S.No: 1	Exp. Name: ***Design a C program which sorts the strings using array of pointers***	Date: 2023-04-23

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,n;
        char * strarray[10];
        printf("Enter the number of strings: ");
        scanf("%d",&n);
        for(i=0;i<n;i++)
        {
                printf("Enter string %d: ",i+1);
                strarray[i]=(char *)malloc(sizeof(char)*20);
                scanf("%s",strarray[i]);
        }
        printf("Before Sorting\n");
        for(i=0;i<n;i++)
        {
                printf("%s\n",strarray[i]);
        }
        for(i=0;i<n-1;i++)
        {
                for(j=0;j<n-1;j++)
                {
                        diff=strcmp(strarray[j],strarray[j+1]);
                        if(diff>0)
                        {
                                temp=strarray[j];
                                strarray[j]=strarray[j+1];
                                strarray[j+1]=temp;
                        }
                }
        }
        printf("After Sorting\n");
        for(i=0;i<n;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
Enter string 2:
Code
Before Sorting
Tantra
Code
After Sorting
Code
Tantra

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

S.No: 2	Exp. Name: ***Write a C program to Search a Key element using Linear search Technique***	Date: 2023-04-23

Aim:
Write a program to search a **key** e**l**ement 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 e**l**ement 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>
int main()
{
        int a[10],i,j,n,flag=0;
        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",&j);
        for(i=0;i<n;i++)
        {
                if(j==a[i])
                {
                        flag++;
                        break;
                }
        }
        if(flag==1)
        {
                printf("The key element %d is found at the position %d",j,i);
        }
        else
        {
                printf("The key element %d is not found in the array",j);
        }
        printf("\n");
}
```

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
The key element 22 is found at the position 1

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: ***Write a C program to Search a Key element using Binary search Technique***	Date: 2023-04-23

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 3
```

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 e**l**ement 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[5],i,j,temp,k,n,flag=0;
        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]);
        }
        for(i=0;i<=n-1;i++)
        {
                for(j=i+1;j<n;j++)
                {
                        if(a[j]<a[i])
                        {
                                temp=a[i];
                                a[i]=a[j];
                                a[j]=temp;
                        }
                }
        }
        printf("Enter key element : ");
        scanf("%d",&k);
        printf("\nAfter sorting the elements in the array are\n");
        for(i=0;i<n;i++)
        {
                printf("\nValue of a[%d] = %d\n",i,a[i]);
        }
        for(i=0;i<n;i++)
        {
                if(k==a[i])
                {
                        flag++;
                        break;
                }
        }
        if(flag==1)
        printf("The key element %d is found at the position %d\n",k,i);
        else
        printf("The Key element %d is not found in the array\n",k);
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter value of n :
4
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

Test Case - 2
User Output
Enter value of n :
2
Enter element for a[0] :
80
Enter element for a[1] :
99
Enter key element :
50
After sorting the elements in the array are
Value of a[0] = 10
Value of a[1] = 80
The Key element 50 is not found in the array

S.No: 4	Exp. Name: ***Write a C program to implement Fibonacci Search technique***	Date: 2023-04-23

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");
}
```

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
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:
4
Element found at index: 1.

S.No: 5	Exp. Name: ***Write a C program to Sort the elements using Insertion Sort Technique***	Date: 2023-04-30

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]);
        }
        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");
        }
        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;
                        }
                }
        }
        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");
        }
}
```

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] :
1
Enter element for a[3] :
5
Enter element for a[4] :
1
Enter element for a[5] :
9
Before sorting the elements in the array are
Value of a[0] = 5
Value of a[1] = 9
Value of a[2] = 1
Value of a[3] = 5
Value of a[4] = 1
Value of a[5] = 9
After sorting the elements in the array are
Value of a[0] = 1
Value of a[1] = 1
Value of a[2] = 5
Value of a[3] = 5
Value of a[4] = 9
Value of a[5] = 9

Test Case - 2
User Output
Enter value of n :
4
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: ***Write a C program to Sort the elements using Selection Sort - Smallest element method Technique***	Date: 2023-04-30

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",i,a[i]);
                printf("\n");
        }
        for(i=0;i<n;i++)
        {
                for(j=i+1;j<n;j++)
                {
                        index=i;
                        if(a[j]<a[index])
                        {
                                index=j;
                        }
                        small=a[i];
                        a[i]=a[index];
                        a[index]=small;
                }
        }
        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");
        }
}
```

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] :
27
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: ***Write a C program to sort given elements using shell sort technique.***	Date: 2023-05-01

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

```c
#include<stdio.h>
void main()
{
        int i,j,n;
        printf("Enter array size : ");
        scanf("%d",&n);
        int a[n];
        printf("Enter %d elements : ",n);
        for(int i=0;i<n;i++)
                scanf("%d",&a[i]);
        }
        printf("Before sorting the elements are : ");
        for(i=0;i<n;i++)
        printf("%d ",a[i]);
        printf("\n");

        int interval,temp;
        for(interval=n/2;interval>0;interval/=2){
                for(i=interval;i<n;i++){
                        temp = a[i];
                        for(j=i;j>=interval&&a[j-interval]>temp;j-=interval)
                        a[j] = a[j-interval];
                        a[j] = temp;
                }
        }
        printf("After sorting the elements are : ");
        for(i=0;i<n;i++)
        printf("%d ",a[i]);
        printf("\n");
}
```

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 33 43 56 78

S.No: 8	Exp. Name: ***Write a C program to Sort the elements using Bubble Sort Technique***	Date: 2023-04-30

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
```



```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",i,a[i]);
                printf("\n");
        }
        for(i=0;i<n;i++)
        {
                for(j=i+1;j<n;j++)
                {
                        if(a[j]<a[i])
                        {
                                temp=a[i];
                                a[i]=a[j];
                                a[j]=temp;
                        }
                }
        }
        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");
        }
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter value of n :
3
Enter element for a[0] :
14
Enter element for a[1] :
25
Enter element for a[2] :
28

Value of a[0] = 14
Value of a[1] = 25
Value of a[2] = 28
After sorting the elements in the array are
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: ***Write a program to sort Ascending order the given elements using quick sort technique.***	Date: 2023-05-03

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
```



```c
#include<stdio.h>
void quicksort(int[],int,int);
int partition(int[],int,int);
void swap(int*, int*);
void main(){
        int i,j,n;
        printf("Enter array size : ");
        scanf("%d",&n);
        printf("Enter %d elements : ",n);
        int a[n];
        for(i=0;i<n;i++){
                scanf("%d",&a[i]);
        }
        printf("Before sorting the elements are : ");
        for(i=0;i<n;i++)
        printf("%d ",a[i]);
        printf("\n");
        int temp,k;
        k = sizeof(a)/sizeof(a[0]);
        quicksort(a,0,k-1);
        printf("After sorting the elements are : ");
        for(i=0;i<n;i++)
        printf("%d ",a[i]);
        printf("\n");
}
void quicksort(int a[],int low,int high){
        if(low<high){
                int index = partition(a,low,high);
                quicksort(a,low,index-1);
                quicksort(a,index+1,high);
        }
}
int partition(int a[],int low,int high){
        int pivot = a[low];
        int st = low;
        int end = high;
        int k = high;
        for(int i=high;i>low;i--){
                if(a[i]>pivot)
                swap(&a[i],&a[k--]);
        }
        swap(&a[low],&a[k]);
        return k;
}
void swap(int *a, int *b){
        int temp;
        temp = *a;
        *a = *b;
        *b = temp;
}
```

