}

void inorderInBST(BSTNODE root)
{
    if (root != NULL)
    {
        inorderInBST(root->left);
        printf("%d ", root->data);
        inorderInBST(root->right);
    }
}
void preorderInBST(BSTNODE root)
{
    if (root != NULL)
    {
        printf("%d ", root->data);
        preorderInBST(root->left);
        preorderInBST(root->right);
    }
}
void postorderInBST(BSTNODE root)
{
    if (root != NULL)
    {
        postorderInBST(root->left);
        postorderInBST(root->right);
        printf("%d ", root->data);
    }
}
BSTNODE insertNodeInBST(BSTNODE node, int ele)
{
    if (node == NULL)
    {
        printf("Successfully inserted.\n");
        return newNodeInBST(ele);
    }
    if (ele < node->data)
        node->left = insertNodeInBST(node->left,ele);
    else if (ele > node->data)
        node->right = insertNodeInBST(node->right,ele);
}

```

```

        return node;
    }
void main()
{
    int x, op;
    BSTNODE root = NULL;
    while(1)
    {
        printf("1.Insert 2.Inorder Traversal 3.Preorder Traversal
4.Postorder Traversal 5.Exit\n");
        printf("Enter your option : ");
        scanf("%d", &op);
        switch(op)
        {
            case 1:
                printf("Enter an element to be inserted : ");
                scanf("%d", &x);
                root = insertNodeInBST(root,x);
                break;
            case 2:
                if(root == NULL)
                {
                    printf("Binary Search Tree is empty.\n");
                }
                else
                {
                    printf("Elements of the BST (in-order traversal):
");
                    inorderInBST(root);
                    printf("\n");
                }
                break;
            case 3:
                if(root == NULL)
                {
                    printf("Binary Search Tree is empty.\n");
                }
                else
                {
                    printf("Elements of the BST (pre-order traversal):
");
                    preorderInBST(root);
                    printf("\n");
                }
                break;
            case 4:
                if(root == NULL)
                {
                    printf("Binary Search Tree is empty.\n");
                }
                else
                {
                    printf("Elements of the BST (post-order traversal):
");
                    postorderInBST(root);
                }
        }
    }
}

```

```

        break;
        case 5:
            exit(0);
    }
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit
Enter your option :
1
Enter an element to be inserted :
100
Successfully inserted.
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit
Enter your option :
1
Enter an element to be inserted :
20
Successfully inserted.
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit
Enter your option :
1
Enter an element to be inserted :
200
Successfully inserted.
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit
Enter your option :
1
Enter an element to be inserted :
10
Successfully inserted.
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit
Enter your option :
1
Enter an element to be inserted :
30
Successfully inserted.
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit
Enter your option :
1
Enter an element to be inserted :
150
Successfully inserted.

```
Enter an element to be inserted :  
300  
Successfully inserted.  
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit  
Enter your option :  
2  
Elements of the BST (in-order traversal): 10 20 30 100 150 200 300  
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit  
Enter your option :  
3  
Elements of the BST (pre-order traversal): 100 20 10 30 200 150 300  
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit  
Enter your option :  
4  
Elements of the BST (post-order traversal): 10 30 20 150 300 200 100  
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit  
Enter your option :  
5
```

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Test Case - 2

User Output

```
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit  
Enter your option :  
1  
Enter an element to be inserted :  
25  
Successfully inserted.  
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit  
Enter your option :  
1  
Enter an element to be inserted :  
63  
Successfully inserted.  
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit  
Enter your option :  
1  
Enter an element to be inserted :  
89  
Successfully inserted.  
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit  
Enter your option :  
1  
Enter an element to be inserted :  
45  
Successfully inserted.  
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit  
Enter your option :  
1
```

