CSE225L – Data Structures and Algorithms Lab
Lab 04
Unsorted List (array based)

In today's lab we will design and implement the List ADT where the items in the list are unsorted.

UnsortedType.h

```
#ifndef UNSORTEDTYPE_H_INCLUDED
#define UNSORTEDTYPE_H_INCLUDED

const int MAX_ITEMS = 5;

template <class ItemType> class UnsortedType
{
public :
    UnsortedType();
    void MakeEmpty();
    bool IsFull();
    int LengthIs();
    bool InsertItem(ItemType);
    bool DeleteItem(ItemType);
    bool RetrieveItem(ItemType&);
    void ResetList();
    bool GetNextItem(ItemType&);
private:
    int length;
    ItemType info[MAX_ITEMS];
    int currentPos;
};
#include "UnsortedType.tpp"
#endif // UNSORTEDTYPE_H_INCLUDED
```

UnsortedType.tpp

```
#include "UnsortedType.h"

template <class ItemType>
UnsortedType<ItemType>::UnsortedType()
{
    length = 0;
    currentPos = -1;
}

template <class ItemType>
void UnsortedType<ItemType>::MakeEmpty()
{
    length = 0;
}

template <class ItemType>
bool UnsortedType<ItemType>::IsFull()
{
    return (length == MAX_ITEMS);
}

template <class ItemType>
int UnsortedType<ItemType>::LengthIs()
{
    return length;
}

template <class ItemType>
void UnsortedType<ItemType>::ResetList()
{
    currentPos = -1;
}
template <class ItemType>
bool UnsortedType<ItemType>::GetNextItem(ItemType&
item)
{
    if(currentPos<length-1){
        currentPos++;
        item = info [currentPos] ;
        return true;
    }
    return false;
}
template <class ItemType>
bool
UnsortedType<ItemType>::RetrieveItem(ItemType&
item)
{
    int location = 0;
    bool found = false;
    while ((location < length) && !found)
    {
        if(item == info[location])
        {
            found = true;
            item = info[location];
        }
        else
        {
            location++;
        }
    }
    return found;
}
template <class ItemType>
bool UnsortedType<ItemType>::InsertItem(ItemType
item)
{
    if(!IsFull())
    {
        info[length] = item;
        length++;
        return true;
    }
    return false;
}
template <class ItemType>
bool UnsortedType<ItemType>::DeleteItem(ItemType
item)
{
    int flag = 0;
    int location = 0;
    while (location < length )
    {
        if(item == info[location])
        {
            flag = 1;
            break;
        }
        location++;
    }
    if(flag==1)
    {
        info[location] = info[length - 1];
        length--;
        return true;
    }
    return false;
}
```

Tasks:

Generate the **driver file (main.cpp)** where you perform the following tasks. Note that you cannot make any change to the header file or the source file.

Task No	Operation to Be Tested and Description of Action	Input Values	Expected Output
Task 1	• Create a list of integers		
	• Insert four items	5 7 6 9	
	• Print the list		5 7 6 9
	• Print the length of the list		4
	• Insert one item	1	
	• Print the list		5 7 6 9 1
	• Retrieve 4 and print whether found or not		Item is not found
	• Retrieve 5 and print whether found or not		Item is found
	• Retrieve 9 and print whether found or not		Item is found
	• Retrieve 10 and print whether found or not		Item is not found
	• Print if the list is full or not		List is full
	• Delete 5		
	• Print if the list is full or not		List is not full
	• Delete 1		
	• Print the list		7 6 9
	• Delete 6		
	• Print the list		7 9
Task 2	• Write a class `studentInfo` that represents a student record. It must have variables to store the student ID, student's name and student's CGPA. It also must have a function to print all the values. • Modify `UnsortedType` class from class template to a class that works with only `studentInfo` type. • Now modify `DeleteItem()` and `RetrieveItem()` function such that items can be deleted or retrieved using `id` of `studentInfo` objects.		
	• Create a list of objects of class `studentInfo`.		
	• Insert 5 student records	15234 Abdullah 2.6 13732 Muhammad 3.9 13569 Ali 1.2 15467 Saad 3.1 16285 Mahdi 3.1	
	• Delete the record with ID 15467		
	• Retrieve the record with ID 13569 and print whether found or not along with the entire record		Item is found 13569, Ali, 1.2
	• Print the list		15234, Abdullah, 2.6 13732, Muhammad, 3.9 13569, Ali, 1.2 16285, Mahdi, 3.1