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: 10	Exp. Name: ***Write a C program to sort the given elements using Heap sort***	Date: 2023-05-10

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
```



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

```
    }
}
```

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

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

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 :
-3 8 -4 -2 5
Before sorting the elements are : -3 -3 8 -4 -2 5
After sorting the elements are : -4 -3 -2 5 5 8

S.No: 11	Exp. Name: ***Write a C program to Sort given elements using Merge sort***	Date: 2023-05-03

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>
#include<conio.h>
void merge(int[],int ,int,int);
void display(int[],int);
void splitAndMerge(int[],int,int);
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[], 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];
```



```
        }
        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 :
-12 -45 -67 -46 -14
Before sorting the elements are : -12 -45 -67 -46 -14
After sorting the elements are : -67 -46 -45 -12 -14

S.No: 12	Exp. Name: ***Write a C program to sort given elements using Radix sort***	Date: 2023-05-03

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[],int);
void printArray(int[],int);
void RadixSort(int[],int);
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;
}
int largest(int a[], int n) {
        int i,k=a[0];
        for(i=0;i<n;i++) {
                if(a[i]>k) {
                        k=a[i];
                }
        }
        return k;
}
void printArray(int a[], int n) {
        int i;
        for(i=0;i<n;i++)
        {
                printf("%d ",a[i]);
        }
        printf("\n");
}
void RadixSort(int a[],int n) {
        int bucket[10][10],bucket_count[10],i,j,k,rem,NOP=0,div1=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++) {
                rem=(a[i]/div1)%10;
                bucket[rem][bucket_count[rem]]=a[i];
                bucket_count[rem]++;
        }
```



```
                for(j=0;j<bucket_count[k];j++) {
                        a[i]=bucket[k][j];
                        i++;
                }
        }
        div1*=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
176
85
24
65
76
Before sorting the elements are : 23 54 176 85 24 65 76
After sorting the elements are : 23 24 54 65 76 85 176

S.No: 13	Exp. Name: ***C program to performs all operations on singly linked list***	Date: 2023-05-03

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`


```
#include<stdio.h>
#include<stdlib.h>
struct node {
        int data;
        struct node *next;
} *head = NULL, *tail =NULL;
void insert();
void Delete();
void display();
void count();
typedef struct node *NODE;
NODE temp,newNode,ptr,ptr2;
int value;
void main() {
        int option=0;
        printf("Singly Linked List Example - All Operations\n");
        while(1) {
                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");
                printf("Enter your option : ");
                scanf("%d",&option);
                if(option<=5) {
                        switch(option) {
                                case 1:
                                insert();
                                break;
                                case 2:
                                Delete();
                                break;
                                case 3:
                                display();
                                break;
                                case 4:
                                count();
                                break;
                                case 5:
                                exit(0);
                        }
                }
                else {
                        printf("Enter options from 1 to 5\n");
                        break;
                }
        }
}
void insert() {
        printf("Enter elements for inserting into linked list : ");
        scanf("%d",&value);
        newNode = (NODE) malloc(sizeof(struct node));
        newNode->data = value;
        newNode->next = NULL;
```

```
                tail = newNode;
        }
        else{
                tail->next = newNode;
                tail = newNode;
        }
}
void Delete() {
        int i = 1,j = 1,pos,spot,cnt = 0;
        temp = head,ptr2 = head;
        while(ptr2!=NULL) {
                cnt++;
                ptr2 = ptr2->next;
        }
        printf("Enter position of the element for deleteing the element : ");
        scanf("%d",&spot);
        while(i<=cnt) {
                if(i == spot) {
                        pos = spot;
                        break;
                }
                i++;
        }
        if(pos !=spot) printf("Invalid Position.\n");
        else {
                if(pos == 1) {
                        head = head->next;
                        free(temp);
                }
                else {
                        while(j<pos){
                                ptr = temp;
                                temp = temp->next;
                                j++;
                        }
                        if(temp->next == NULL){
                                ptr->next = NULL;
                                free(temp);
                        }
                        else{
                                ptr->next = temp->next;
                                free(temp);
                        }
                }
                printf("Deleted successfully\n");
        }
}
void display() {
        temp = head;
        printf("The elements in the linked list are : ");
        while(temp !=NULL) {
                printf("%d ",temp->data);
                temp = temp->next;
        }
        printf("\n");
```



```
        int count = 0;
        temp = head;
        while(temp != NULL) {
                count++;
                temp = temp->next;
        }
        printf("No of elements in the linked list are : %d\n",count);
}
```

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 :

Enter elements for inserting into linked list :
111
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 :
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 :

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()
```



```
5 : Exit()
Enter your option :

Enter elements for inserting into linked list :
111
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 :
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 :

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
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
```



```
2
Enter position of the element for deleteing the element :
2
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 : 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
```



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



```
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
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
```

S.No: 14	Exp. Name: *C program which performs all operations on double linked list.*	Date: 2023-05-03

Aim:
Write a C program that uses functions to perform the following **operations on double linked list**
i) Creation ii) Insertion iii) Deletion iv) Traversal

Source Code:

AllOperationsDLL.c


```
#include<stdio.h>
#include<stdlib.h>
void insert();
void rem();
void display();
struct node {
        int data;
        struct node *next;
        struct node *prev;
} *head = NULL, *tail = NULL;
typedef struct node *NODE;
void main() {
        int option = 0;
        while(1) {
                printf("Operations on doubly linked list\n");
                printf("1. Insert \n");
                printf("2.Remove\n");
                printf("3. Display\n");
                printf("0. Exit\n");
                printf("Enter Choice 0-4? : ");
                scanf("%d",&option);
                switch(option) {
                        case 1:
                        insert();
                        break;
                        case 2:
                        rem();
                        break;
                        case 3:
                        display();
                        break;
                        case 0:
                        exit(0);
                }
        }
}
void insert() {
        NODE temp,newNode;
        int value;
        newNode = (NODE)malloc(sizeof(struct node));
        printf("Enter number: ");
        scanf("%d",&value);
        newNode->data = value;
        if(head == NULL) {
                newNode->next = NULL;
                newNode->prev = NULL;
                head = newNode;
                tail = newNode;
        }
        else {
                tail->next = newNode;
                newNode->prev = tail;
                newNode->next = NULL;
                tail = newNode;
        }
```



```
        int devalue,item;
        NODE temp,ptr;
        printf("Enter number to delete: ");
        scanf("%d",&item);
        ptr = head;
        while(ptr !=NULL) {
                if(ptr->data == item) {
                        devalue = item;
                        break;
                }
                ptr = ptr->next;
        }
        if(devalue != item)
        printf("%d not found.\n",item);
        else {
                if(devalue == head->data) {
                        temp = head;
                        head = head->next;
                        head->prev = NULL;
                        free(temp);
                }
                else if(devalue == tail->data) {
                        temp = tail;
                        tail = tail->prev;
                        tail->next = NULL;
                        free(temp);
                }
                else {
                        temp = head;
                        while(temp->data !=devalue) {
                                temp = temp->next;
                        }
                        temp->prev->next = temp->next;
                        temp->next->prev = temp->prev;
                        free(temp);
                }
        }
}
void display() {
        NODE temp;
        temp = head;
        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
Enter Choice 0-4?:
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
```