2022-2026-CSE-A

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```
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit
Enter your option :
1
Enter an element to be inserted :
28
Successfully inserted.
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit
Enter your option :
4
Elements of the BST (post-order traversal): 28 45 65 89 63 25
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit
Enter your option :
3
Elements of the BST (pre-order traversal): 25 63 45 28 89 65
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit
Enter your option :
2
Elements of the BST (in-order traversal): 25 28 45 63 65 89
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit
Enter your option :
5
```

S.No: 24	Exp. Name: <i>Write a Program to Search an element using Binary Search and Recursion</i>	Date: 2023-07-09
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Aim:

Write a program to [search](#) the given element from a list of elements with [binary search](#) technique using [recursion](#).

At the time of execution, the program should print the message on the console as:

Enter value of n :

For example, if the user gives the [input](#) as:

Enter value of n : 5

Next, the program should print the following messages one by one on the console as:

Enter 5 elements :

if the user gives the [input](#) as:

Enter 5 elements : 33 55 22 44 11

then the program should [print](#) the result as:

After sorting the elements are : 11 22 33 44 55

Next, the program should print the message on the console as:

Enter key element :

if the user gives the [input](#) as:

Enter key element : 11

then the program should [print](#) the result as:

The given key element 11 is found at position : 0

Similarly, if the key element is given as [18](#) for the above example then the program should print the output as:

The given key element 18 is not found

Note: Write the functions [read\(\)](#), [bubbleSort\(\)](#), [display\(\)](#) and [binarySearch\(\)](#) in [BinarySearch.c](#)

Source Code:

[BinarySearch.c](#)

```

#include <stdio.h>
void read(int a[20], int n)
{
    int i;
    printf("Enter %d elements : ", n);
    for (i = 0; i < n; i++)
    {
        scanf("%d", &a[i]);
    }
}
void bubbleSort(int a[20], int n)
{
    int i, j, temp;
    for (i = 0; i < n - 1; i++)
    {
        for (j = 0; j < n - i - 1; j++)
        {
            if (a[j] > a[j+1])
            {
                temp = a[j];
                a[j] = a[j+1];
                a[j+1] = temp;
            }
        }
    }
}
void display(int a[20], int n)
{
    int i;
    for (i = 0; i < n; i++)
    {
        printf("%d ", a[i]);
    }
    printf("\n");
}
int binarySearch(int a[20], int low, int high, int key)
{
    int mid;
    if (low <= high)
    {
        mid = (low + high) / 2;
        if (a[mid] == key)
            return mid;
        else if (key < a[mid])
            binarySearch(a, low, mid - 1, key);
        else if (key > a[mid])
            binarySearch(a, mid + 1, high, key);
    }
    else
    {
        return -1;
    }
}
void main()
{

```

```

scanf("%d", &n);
read(a, n);
bubbleSort(a, n);
printf("After sorting the elements are : ");
display(a, n);
printf("Enter key element : ");
scanf("%d", &key);
flag = binarySearch(a, 0, n - 1, key);
if (flag == -1)
{
    printf("The given key element %d is not found\n", key);
}
else
{
    printf("The given key element %d is found at position : %d\n", key,
flag);
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter value of n :
5
Enter 5 elements :
33 55 22 44 11
After sorting the elements are : 11 22 33 44 55
Enter key element :
11
The given key element 11 is found at position : 0

Test Case - 2
User Output
Enter value of n :
4
Enter 4 elements :
23 9 45 18
After sorting the elements are : 9 18 23 45
Enter key element :
24
The given key element 24 is not found

S.No: 25	Exp. Name: <i>Graph traversals implementation - Breadth First Search</i>	Date: 2023-07-09
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Aim:

Write a program to implement Breadth First Search of a graph.

