# 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:**

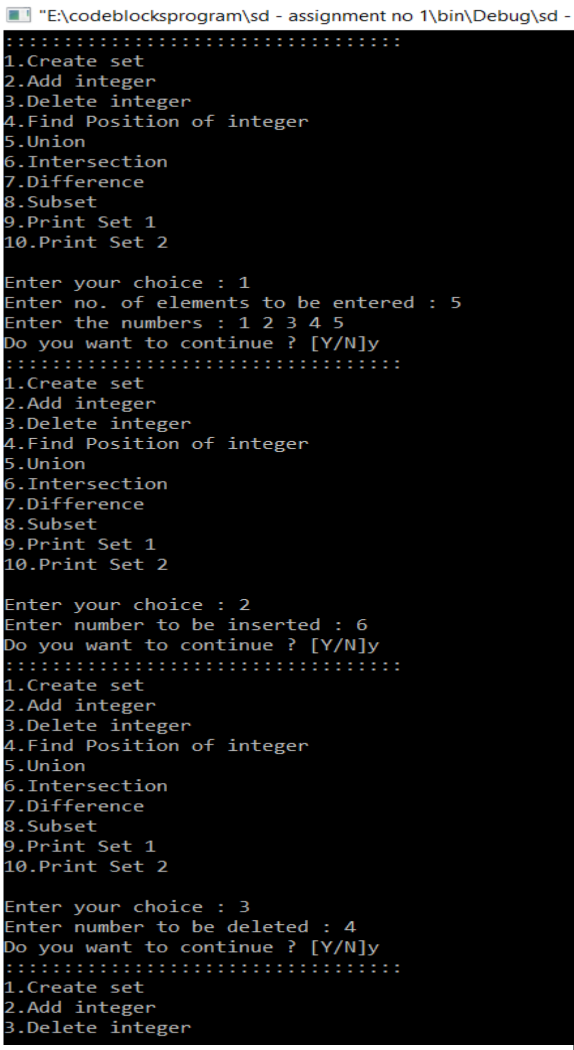
```cpp
#include <iostream>

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 : ";
```

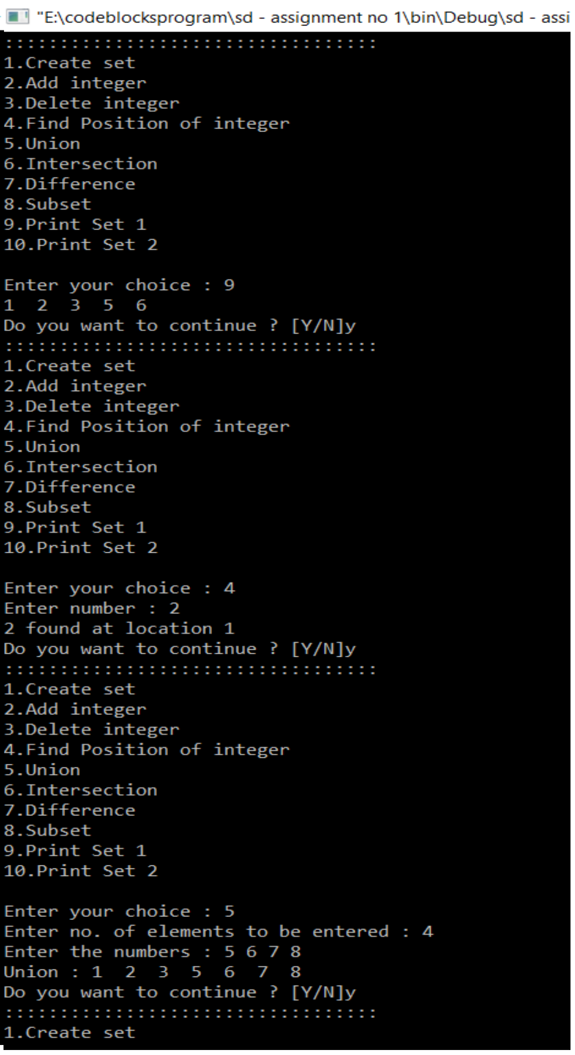
```
int choice;
cin>>choice;
switch(choice){
   case 1 : set1.input();
   break;
   case 2 :
      cout<<"Enter number to be inserted : ";
      int no1;
      cin>>no1;
      set1.add(no1);
   break;
   case 3 :
      cout<<"Enter number to be deleted : ";
      int no2;
      cin>>no2;
      set1.del(no2);
   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;
}
```

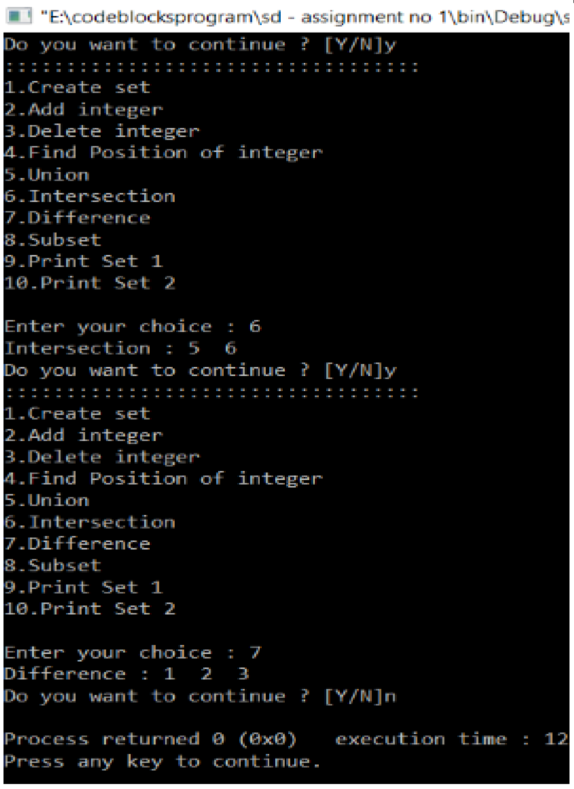
OUTPUT :



```
"E:\codeblocksprogram\sd - assignment no 1\bin\Debug\sd -
:::::::::::::::::::::::::::::::::::
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 : 5
Enter the numbers : 1 2 3 4 5
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 : 4
Do you want to continue ? [Y/N]y
:::::::::::::::::::::::::::::::::::
1.Create set
2.Add integer
3.Delete integer
```



```
"E:\codeblocksprogram\sd - assignment no 1\bin\Debug\sd - assi
:::::::::::::::::::::::::::::::::::
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 : 9
1  2  3  5  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 : 4
Enter number : 2
2 found at location 1
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 : 5
Enter no. of elements to be entered : 4
Enter the numbers : 5 6 7 8
Union : 1  2  3  5  6  7  8
Do you want to continue ? [Y/N]y
:::::::::::::::::::::::::::::::::::
1.Create set
```



```
"E:\codeblocksprogram\sd - assignment no 1\bin\Debug\s
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 : 6
Intersection : 5  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 : 7
Difference : 1  2  3
Do you want to continue ? [Y/N]n

Process returned 0 (0x0)   execution time : 12
Press any key to continue.
```

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