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


S.No: 15	Exp. Name: ***C program to which performs all operations on Circular linked list.***	Date: 2023-05-22

Aim:
Write a program that uses functions to perform the following **operations on Circular linked list**
(Creation\Insertion\Deletion\Traverse) Traversal

Source Code:

`AlloperationsinCLL.c`


```
#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:
14
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


```
2
Enter the element to be deleted:
1
Element does not exist...!
1.INSERT 2.DELETE 3.FIND 4.PRINT 5.QUIT
Enter the choice:
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: ***Implementation of Circular Queue using Dynamic Array***	Date: 2023-05-22

Aim:
Write a program to implement `circular queue` using ***dynamic array***.

```
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
```



```
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
```


S.No: 17	Exp. Name: ***Write a C program to implement different Operations on Stack using Array representation***	Date: 2023-05-03

Aim:

Write a program to implement `stack` using **arrays**.

```
Sample Input and Output:
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 4
    Stack is empty.
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 2
    Stack is underflow.
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 3
    Stack is empty.
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 5
    Stack is underflow.
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 1
    Enter element : 25
    Successfully pushed.
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 1
    Enter element : 26
    Successfully pushed.
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 3
    Elements of the stack are : 26 25
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 2
    Popped value = 26
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 4
    Stack is not empty.
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 5
    Peek value = 25
    1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
    Enter your option : 6
```

Source Code:

StackUsingArray.c


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



```
        }
}
void pop(){
        if(top==-1){
                printf("Stack is underflow.\n");
        }
        else{
                printf("Poppod value = %d\n",arr[top]);
                top--;
        }
}
void peek() {
        if(top==-1){
                printf("Stack is underflow.\n");
        }
        else{
                printf("Peek value = %d\n",arr[top]);
        }
}
void isEmpty(){
        if(top==-1){
                printf("Stack is empty.\n");
        }
        else{
                printf("Stack is not empty.\n");
        }
}
```


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.Is Empty 5.Peek 6.Exit
Enter your option :
1
Enter element :
20
Successfully pushed.
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
1
Enter element :
30
Successfully pushed.
```



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

S.No: 18	Exp. Name: ***Write a C program to implement different Operations on Stack using Linked Lists***	Date: 2023-06-01

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

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

Source Code:

StackUsingList.c


```c
#include<stdio.h>
#include<stdlib.h>
void display();
void peek();
void isEmpty();
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);
                }
        }
}
struct stack {
        int data;
        struct stack*next;
};
typedef struct stack *stk;
stk top = NULL;
int 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() {
        if(top == NULL)
        printf("Stack is empty.\n");
```



```c
                stk temp=top;
                while(temp!=NULL) {
                        printf("%d ",temp->data);
                        temp=temp->next;
                }
                printf("\n");
        }
}
void pop() {
        if(top==NULL)
        printf("Stack is underflow.\n");
        else {
                printf("Popped value = ");
                stk temp = top;
                top = top->next;
                printf("%d\n",temp->data);
                free(temp);
        }
}
void peek() {
        if(top==NULL)
        printf("Stack is underflow.\n");
        else {
                printf("Peek value = ");
                stk temp = top;
                printf("%d\n",temp->data);
        }
}
void isEmpty() {
        if(top==NULL)
        printf("Stack is empty.\n");
        else
        printf("Stack is not empty.\n");
}
```


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 :
33
Successfully pushed.
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
1
Enter element :
22
Successfully pushed.
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
1
Enter element :
55
Successfully pushed.
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
1
Enter element :
```



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

Test Case - 2

User Output

```
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
2
Stack is underflow.
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
3
Stack is empty.
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
5
Stack is underflow.
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
4
Stack is empty.
```



```
Enter your option :
1
Enter element :
23
Successfully pushed.
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
1
Enter element :
24
Successfully pushed.
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
3
Elements of the stack are : 24 23
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
5
Peek value = 24
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
2
Popped value = 24
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
2
Popped value = 23
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
2
Stack is underflow.
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
4
Stack is empty.
1.Push 2.Pop 3.Display 4.Is Empty 5.Peek 6.Exit
Enter your option :
6
```

S.No: 19	Exp. Name: ***Write a C program to implement different Operations on Queue using Array representation***	Date: 2023-06-01

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

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

Source Code:

QUsingArray.c


```c
#include<stdio.h>
#include<stdlib.h>
void enqueue(int);
void dequeue();
void display();
void isEmpty();
void size();
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);
                }
        }
}
#define MAX 20
int rear = -1,front = -1,i;
int queue[MAX];
void enqueue(int ele) {
        if(rear==MAX-1)
        printf("Queue is overflow.\n");
        else
        {
                rear=rear+1;
                queue[rear]=ele;
                printf("Successfully inserted.\n");
        }
        if(front==-1)
        front=front+1;
}
void dequeue() {
        if(front==-1)
        printf("Queue is underflow.\n");
        else {
```



```c
        if(front==rear) {
                front=-1;
                rear=-1;
        }
        else
        front=front+1;
}
void display() {
        if(rear==-1&&front==-1)
        printf("Queue is empty.\n");
        else {
                printf("Elements in the queue : ");
                for(i=front;i<=rear;i++)
                printf("%d ",queue[i]);
                printf("\n");
        }
}
void isEmpty()
{
        if(rear==-1&&front==-1)
        printf("Queue is empty.\n");
        else
        printf("Queue is not empty.\n");
}
void size() {
        if(rear==-1&&front==-1)
        printf("Queue size : 0\n");
        else
        printf("Queue size : %d\n",rear-front+1);
}
```

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



```
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
5
Queue size : 3
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
6
```

Test Case - 2

User Output

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



```
Queue is empty.
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
5
Queue size : 0
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
1
Enter element :
63
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
5
Queue size : 1
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
6
```

S.No: 20	Exp. Name: ***Write a C program to implement different Operations on Queue using Dynamic Array***	Date: 2023-05-10

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 : 5
    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:

QUsingDynamicArray.c


```
#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("Elements in the queue : ");
                for (int i = front;i <=rear; i++) {
                        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);
```



```
                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
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
```



```
4
```

Test Case - 2

User Output

```
Enter the maximum size of the queue :
5
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.
```

```
Enter your option :
1
Enter element :
56
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: ***Write a C program to implement different Operations on Queue using Linked Lists***	Date: 2023-05-03

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

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

Source Code:

QUsingLL.c


```
#include<stdio.h>
#include<consio.h>
void enqueue (int );
void dequeue();
void display();
void size();
void isEmpty();
int main() {
        int op,k;
        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",&k);
                        enqueue(k);
                        break;
                        case 2:
                        dequeue();
                        break;
                        case 3:
                        display();
                        break;
                        case 4:
                        isEmpty();
                        break;
                        case 5:
                        size();
                        break;
                        case 6: exit(0);
                }
        }
}
struct queue {
        int data;
        struct queue *next;
};
typedef struct queue *Q;
Q front = NULL, rear = NULL;
void enqueue(int ele)
{
        Q temp = NULL;
        temp = (Q)malloc(sizeof(struct queue));
        if(temp == NULL)
        {
                printf("Queue is overflow.\n");
        }
        else {
                temp->data = ele;
                temp->next = NULL;
                if(front == NULL) {
                        front = temp;
                }
```