Source Code:

GraphsBFS.c

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```

#include <stdio.h>
#include <stdlib.h>
#define MAX 99
struct node
{
    struct node *next;
    int vertex;
};
typedef struct node * GNODE;
GNODE graph[20];
int visited[20];
int queue[MAX], front = -1,rear = -1;
int n;
void insertQueue(int vertex)
{
    if(rear == MAX-1)
        printf("Queue Overflow.\n");
    else
    {
        if(front == -1)
            front = 0;
        rear = rear+1;
        queue[rear] = vertex ;
    }
}
int isEmptyQueue()
{
    if(front == -1 || front > rear)
        return 1;
    else
        return 0;
}
int deleteQueue()
{
    int deleteItem;
    if(front == -1 || front > rear)
    {
        printf("Queue Underflow\n");
        exit(1);
    }
    deleteItem = queue[front];
    front = front+1;
    return deleteItem;
}
void BFS(int v)
{
    int w;
    insertQueue(v);
    while(!isEmptyQueue())
    {
        v = deleteQueue();
        printf("\n%d",v);
        visited[v]=1;
        GNODE g = graph[v];
        for(;g!=NULL;g=g->next)

```

```

        if(visited[w]==0)
        {
            insertQueue(w);
            visited[w]=1;
        }
    }
}

void main()
{
    int N, E, s, d, i, j, v;
    GNODE p, q;
    printf("Enter the number of vertices : ");
    scanf("%d",&N);
    printf("Enter the number of edges : ");
    scanf("%d",&E);
    for(i=1;i<=E;i++)
    {
        printf("Enter source : ");
        scanf("%d",&s);
        printf("Enter destination : ");
        scanf("%d",&d);
        q=(GNODE)malloc(sizeof(struct node));
        q->vertex=d;
        q->next=NULL;
        if(graph[s]==NULL)
        {
            graph[s]=q;
        }
        else
        {
            p=graph[s];
            while(p->next!=NULL)
            p=p->next;
            p->next=q;
        }
    }
    for(i=1;i<=n;i++)
    visited[i]=0;
    printf("Enter Start Vertex for BFS : ");
    scanf("%d", &v);
    printf("BFS of graph : ");
    BFS(v);
    printf("\n");
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the number of vertices :
5

```
5
Enter source :
1
Enter destination :
2
Enter source :
1
Enter destination :
4
Enter source :
4
Enter destination :
2
Enter source :
2
Enter destination :
3
Enter source :
4
Enter destination :
5
Enter Start Vertex for BFS :
1
BFS of graph :
1
2
4
3
5
```

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Test Case - 2	
User Output	
Enter the number of vertices :	
4	
Enter the number of edges :	
3	
Enter source :	
1	
Enter destination :	
2	
Enter source :	
2	
Enter destination :	
3	
Enter source :	
3	
Enter destination :	

BFS of graph :

2

3

4

S.No: 26	Exp. Name: <i>Graph traversals implementation - Depth First Search</i>	Date: 2023-07-09
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Aim:

Write a program to implement Depth First Search for a graph.

Source Code:

GraphsDFS.c

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```

#include<stdio.h>
#include<stdlib.h>
struct node
{
    struct node *next;
    int vertex;
};
typedef struct node * GNODE;
GNODE graph[20];
int visited[20];
int n;
void DFS(int i)
{
    GNODE p;
    printf("\n%d",i);
    p=graph[i];
    visited[i]=1;
    while(p!=NULL)
    {
        i=p->vertex;
        if(!visited[i])
            DFS(i);
        p=p->next;
    }
}
void main()
{
    int N,E,i,s,d,v;
    GNODE q,p;
    printf("Enter the number of vertices : ");
    scanf("%d",&N);
    printf("Enter the number of edges : ");
    scanf("%d",&E);
    for(i=1;i<=E;i++)
    {
        printf("Enter source : ");
        scanf("%d",&s);
        printf("Enter destination : ");
        scanf("%d",&d);
        q=(GNODE)malloc(sizeof(struct node));
        q->vertex=d;
        q->next=NULL;
        if(graph[s]==NULL)
            graph[s]=q;
        else
        {
            p=graph[s];
            while(p->next!=NULL)
                p=p->next;
            p->next=q;
        }
    }
    for(i=0;i<n;i++)
        visited[i]=0;
}

```

