ASSIGNMENT 1

AIM:

TO CREATE ADT TO PERFORM THE FOLLOWING SET OPERATIONS:

1. ADD (NEW ELEMENT) PLACE A VALUE IN A SET.
2. REMOVE(ELEMENT).
3. RETURNS TRUE IF ELEMENT IS IN COLLECTION.
4. SIZE() RETURNS NUMBER OF VALUES IN A COLLECTION.
5. INTERSECTION OF TWO SETS.
6. UNION OF TWO SETS.
7. DIFFERENCE BETWEEN TWO SETS
8. SUBSET.

OBJECTIVE:

TO IMPLEMENT THE " SET " CONCEPT.

THEORY :

A **set** is an abstract data type that can store unique values, without any particular order. It is a computer implementation of the mathematical concept of a finite set. Unlike most other collection types, rather than retrieving a specific element from a set, one typically tests a value for membership in a set. One may define the operations of the algebra of sets:

union(S,T): returns the union of sets S and T.
intersection(S,T): returns the intersection of sets S and T.
difference(S,T): returns the difference of sets S and T.
subset(S,T): a predicate that tests whether the set S is a subset of set T.

ALGORITHM:

UNION:

```
1) Initialize union U as empty.
2) Copy all elements of first array to U.
3) Do following for every element x of second array:
   a) If x is not present in first array, then copy x to U.
4) Return U.
```

INTERSECTION:

```
1) Initialize intersection I as empty.
2) Do following for every element x of first array
```

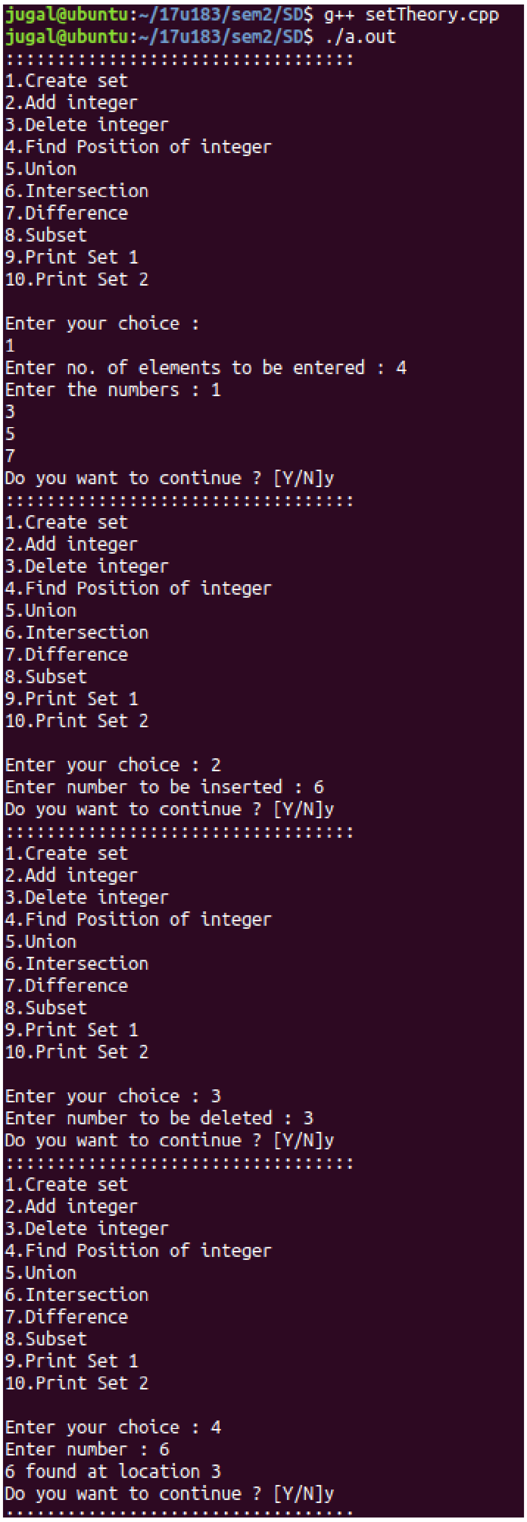
```
   a) If x is present in second array, then copy x to I.
4) Return I.
```

CODE:

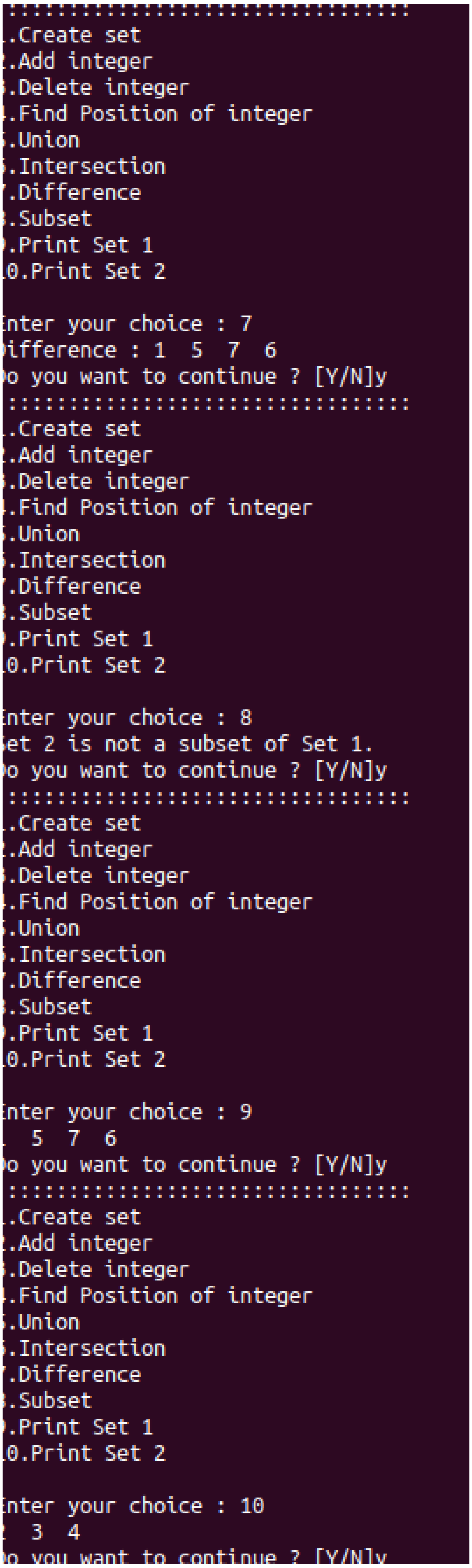
```
#include <iostream>

using namespace std;

int set1[100],set2[100];

class Set{
private:
    int arr[100];
    int currLength;
public:
    Set(){
        currLength = 0;
    }
    Set(const Set &s){
        for(int i = 0 ;i<s.currLength; i++){
            arr[i] = s.arr[i];
        }
        currLength = s.currLength;
    }

    void input(){
        cout<<"Enter no. of elements to be entered : ";
        int no;
        cin>>no;
        if(no<=100){
            cout<<"Enter the numbers : ";
            for(int i =0;i<no;i++){
                cin>>arr[i];
            }
            currLength = no;
        }
    }

    void add(int val){
        if(currLength<=100){
            arr[currLength] = val;
        }
        currLength++;
    }

    void del(int val){
        bool found = false;
        for(int i = 0; i<currLength; i++){
            if(arr[i] == val){
                found = true;
                int j = i;
                for(j = i; j<currLength-1; j++){
                    arr[j] = arr[j+1];
                }
                arr[j] = 0;
                currLength--;
            }
        }
        if(!found){
            cout<<"The number is not present in the set."<<endl;
        }
    }

    void findNo(int val){
        bool found = false;
        for(int i = 0; i<currLength; i++){
            if(arr[i] == val){
                cout<<val<<" found at location "<<i<<endl;
                found = true;
            }
        }
        if(!found){
            cout<<"The number is not present in the set."<<endl;
        }
    }

    bool findNoPresence(int val){
        bool found = false;
        for(int i = 0; i<currLength; i++){
            if(arr[i] == val){
                found = true;
            }
        }
        return found;
    }

    void print(){
        for(int i=0;i<currLength; i++){
            cout<<arr[i]<<"  ";
        }
        cout<<endl;
    }

    int getIndexVal(int index){
        return arr[index];
    }

    int sizeofset(){
        return currLength;
    }

};

void setsUnion(Set set1, Set set2){
    Set ans;
    for(int i = 0; i<set1.sizeofset(); i++){
        ans.add(set1.getIndexVal(i));
    }
    for(int j  = 0 ; j<set2.sizeofset(); j++){
        if(!ans.findNoPresence(set2.getIndexVal(j))){
            ans.add(set2.getIndexVal(j));
        }
    }
    cout<<"Union : ";
    ans.print();
}

void setsIntersection(Set set1, Set set2){
    Set ans;
    for(int i = 0 ; i<set1.sizeofset(); i++){
        if(set2.findNoPresence(set1.getIndexVal(i))){
            ans.add(set1.getIndexVal(i));
        }
    }
    cout<<"Intersection : ";
    ans.print();
}

void setsDifference(Set set1, Set set2){
    Set ans = set1;
    for(int i = 0; i<set2.sizeofset(); i++){
        if(ans.findNoPresence(set2.getIndexVal(i))){
            ans.del(set2.getIndexVal(i));
        }
    }
    cout<<"Difference : ";
    ans.print();
}

void subset(Set set1, Set set2){
    int matches = 0;
    if(set2.sizeofset() <= set1.sizeofset()){
        for(matches = 0; matches<set2.sizeofset();matches++){
            if(!set1.findNoPresence(set2.getIndexVal(matches))){
                break;
            }
        }
    }
    if(matches == set2.sizeofset()){
        cout<<"Set 2 is subset of Set 1."<<endl;
    }
    else{cout<<"Set 2 is not a subset of Set 1."<<endl;}


}
int main()
{
    Set set1,set2;
    char ch;
    do{
        cout<<"::::::::::::::::::::::::::::::::::"<<endl;
        cout<<"1.Create set"<<endl<<"2.Add integer"<<endl<<"3.Delete
integer"<<endl<<"4.Find Position of integer"<<endl;

cout<<"5.Union"<<endl<<"6.Intersection"<<endl<<"7.Difference"<<endl<
<"8.Subset"<<endl<<"9.Print Set 1"<<endl<<"10.Print Set 2"<<endl;
```

```
        cout<<endl<<"Enter your choice : ";
        int choice;
        cin>>choice;
        switch(choice){
            case 1 : set1.input();
            break;
            case 2 :
                cout<<"Enter number to be inserted : ";
                int no1;
                cin>>no1;
                set1.add(no1);
            break;
            case 3 :
                cout<<"Enter number to be deleted : ";
                int no2;
                cin>>no2;
                set1.del(no2);
            break;
            case 4 :
                cout<<"Enter number : ";
                int no3;
                cin>>no3;
                set1.findNo(no3);
            break;
            case 5 :
                if(set2.sizeofset() == 0){
                    set2.input();
                }
                setsUnion(set1,set2);
            break;
            case 6 :
                if(set2.sizeofset() == 0){
                    set2.input();
                }
                setsIntersection(set1,set2);
            break;
            case 7 :
                if(set2.sizeofset() == 0){
                    set2.input();
                }
                setsDifference(set1,set2);
            break;
            case 8 :
                if(set2.sizeofset() == 0){
                    set2.input();
                }
                subset(set1,set2);
            break;
            case 9 :
                set1.print();
            break;
            case 10 :
                set2.print();
            break;
            default : cout<<"Wrong input !!"<<endl;
        }
        cout<<"Do you want to continue ? [Y/N]";
        cin>>ch;
    }while(ch=='y' || ch=='Y');
    return 0;
}
```