```
                }
                rear = temp;
                printf("Successfully inserted.\n");
        }
}
void dequeue() {
        if(front == NULL)
        printf("Queue is underflow.\n");
        else {
                Q temp = front;
                front = front->next;
                printf("Deleted value = %d\n",temp->data);
                free(temp);
        }
}
void display() {
        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 temp, count =0;
        printf("Queue size : ");
        if(front == NULL)
        printf("0\n");
        else {
                Q temp = front;
                while(temp!=NULL) {
                        count++;
                        temp = temp->next;
                }
                printf("%d\n",count);
        }
}
void isEmpty() {
        if(front == NULL)
        printf("Queue is empty.\n");
        else
        printf("Queue is not empty.\n");
}
```

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 :
2
Queue is underflow.
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
3
Queue is empty.
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
4
Queue is empty.
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
5
Queue size : 0
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
1
Enter element :
44
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
1
Enter element :
55
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
1
Enter element :
66
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
1
Enter element :
67
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
3
Elements in the queue : 44 55 66 67
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
2
Deleted value = 44
```



```
Enter your option :
2
Deleted value = 55
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
5
Queue size : 2
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
4
Queue is not empty.
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
6
```

Test Case - 2

User Output

```
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
1
Enter element :
23
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
1
Enter element :
234
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
1
Enter element :
45
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
1
Enter element :
456
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
2
Deleted value = 23
1.Enqueue 2.Dequeue 3.Display 4.Is Empty 5.Size 6.Exit
Enter your option :
5
```



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


S.No: 22	Exp. Name: ***Reversing the links of a linked list***	Date: 2023-05-10

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;
} *head = NULL;
typedef struct node *NODE;
void reverselist();
void displaylist();
void main() {
        int i, n, value;
        NODE newNode;
        printf("How many  numbers you want to enter:");
        scanf("%d",&n);
        if(n<=0) {
                printf("Enter a valid number\n");
        }
        else {
                for(i=1;i<=n;i++) {
                        newNode = (NODE) malloc(sizeof(struct node));
                        printf("Enter number %d:",i);
                        scanf("%d",&value);
                        newNode->data = value;
                        newNode->next = NULL;
                        if(head == NULL)
                        head = newNode;
                        else {
                                newNode->next = head;
                                head = newNode;
                        }
                }
                printf("Given linked list:");
                displaylist();
                reverselist();
                printf("Reversed linked list:");
                displaylist();
        }
}
void reverselist() {
        NODE prev = NULL, next = NULL, current;
        current = head;
        while(current != NULL) {
                next = current->next;
                current->next = prev;
                prev = current;
                current = next;
        }
        head = prev;
}
void displaylist() {
        NODE temp;
        printf("%d",head->data);
        temp = head->next;
        while(temp != NULL) {
                printf("->%d",temp->data);
```

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

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->6->1->8
Reversed linked list:8->1->6->5

Test Case - 2
User Output
How many numbers you want to enter:

Enter number 1:
5
Enter number 2:
9
Given linked list:9->5
Reversed linked list:5->9

S.No: 23	Exp. Name: ***Program to insert into BST and traversal using In-order, Pre-order and Post-order***	Date: 2023-06-11

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`


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



```
                }
        }
}
```

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 :
50
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.
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit
Enter your option :

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

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

65
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 :
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: ***Write a Program to Search an element using Binary Search and Recursion***	Date: 2023-06-11

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: ***Graph traversals implementation - Breadth First Search***	Date: 2023-06-12

Aim:
Write a program to implement Breadth First Search of a graph.
Source Code:

GraphsBFS.c


```
#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

Enter the number of edges :
5
Enter source :
1
Enter destination :
2
Enter source :
1
Enter destination :
4
Enter source :
4
Enter destination :
5
Enter source :
2
Enter destination :
5
Enter source :
4
Enter destination :
5
Enter Start Vertex for BFS :
1
BFS of graph :
1
2
4
3
5

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

4
Enter Start Vertex for BFS :
2
BFS of graph :
2
3
4

S.No: 26	Exp. Name: ***Graph traversals implementation - Depth First Search***	Date: 2023-06-12

Aim:
Write a program to implement Depth First Search for a graph.
Source Code:

GraphsDFS.c


```
#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
2
4
5
```


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: ***Travelling Sales Person problem using Dynamic programming***	Date: 2023-06-12

Aim:

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

Source Code:

TSP.c


```
#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: ***Write a C program to Open a File and to Print its contents on the screen***	Date: 2023-04-20

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);
}
```

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
```

Test Case - 2

User Output


```
Enter the text with @ at end :
CodeTantra is
increasing development of Languages Year
by Year@
Given message is : CodeTantra is
increasing development of Languages Year
by Year
```


S.No: 29	Exp. Name: ***Write a C program to Copy contents of one File into another File***	Date: 2023-04-27

Aim:

Write a program to `copy` contents of one file into another file. Follow the instructions given below to write a program to copy the contents of one file to another file.

- Open a new file "`SampleTextFile1.txt`" in write mode
- Write the content onto the file
- Close the file
- Open an existing file "`SampleTextFile1.txt`" in read mode
- Open a new file "`SampleTextFile2.txt`" in write mode
- Copy the content from existing file to new file
- Close the files
- Open the copied file in read mode
- Read the text from file and print on the screen
- Close the file

Source Code:

CopyFile.c

```
#include<stdio.h>
void main()
{
        FILE *fp, *fp1, *fp2;
        char ch;
        fp = fopen("SampleTextFile1.txt", "w");
        printf("Enter the text with @ at end : ");
        while ((ch = getc(stdin))!= '@') {
                putc(ch, fp);
        }
        putc(ch, fp);
        fclose(fp);
        fp1 = fopen("SampleTextFile1.txt", "r");
        fp2 = fopen("SampleTextFile2.txt", "w");
        while ((ch = getc(fp1))!= '@') {
                putc(ch,fp2);
        }
        putc(ch, fp2);
        fclose(fp1);
        fclose(fp2);
        fp2 = fopen("SampleTextFile2.txt", "r");
        printf("Copied text is : ");
        while ((ch = getc(fp2))!='@') {
                putchar(ch);
        }
        printf("\n");
        fclose(fp2);
}
```

Execution Results - All test cases have succeeded!

Test Case - 1

User Output

```
Enter the text with @ at end :
CodeTantra started in the year 2014@
Copied text is : CodeTantra started in the year 2014
```

Test Case - 2

User Output

```
Enter the text with @ at end :
CodeTantra received
best Startup award from Hysea in 2016@
Copied text is : CodeTantra received
best Startup award from Hysea in 2016
```

S.No: 30	Exp. Name: ***Write a C program to Merge two Files and stores their contents in another File***	Date: 2023-06-12

Aim:

Write a program to `merge` two files and stores their contents in another file.

- Open a new file `"SampleDataFile1.txt"` in write mode
- Write the content onto the file
- Close the file
- Open another new file `"SampleDataFile2.txt"` in write mode
- Write the content onto the file
- Close the file
- Open first existing file `"SampleDataFile1.txt"` in read mode
- Open a new file `"SampleDataFile3.txt"` in write mode
- Copy the content from first existing file to new file
- Close the first existing file
- Open another existing file `"SampleDataFile2.txt"` in read mode
- Copy its content from existing file to new file
- Close that existing file
- Close the merged file

Source Code:

Merge.c