```
    printf("DFS of graph : ");
    DFS(v);
    printf("\n");
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the number of vertices :
6
Enter the number of edges :
7
Enter source :
1
Enter destination :
2
Enter source :
1
Enter destination :
4
Enter source :
4
Enter destination :
2
Enter source :
2
Enter destination :
3
Enter source :
4
Enter destination :
5
Enter source :
1
Enter destination :
3
Enter source :
3
Enter destination :
6
Enter Start Vertex for DFS :
1
DFS of graph :
1

Test Case - 2**User Output**

Enter the number of vertices :

5

Enter the number of edges :

5

Enter source :

1

Enter destination :

2

Enter source :

1

Enter destination :

4

Enter source :

4

Enter destination :

2

Enter source :

2

Enter destination :

3

Enter source :

4

Enter destination :

5

Enter Start Vertex for DFS :

1

DFS of graph :

1

2

3

4

5

S.No: 27	Exp. Name: <i>Travelling Sales Person problem using Dynamic programming</i>	Date: 2023-07-09
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Aim:

Write a C program to implement Travelling Sales Person problem using Dynamic programming.

Source Code:

TSP.c

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```

#include<stdio.h>
int ary[10][10], completed[10], n, cost = 0;
void takeInput()
{
    int i, j;
    printf("Number of villages: ");
    scanf("%d", &n);
    for (i = 0; i < n; i++)
    {
        for (j = 0; j < n; j++)
            scanf("%d", &ary[i][j]);
        completed[i] = 0;
    }
    printf("The cost list is:");
    for (i = 0; i < n; i++)
    {
        printf("\n");
        for (j = 0; j < n; j++)
            printf("\t%d", ary[i][j]);
    }
}
void mincost(int city)
{
    int i, ncity;
    completed[city] = 1;
    printf("%d-->", city + 1);
    ncity = least(city);
    if (ncity == 999)
    {
        ncity = 0;
        printf("%d", ncity + 1);
        cost += ary[city][ncity];
        return;
    }
    mincost(ncity);
}
int least(int c)
{
    int i, nc = 999;
    int min = 999, kmin;
    for (i = 0; i < n; i++)
    {
        if ((ary[c][i] != 0) && (completed[i] == 0))
            if (ary[c][i] + ary[i][c] < min)
            {
                min = ary[i][0] + ary[c][i];
                kmin = ary[c][i];
                nc = i;
            }
    }
    if (min != 999)
        cost += kmin;
    return nc;
}
int main()

```

```

        printf("\nThe Path is:\n");
        mincost(0);
        printf("\nMinimum cost is %d", cost);
        return 0;
    }
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Number of villages:
3
0 10 15
10 0 35
15 35 0
The cost list is:
0 10 15
10 0 35
15 35 0
The Path is:
1-->2-->3-->1
Minimum cost is 60

S.No: 28	Exp. Name: <i>Write a C program to Open a File and to Print its contents on the screen</i>	Date: 2023-07-09
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Aim:

Follow the instructions given below to write a program to [open](#) a file and to [print](#) its **contents** on the screen.

- Open a new file "[SampleText1.txt](#)" in write mode
- Write the content in the file
- Close the file
- Open the same file in read mode
- Read the content from file and print them on the screen
- Close the file

Source Code:

file1.c

```
#include <stdio.h>
void main()
{
    FILE *fp;
    char ch;
    fp = fopen("SampleText1.txt", "w");
    printf("Enter the text with @ at end : ");
    while ((ch = getchar()) != '@')
    {
        putc(ch, fp);
    }
    putc(ch, fp);
    fclose(fp);
    fp = fopen("SampleText1.txt", "r");
    printf("Given message is : ");
    while ((ch = getc(fp)) != '@')
    {
        putchar(ch);
    }
    printf("\n");
    fclose(fp);
}
```

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Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the text with @ at end :
CodeTantra is a
Startup Company recognized by Government of India@
Given message is : CodeTantra is a
Startup Company recognized by Government of India