OUTPUT :



```
jugal@ubuntu:~/17u183/sem2/SD$ g++ setTheory.cpp
jugal@ubuntu:~/17u183/sem2/SD$ ./a.out
::::::::::::::::::::::::::::::::::
1.Create set
2.Add integer
3.Delete integer
4.Find Position of integer
5.Union
6.Intersection
7.Difference
8.Subset
9.Print Set 1
10.Print Set 2

Enter your choice :
1
Enter no. of elements to be entered : 4
Enter the numbers : 1
3
5
7
Do you want to continue ? [Y/N]y
::::::::::::::::::::::::::::::::::
1.Create set
2.Add integer
3.Delete integer
4.Find Position of integer
5.Union
6.Intersection
7.Difference
8.Subset
9.Print Set 1
10.Print Set 2

Enter your choice : 2
Enter number to be inserted : 6
Do you want to continue ? [Y/N]y
::::::::::::::::::::::::::::::::::
1.Create set
2.Add integer
3.Delete integer
4.Find Position of integer
5.Union
6.Intersection
7.Difference
8.Subset
9.Print Set 1
10.Print Set 2

Enter your choice : 3
Enter number to be deleted : 3
Do you want to continue ? [Y/N]y
::::::::::::::::::::::::::::::::::
1.Create set
2.Add integer
3.Delete integer
4.Find Position of integer
5.Union
6.Intersection
7.Difference
8.Subset
9.Print Set 1
10.Print Set 2

Enter your choice : 4
Enter number : 6
6 found at location 3
Do you want to continue ? [Y/N]y
::::::::::::::::::::::::::::::::::
```



```
::::::::::::::::::::::::::::::::::
.Create set
.Add integer
.Delete integer
.Find Position of integer
.Union
.Intersection
.Difference
.Subset
.Print Set 1
0.Print Set 2

nter your choice : 7
ifference : 1  5  7  6
o you want to continue ? [Y/N]y
::::::::::::::::::::::::::::::::::
.Create set
.Add integer
.Delete integer
.Find Position of integer
.Union
.Intersection
.Difference
.Subset
.Print Set 1
0.Print Set 2

nter your choice : 8
et 2 is not a subset of Set 1.
o you want to continue ? [Y/N]y
::::::::::::::::::::::::::::::::::
.Create set
.Add integer
.Delete integer
.Find Position of integer
.Union
.Intersection
.Difference
.Subset
.Print Set 1
0.Print Set 2

nter your choice : 9
  5  7  6
o you want to continue ? [Y/N]y
::::::::::::::::::::::::::::::::::
.Create set
.Add integer
.Delete integer
.Find Position of integer
.Union
.Intersection
.Difference
.Subset
.Print Set 1
0.Print Set 2

nter your choice : 10
  3  4
o you want to continue ? [Y/N]y
```

CONCLUSION:

We saw all the algorithms the STL offers to operate on sets, that are collections of sorted elements, in the general sense.