```
#include <stdio.h>
void main()
{
        FILE *fp1, *fp2, *fp3;
        char ch;
        fp1 = fopen("SampleDataFile1.txt", "w");
        printf("Enter the text with @ at end for file-1 :\n");
        while ((ch = getchar()) != '@')
        {
                putc(ch, fp1);
        }
        putc(ch, fp1);
        fclose(fp1);
        fp2 = fopen("SampleDataFile2.txt", "w");
        printf("Enter the text with @ at end for file-2 :\n");
        while ((ch = getchar()) != '@')
        {
                putc(ch, fp2);
        }
        putc(ch, fp2);
        fclose(fp2);
        fp1 = fopen("SampleDataFile1.txt", "r");
        fp3 = fopen("SampleDataFile3.txt", "w");
        while ((ch = getc(fp1)) != '@')
        {
                putc(ch, fp3);
        }
        fclose(fp1);
        fp2 = fopen("SampleDataFile2.txt", "r");
        while ((ch = getc(fp2)) != '@')
        {
                putc(ch, fp3);
        }
        putc(ch, fp3);
        fclose(fp2);
        fclose(fp3);
        fp3 = fopen("SampleDataFile3.txt", "r");
        printf("Merged text is : ");
        while ((ch = getc(fp3)) != '@')
        {
                putchar(ch);
        }
        printf("\n");
        fclose(fp3);
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the text with @ at end for file-1 :
CodeTantra developed an interactive tool

In the year 2014
CodeTantra got best Startup award in 2016@
Enter the text with @ at end for file-2 :
Now lot of Companies and Colleges using CodeTantra Tool@
Merged text is : CodeTantra developed an interactive tool
In the year 2014
CodeTantra got best Startup award in 2016
Now lot of Companies and Colleges using CodeTantra Tool

S.No: 31	Exp. Name: ***Write a C program to Delete a File***	Date: 2023-05-12

Aim:

Write a program to `delete` a **file**.

Note: Use the `remove(fileName)` function to delete an existing file.

Source Code:

Delete.c

```
#include <stdio.h>
#include<string.h>
void main() {
        FILE *fp;
        int status;
        char fileName[40], ch;
        printf("Enter a new file name : ");
        gets(fileName);
        fp = fopen("fileName.txt","w");
        printf("Enter the text with @ at end : ");
        while ((ch =getc(stdin))!='@') {
                putc(ch,fp);
        }
        putc(ch,fp);
        fclose(fp);
        fp = fopen("fileName.txt","r");
        printf("Given message is : ");
        while ((ch = fgetc(fp))!='@') {
                putchar(ch);
        }
        printf("\n");
        fclose(fp);
        status = remove(fileName);
        if (status == 0){
                printf("Unable to delete the file -- ");
                perror("Error\n");
        }
        else
        printf("%s file is deleted successfully\n", fileName);
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter a new file name :
Text1.txt
Enter the text with @ at end :
This is CodeTantra@
Given message is : This is CodeTantra
Text1.txt file is deleted successfully

Test Case - 2
User Output
Enter a new file name :
Text2.txt
Enter the text with @ at end :
C developed by Dennis Ritchie@
Given message is : C developed by Dennis Ritchie
Text2.txt file is deleted successfully

S.No: 32	Exp. Name: ***Write a C program to Copy last n characters from one File to another File***	Date: 2023-05-13

Aim:

Write a program to `copy` last `n` characters from **file-1** to **file-2**.

- open a new file `"TestDataFile1.txt"` in write mode
- write the content onto the file
- close the file
- open an existing file `"TestDataFile1.txt"` in read mode
- open a new file `"TestDataFile2.txt"` in write mode
- read the number of characters to copy
- set the cursor position by using fseek()
- copy the content from existing file to new file
- close the files
- open the copied file `"TestDataFile2.txt"` in read mode
- read the text from file and print on the screen
- close the file

Source Code:

Copy.c


```
#include<stdio.h>
void main() {
        FILE *fp, *fp1, *fp2;
        int num, length;
        char ch;
        fp = fopen("TestDataFile1.txt", "w");
        printf("Enter the text with @ at end : ");
        while ((ch = getc(stdin))!='@') {
                putc(ch, fp);
        }
        putc(ch, fp);
        fclose(fp);
        fp1 = fopen("TestDataFile1.txt", "r");
        fp2 = fopen("TestDataFile2.txt", "w");
        printf("Enter number of characters to copy : ");
        scanf("%d",&num);
        fseek(fp1,0,SEEK_END);
        length = ftell(fp1);
        fseek(fp1, (length-1-num), SEEK_SET);
        while ((ch = getc(fp1))!='@') {
                putc(ch, fp2);
        }
        putc(ch, fp2);
        fclose(fp1);
        fclose(fp2);
        fp2 = fopen("TestDataFile2.txt", "r");
        printf("Copied text is : ");
        while ((ch = getc(fp2))!='@') {
                putchar(ch);
        }
        printf("\n");
        fclose(fp2);
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the text with @ at end :

We should not give up
and we should not allow the problem to defeat us@
Enter number of characters to copy :
15
Copied text is : em to defeat us

Test Case - 2
User Output
Enter the text with @ at end :
You have to dream
before
Your dreams can come true@
Enter number of characters to copy :
20
Copied text is : dreams can come true

S.No: 33	Exp. Name: ***Write a C program to Reverse first n characters in a File***	Date: 2023-06-18

Aim:

Write a program to `reverse` the first `n` characters in a file.

- open a new file `"TestDataFile.txt"` in read/write mode
- write the content onto the file
- read the number of characters to copy
- copy the specified number of characters into a string
- reverse the string
- overwrite the entire string into the file from the beginning
- close the file
- open the copied file `"TestDataFile1.txt"` in read mode
- read the text from file and print on the screen
- close the file

Source Code:

Program1506.c

```
#include<stdio.h>
#include<string.h>
void stringReverse(char[]);
void main()
{
        FILE *fp;
        int num, i;
        char ch, data[100];
        fp = fopen("TestDataFile3.txt", "w+");
        printf("Enter the text with @ at end : ");
        while ((ch = getchar()) != '@')
        {
                putc(ch, fp);
        }
        putc(ch, fp);
        printf("Enter number of characters to copy : ");
        scanf("%d", &num);
        i = 0;
        rewind(fp);
        while (i < num)
        {
                data[i] = getc(fp);
                i++;
        }
        data[i] = '\0';
        rewind(fp);
        stringReverse(data);
        fputs(data, fp);
        fclose(fp);
        fp = fopen("TestDataFile3.txt", "r");
        printf("Result is : ");
        while ((ch = getc(fp)) != '@')
        {
                putchar(ch);
        }
        printf("\n");
        fclose(fp);
}
void stringReverse(char data[100])
{
        int i, j;
        char temp;
        i = j = 0;
        while (data[j] != '\0')
        {
                j++;
        }
        j--;
        while (i < j)
        {
                temp = data[i];
                data[i] = data[j];
                data[j] = temp;
                i++;
                j--;
        }
```

```
}
```

Execution Results - All test cases have succeeded!

Test Case - 1

User Output
Enter the text with @ at end :
Teaching is a
very noble profession that shapes the
character, caliber and future of an individual@
Enter number of characters to copy :
18
Result is : srov
a si gnihcaeT noble profession that shapes the
character, caliber and future of an individual

Test Case - 2

User Output
Enter the text with @ at end :
Small aim
is a crime; have great aim@
Enter number of characters to copy :
11
Result is : I
eola illeSs a crime; have great aim

S.No: 34	Exp. Name: ***Write a C program to Append data to an existing File***	Date: 2023-04-27

Aim:

Write a program to `append` data to an existing file and **display** its contents.

- open a new file `"DemoTextFile1.txt"` in write mode
- write the content onto the file
- close the file
- open a new same file in append mode
- write the content onto the file
- close the file
- open the same file in read mode
- read the text from file and print them on the screen
- close the file

Source Code:

appendDataToFile.c

```
#include <stdio.h>
void main() {
        FILE *fp;
        char ch;
        fp = fopen("DemoTextFile1.txt", "w");
        printf("Enter the text with @ at end : ");
        while ((ch=getchar())!='@') {
                putc(ch,fp);
        }
        fclose(fp);
        fp = fopen("DemoTextFile1.txt", "a");
        printf("Enter the text to append to a file with @ at end : ");
        while ((ch=getchar())!='@') {
                putc(ch,fp);
        }
        putc(ch,fp);
        fclose(fp);
        fp = fopen("DemoTextFile1.txt", "r");
        printf("File content after appending : ");
        while ((ch=getc(fp))!='@') {
                putchar(ch);
        }
        printf("\n");
        fclose(fp);
}
```

Execution Results - All test cases have succeeded!

Test Case - 1

User Output
Enter the text with @ at end :
I am studying@
Enter the text to append to a file with @ at end :

Life skills in University@
File content after appending : I am studying
Life skills in University

Test Case - 2

User Output
Enter the text with @ at end :
CodeTantra
developed@
Enter the text to append to a file with @ at end :
an interactive tool
to learn Programming@
File content after appending : CodeTantra
developed
an interactive tool
to learn Programming

S.No: 35	Exp. Name: ***Write a C program to Count number of Characters, Words and Lines of a given File***	Date: 2023-05-13

Aim:

Write a program to `count` number of **characters**, **words** and **lines** of given text file.

- open a new file `"DemoTextFile2.txt"` in write mode
- write the content onto the file
- close the file
- open the same file in read mode
- read the text from file and find the characters, words and lines count
- print the counts of characters, words and lines
- close the file

Source Code:

countCharWordLines.c

```
#include<stdio.h>
void main() {
        FILE *fp;
        char ch;
        int charCount = 0, wordCount = 0, lineCount = 0;
        fp = fopen("DemoTextFile2.txt", "w");
        printf("Enter the text with @ at end : ");
        while ((ch=getchar())!='@') {
                putc(ch,fp);
        }
        putc(ch,fp);
        fclose(fp);
        fp = fopen("DemoTextFile2.txt", "r");
        do {
                if (ch==' ' || ch=='\n')
                wordCount++;
                else
                charCount++;
                if (ch== '\n')
                lineCount++;
        }
        while ((ch=fgetc(fp))!='@');
        fclose(fp);
        printf("Total characters : %d\n", charCount-1);
        printf("Total words : %d\n", wordCount+1);
        printf("Total lines : %d\n", lineCount+1);
}
```

Execution Results - All test cases have succeeded!

Test Case - 1

User Output
Enter the text with @ at end :
Arise! Awake!

and stop not until
the goal is reached@
Total characters : 43
Total words : 10
Total lines : 3

Test Case - 2

User Output
Enter the text with @ at end :
All power is with in you;
you can do anything
and everything@
Total characters : 48
Total words : 12
Total lines : 3

S.No: 36	Exp. Name: ***Linked list Female gender first***	Date: 2023-06-18

Aim:

Consider a linked list consisting of name of a person and gender as a node. Arrange the linked list using 'Ladies first' principle. You may create new linked list if necessary.

Note: Add node at the beginning.

Source Code:

rearrangeList.c


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

struct Node
{
        int data;
        char name[20];
        char gender;
        struct Node *next;
};

void segregateEvenOdd(struct Node **head_ref)
{
        struct Node *end = *head_ref;
        struct Node *prev = NULL;
        struct Node *curr = *head_ref;

        while (end->next != NULL)
        end = end->next;

        struct Node *new_end = end;

        while (curr->data %2 != 0 && curr != end)
        {
                new_end->next = curr;
                curr = curr->next;
                new_end->next->next = NULL;
                new_end = new_end->next;
        }

        if (curr->data%2 == 0)
        {
                *head_ref = curr;

                while (curr != end)
                {
                        if ( (curr->data)%2 == 0 )
                        {
                                prev = curr;
                                curr = curr->next;
                        }
                        else
                        {
                                prev->next = curr->next;

                                curr->next = NULL;

                                new_end->next = curr;

                                new_end = curr;

                                curr = prev->next;
                        }
                }
```



```
                prev = curr;
                if (new_end!=end && (end->data)%2 != 0)
                {
                        prev->next = end->next;
                        end->next = NULL;
                        new_end->next = end;
                }
                return;
}

void push(struct Node** head_ref, char new_name[20], char new_gender)
{
        struct Node* new_node = (struct Node*) malloc(sizeof(struct Node));
        strcpy(new_node->name, new_name);
        new_node->gender = new_gender;
        if (new_gender == 'F')
        new_node->data = 0;
        else if (new_gender == 'M')
        new_node->data = 1;
        new_node->next = (*head_ref);
        (*head_ref) = new_node;
}
void printList(struct Node *node)
{
        while (node!=NULL)
        {
                printf("%s (%c)", node->name, node->gender);
                node = node->next;
                if (node!=NULL)
                printf(" --> ");
        }
}

int main()
{
        struct Node* head = NULL;
        char name[20];
        char gender;
        int noOfInputs, i;
        int option;
        printf("Insert Data\n");
        do
        {
                printf("Enter Name: ");
                scanf(" %s", name);
                printf("Enter Gender: ");
                scanf(" %c", &gender);
                push(&head, name, gender);
                printf("1 : Insert into Linked List\n");
                printf("0 : Exit\n");
                printf("Enter your option: ");
                scanf(" %d", &option);

        } while(option == 1);
```

```
                segregateEvenOdd(&head);
                printf("\nModified Linked list \n");
                printList(head);
                printf("\n");
                return 0;
}
```

Execution Results - All test cases have succeeded!

Test Case - 1

User Output
Insert Data
Enter Name:
Ganga
Enter Gender:
F
1 : Insert into Linked List
0 : Exit
Enter your option:
1
Enter Name:
Yamuna
Enter Gender:
F
1 : Insert into Linked List
0 : Exit
Enter your option:
1
Enter Name:
Raj
Enter Gender:
M
1 : Insert into Linked List
0 : Exit
Enter your option:
1
Enter Name:
Veer
Enter Gender:
M
1 : Insert into Linked List
0 : Exit
Enter your option:
1
Enter Name:
Narmada
Enter Gender:

1 : Insert into Linked List
0 : Exit
Enter your option:
1
Enter Name:
Amar
Enter Gender:
M
1 : Insert into Linked List
0 : Exit
Enter your option:
0
Original Linked list
Amar (M) --> Narmada (F) --> Veer (M) --> Raj (M) --> Yamuna (F) --> Ganga (F)
Modified Linked list
Narmada (F) --> Yamuna (F) --> Ganga (F) --> Amar (M) --> Veer (M) --> Raj (M)

Test Case - 2

User Output
Insert Data
Enter Name:
Ganga
Enter Gender:
F
1 : Insert into Linked List
0 : Exit
Enter your option:
1
Enter Name:
Yamuna
Enter Gender:
F
1 : Insert into Linked List
0 : Exit
Enter your option:
1
Enter Name:
Narmada
Enter Gender:
F
1 : Insert into Linked List
0 : Exit
Enter your option:
0
Original Linked list
Narmada (F) --> Yamuna (F) --> Ganga (F)
Modified Linked list
Narmada (F) --> Yamuna (F) --> Ganga (F)

Test Case - 3

User Output
Insert Data
Enter Name:
Raj
Enter Gender:
M
1 : Insert into Linked List
0 : Exit
Enter your option:
1
Enter Name:
Veer
Enter Gender:
M
1 : Insert into Linked List
0 : Exit
Enter your option:
1
Enter Name:
Amar
Enter Gender:
M
1 : Insert into Linked List
0 : Exit
Enter your option:
0
Original Linked list
Amar (M) --> Veer (M) --> Raj (M)
Modified Linked list
Amar (M) --> Veer (M) --> Raj (M)

S.No: 37	Exp. Name: ***Indexing of a file***	Date: 2023-05-03

Aim:

Write a C program to illustrate **Indexing of a file**.

Take an array of integers and find whether the given integer is present or not using **file indexing** method and print the output as shown in the sample output.

Source Code:

```
fileIndexing.c
```



```
#include<stdio.h>
#define MAX 25
struct indexfile
{
        int indexId;
        int kIndex;
};
int main()
{
        int numbers[MAX];
        struct indexfile index[MAX];
        int i, num, low, high, br = 4;
        int noofstudents;
        printf("\nHow many numbers do you want to enter:");
        scanf("%d", &noofstudents);
        printf("Enter %d numbers:\n",noofstudents);
        for(i = 0;i < noofstudents; i++)
        {
                scanf("%d",&numbers[i]);
        }
        for(i=0;i<(noofstudents/5);i++)
        {
                index[i].indexId=numbers[br];
                index[i].kIndex=br;
                br=br+5;
        }
        printf("\nEnter a number to search:");
        scanf("%d",&num);
        for(i=0;(i<noofstudents/5)&&(index[i].indexId<=num);i++)
        if(i!=0)low=index[i-1].kIndex;
        else low=0;
        if(index[i].kIndex!=0 && index[i].kIndex <=noofstudents)high=index[i].kIndex;
        else high=noofstudents;
        for(i=low;i<=high;i++)
        {
                if(num==numbers[i])
                {
                        printf("\nNumber found at position:%d",i);
                        return 0;
                }
        }
        printf("\nNumbers not found.");
        return 0;
}
```

Execution Results - All test cases have succeeded!

Test Case - 1

User Output
How many numbers do you want to enter:
5
Enter 5 numbers:
1 5 6 9 12
Enter a number to search:
6
Number found at position:2

Test Case - 2

User Output
How many numbers do you want to enter:
7
Enter 7 numbers:
2 3 6 9 12 20 25
Enter a number to search:
20
Number found at position:5

S.No: 38	Exp. Name: ***Write a C program to Convert an Infix expression into Postfix expression***	Date: 2023-07-03

Aim:

Write a program to convert an `infix` expression into `postfix` expression.

Source Code:

```
Infix2PostfixMain.c
```



```
#include<stdlib.h>
#include<string.h>
#include<stdio.h>
#include<ctype.h>
#define STACK_MAX_SIZE 20
char stack [STACK_MAX_SIZE];
int top = -1;
int isEmpty() {
        if(top<0)
        return 1;
        else
        return 0;
}
void push(char x) {
        if(top == STACK_MAX_SIZE - 1) {
                printf("Stack is overflow.\n");
        } else {
                top = top + 1;
                stack[top] = x;
        }
}
char pop() {
        if(top < 0) {
                printf("Stack is underflow : unbalanced parenthesis\n");
                exit(0);
        }
        else
        return stack[top--];
}
int priority(char x) {
        if(x == '(')
        return 0;
        if(x == '+' || x == '-')
        return 1;
        if(x == '*' || x == '/' || x == '%')
        return 2;
}
void convertInFix(char * e) {
int x;
int k=0;
char* p = (char *)malloc(sizeof(char)*strlen(e));
while(*e != '\0') {
        if(isalnum(*e))
        p[k++]=*e;
        else if(*e == '(')
        push(*e);
        else if(*e == ')') {
                while(!isEmpty() && (x = pop()) != '(')
                p[k++]=x;
                }
                else if (*e == '+' || *e == '-' || *e == '*' || *e == '/' || *e == '%')
{
                        while(priority(stack[top]) >= priority(*e))
                        p[k++]=pop();
                        push(*e);
```



```
                        printf("Invalid symbols in infix expression. Only
alphanumeric and { '+', '-', '*', '%', '/' } are allowed.\n");
                        exit(0);
                        }
                        e++;
                        }
                        while(top != -1) {
                                x=pop();
                                if(x == '(') {
                                        printf("Invalid infix expression :
unbalanced parenthesis.\n");
                                        exit(0);
                                        }
                                p[k++] = x;
                                }
                                p[k++]='\0';
                                printf("Postfix expression :
%s\n",p);
                                }
                                int main() {
                                char exp[20];
                                char *e, x;
                                printf("Enter the expression : ");
                                scanf("%s",exp);
                                e = exp;
                                convertInFix(e);
                                }
```

Execution Results - All test cases have succeeded!

Test Case - 1

User Output
Enter the expression :
A+B*(C-D)
Postfix expression : ABC>*+

Test Case - 2

User Output
Enter the expression :
A+B*C
Postfix expression : ABC*+

S.No: 39	Exp. Name: ***Infix to Prefix Conversion***	Date: 2023-06-18

Aim:
Write a C program to convert an Infix expression to Prefix expression.
Source Code:

infixToPrefix.c

```
#define SIZE 50
#include<string.h>
#include <ctype.h>
#include<stdio.h>
char *strrev(char *str)
{
        char c, *front, *back;
        if(!str || !*str)
        {
                return str;
        }
        for(front=str,back=str+strlen(str)-1;front < back;front++,back--)
        {
                c=*front;
                *front=*back;
                *back=c;
        }
        return str;
}
char s[SIZE];
int top = -1;
void push (char elem)
{
        s[++top] = elem;
}
char pop ()
{
        return (s[top--]);
}
int pr (char elem)
{
        switch (elem)
        {
                case '#':
                return 0;
                case ')':
                return 1;
                case '+':
                case '-':
                return 2;
                case '*':
                case '/':
                return 3;
        }
}
void main ()
{
        char infx[50], prfx[50], ch, elem;
        int i = 0, k = 0;
        printf ("Enter Infix Expression:");
        scanf ("%s", infx);
        push ('#');
        strrev (infx);
        while ((ch = infx[i++]) != '\0')
        {
```



```
                else if (isalnum (ch))
                prfx[k++] = ch;
                else if (ch == ')')
                {
                        while (s[top] != '(')
                        {
                                prfx[k++] = pop ();
                        }
                        elem = pop ();
                }
                else
                {
                        while (pr (s[top]) >= pr (ch))
                        {
                                prfx[k++] = pop ();
                        }
                        push (ch);
                }
        }
        while (s[top] != '#')
        {
                prfx[k++] = pop ();
        }
        prfx[k] = '\0';
        strrev (prfx);
        strrev (infx);
        printf ("Prefix Expression:%s\n", prfx);
}
```


Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter Infix Expression:
A+B
Prefix Expression:+AB

Test Case - 2
User Output
Enter Infix Expression:
A/B-C/D
Prefix Expression:+/AB/CD

S.No: 40	Exp. Name: ***Postfix to Infix Conversion***	Date: 2023-06-18

Aim:
Write a C program to convert a Postfix expression to Infix expression.
Source Code:

postfixToInfix.c

```
#include<stdio.h>
#include<conio.h>
#include<string.h>
#include<stdlib.h>
# define MAX 20
char str[MAX],stack[MAX];
int top=-1;
void push(char c)
{
        stack[++top]=c;
}
char pop()
{
        return stack[top--];;
}
char *strrev(char *str)
{
        char c, *front, *back;
        if(!str || !*str)
        return str;
        for(front=str,back=str+strlen(str)-1;front < back;front++,back--)
        {
                c=*front;*front=*back;*back=c;
        }
        return str;
}
void postfix()
{
        int n,i,j=0;
        char a,b,op,x[20];
        printf("Enter a Postfix expression:");
        fflush(stdin);
        scanf("%s", str);
        strrev(str);
        n=strlen(str);
        for(i=0;i<MAX;i++)
        {
                stack[i]='\0';
        }
        printf("Infix expression:");
        for(i=0;i<n;i++)
        {
                if(str[i]=='+'||str[i]=='-'||str[i]=='*'||str[i]=='/')
                {
                        push(str[i]);
                }
                else
                {
                        x[j]=str[i]; j++;
                        x[j]=pop(); j++;
                }
        }
        x[j]=str[top--];
        strrev(x);
        printf("%s\n",x);
```



```
{
        postfix();
}
```


Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter a Postfix expression:
AB+
Infix expression:A+B

Test Case - 2
User Output
Enter a Postfix expression:
ABC*+D+
Infix expression:A+B*C+D

S.No: 41	Exp. Name: ***Prefix to Infix Conversion***	Date: 2023-06-18

Aim:
Write a C program to convert a Prefix expression to Infix expression.
Source Code:

prefixToInfix.c

```
#include<stdio.h>
#include<conio.h>
#include<string.h>
#include<stdlib.h>
# define MAX 20
char str[MAX],stack[MAX];
int top=-1;
void push(char c)
{
        stack[++top]=c;
}
char pop()
{
        return stack[top--];
}
void prefix()
{
        int n,i;
        char a,b,op;
        printf("Enter a Prefix expression:");
        fflush(stdin);
        scanf("%s", str);
        n=strlen(str);
        for(i=0;i<MAX;i++)
        {
                stack[i]='\0';
        }
        printf("Infix expression:");
        for(i=0;i<n;i++)
        {
                if(str[i]=='+'||str[i]=='-'||str[i]=='*'||str[i]=='/')
                {
                        push(str[i]);
                }
                else
                {
                        op=pop();
                        a=str[i];
                        if(op == '\0')
                        {
                                printf("%c",a);
                        }
                        else
                        {
                        printf("%c%c",a,op);
                        }
                }
        }
}

if(top >= 0)
{
        printf("%c\n",str[top--]);
}
else
{
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter a Prefix expression:
+AB
Infix expression:A+B

Test Case - 2
User Output
Enter a Prefix expression:
+/AB/CD
Infix expression:A/B+C/D

S.No: 42	Exp. Name: ***Postfix to Prefix Conversion***	Date: 2023-06-19

Aim:
Write a C program to convert a Postfix expression to Prefix expression.
Source Code:

postFixToPrefix.c


```
#include<stdio.h>
#include<conio.h>
#include<string.h>
#include<stdlib.h>
# define MAX 20
char *strrev(char *str)
{
        char c, *front, *back;
         if(!str || !*str)
          return str;
          for(front=str,back=str+strlen(str)-1;front < back;front++,back--)
           {
               c=*front;
                *front=*back;
                *back=c;
           }
            return str;
}
char str[MAX],stack[MAX];
int top=-1;
void push(char c)
{
        stack[++top]=c;
}
char pop()
{
        return stack[top--];
}
void post_pre()
{
        int n,i,j=0; char c[20];
         char a,b,op;
          printf("Enter the postfix expression:");
           scanf("%s", str);
            n=strlen(str);
             for(i=0;i<MAX;i++)
              stack[i]='\0';
               printf("Prefix expression is:");
                for(i=n-1;i>=0;i--)
                 {
                        if(str[i]=='+'||str[i]=='-'||str[i]=='*'||str[i]=='/')
                        {
                                push(str[i]);
                        }
                        else
                         {
                                c[j++]=str[i];
                                while((top!=-1)&&(stack[top]=='@'))
                                 {
                                        a=pop(); c[j++]=pop();
                                 }
                                 push('@');
                         }
                 }
                  c[j]='\0';
```



```
}
void main()
{
        post_pre();
}
```


Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the postfix expression:
AB+
Prefix expression is:+AB

Test Case - 2
User Output
Enter the postfix expression:
ABC*+D+
Prefix expression is:+A*BCD

S.No: 43	Exp. Name: ***Prefix to Postfix Conversion***	Date: 2023-06-19

Aim:
Write a C program to convert a Prefix expression to Postfix expression.
Source Code:

prefixToPostfix.c

```
#include<stdio.h>
#include<conio.h>
#include<string.h>
#include<stdlib.h>
# define MAX 20
char str[MAX],stack[MAX];
int top=-1;
void push(char c)
{
        stack[++top]=c;
}
char pop()
{
        return stack[top--];
}
void pre_post()
{
        int n,i,j=0; char c[20];
         char a,b,op;
          printf("Enter a Prefix expression:");
           scanf("%s", str);
            n=strlen(str);
             for(i=0;i<MAX;i++)
              stack[i]='\0';
               printf("Postfix expression is:");
                for(i=0;i<n;i++)
                 {
                        if(str[i]=='+'||str[i]=='-'||str[i]=='*'||str[i]=='/')
                        {
                                push(str[i]);
                        }
                        else
                         {
                                c[j++]=str[i];
                                while((top!=-1)&&(stack[top]=='@'))
                                 {
                                        a=pop(); c[j++]=pop();
                                 }
                                 push('@');
                         }
                 }
                  c[j]='\0';
                   printf("%s\n",c);
}
void main()
{
        pre_post();
}
```


Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter a Prefix expression:
+AB
Postfix expression is:AB+

Test Case - 2
User Output
Enter a Prefix expression:
+/AB/CD
Postfix expression is:AB/CD/+