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Reg no: SP22-BCS-063

Class: DSA LAB

Sec: C

Code
Driver class:

```
public class Driver {

    public static void main(String[] args) {
    // Creating an object of MyArray class with size 10.
    MyArray mr=new MyArray(10);
    // Adding elements to the array.
    System.out.println("Adding");
    boolean a0=mr.addAtEnd(10);
    boolean a1=mr.addAtEnd(20);
    boolean a2=mr.addAtEnd(30);
    boolean a5=mr.addAtEnd(30);
    boolean a3=mr.addAtEnd(40);
    boolean a4=mr.addAtEnd(50);

    // Printing the array.
    mr.printArray();
    System.out.println("---------------");

    // Deleting an element from a specific index.
    System.out.println("Deleting at index 2");
    int deleted_val=mr.deleteAtIndex(2);
    mr.printArray();
    System.out.println("---------------");
```

```java
// Adding an element at a specific index.
System.out.println("Add at index 2");
boolean b0=mr.addAtIndex(30,2);
mr.printArray();
System.out.println("---------------");

// Deleting an element from the end of the array.
System.out.println("Delete at end");
int dv2=mr.deleteAtEnd();
mr.printArray();
System.out.println("---------------");

// Searching for the index of a specific value in the array.
System.out.println("Searching index of value 30 ");
System.out.println(mr.linearSearchOfOne(30));

// Searching for all the indexes of a specific value in the array.
System.out.println("Searching all indexes of value 30 ");
int arr[]=mr.linearSearchOfAll(30);
System.out.print("At index ");
for(int i=0;i<arr.length;i++){
    if(arr[0]!=-1){
        if(arr[0]==0){
            System.out.print(arr[i]+",");
        }
        if(arr[i]!=0){
            System.out.print(arr[i]+",");
        }
    }
}
System.out.println();
```

```
    System.out.println("---------------");

    // Updating an element at a specific index.
    System.out.println("Update at index 2");
    int deleted_val2=mr.updateAtIndex(40, 2);
    mr.printArray();

    // Updating the first matching element with a specific value.
    System.out.println("Update val by finding first match");
    int deleted_val3=mr.updateOneVal(10, 40);
    mr.printArray();

    // Updating all the matching elements with a specific value.
    System.out.println("Update all finding val");
    int deleted_val4=mr.updateAllMatchingVal(40, 100);
    mr.printArray();
    System.out.println("---------------");

    // Sorting the array.
    System.out.println("Sorting");
    boolean a7=mr.addAtEnd(70);
    mr.sorting();
    mr.printArray();
    System.out.println("---------------");

    // Performing binary search on the array.
    System.out.println("Binary Search");
    System.out.println(mr.binarySearch(100));
}
}
```

Array Class:

```
public class MyArray {

    int A[]; // array to store values
    int N; // size of the array
    int k; // current number of elements in the array

    // constructor to initialize the array with a given size
    MyArray(int N) {
        A = new int[N];
        this.N = N;
    }

    // method to add a value at the end of the array
    public boolean addAtEnd(int val) {
        if (k < N) { // check if there's enough space in the array
            A[k] = val;
            k++;
            return true;
        }
        return false;
    }

    // method to add a value at a specific index in the array
    public boolean addAtIndex(int val, int index) {
        if (k < N) { // check if there's enough space in the array
            if (index >= 0 && index < k) { // check if the index is valid
                for (int i = k; i > index; i--) {
                    A[i] = A[i - 1]; // shift elements to the right to make room
for the new value
                }
                A[index] = val;
```

```
                k++;
                return true;
            }
        }
        return false;
    }

    // method to delete a value at a specific index in the array
    public int deleteAtIndex(int index) {
        int temp = 0;
        if (index >= 0 && index < k) { // check if the index is valid
            temp = A[index]; // save the value that is being deleted
            for (int i = index; i < k; i++) {
                A[i] = A[i + 1]; // shift elements to the left to fill the gap
left by the deleted value
            }
            k--;
        }
        return temp;
    }

    // method to delete the value at the end of the array
    public int deleteAtEnd() {
        int temp = 0;
        if (k > 0) { // check if there are values in the array
            temp = A[k - 1]; // save the value that is being deleted
            A[k - 1] = 0; // set the last element to 0 to "delete" it
            k--;
        }
        return temp;
    }
```

```java
// method to search for the first occurrence of a value in the array
public int linearSearchOfOne(int val) {
    int index = -1;
    for (int i = 0; i < k; i++) {
        if (A[i] == val) {
            index = i;
            break; // stop searching once the value is found
        }
    }
    return index;
}

// method to search for all occurrences of a value in the array
public int[] linearSearchOfAll(int val) {
    int index[] = new int[k];
    int j = 0;
    for (int i = 0; i < k; i++) {
        if (A[i] == val) {
            index[j] = i;
            j++;
        }
    }
    if (j == 0) { // check if the value was not found in the array
        index[0] = -1;
        return index;
    }
    return index;
}

// method to update a value at a specific index in the array
public int updateAtIndex(int val, int index) {
    int temp = 0;
```

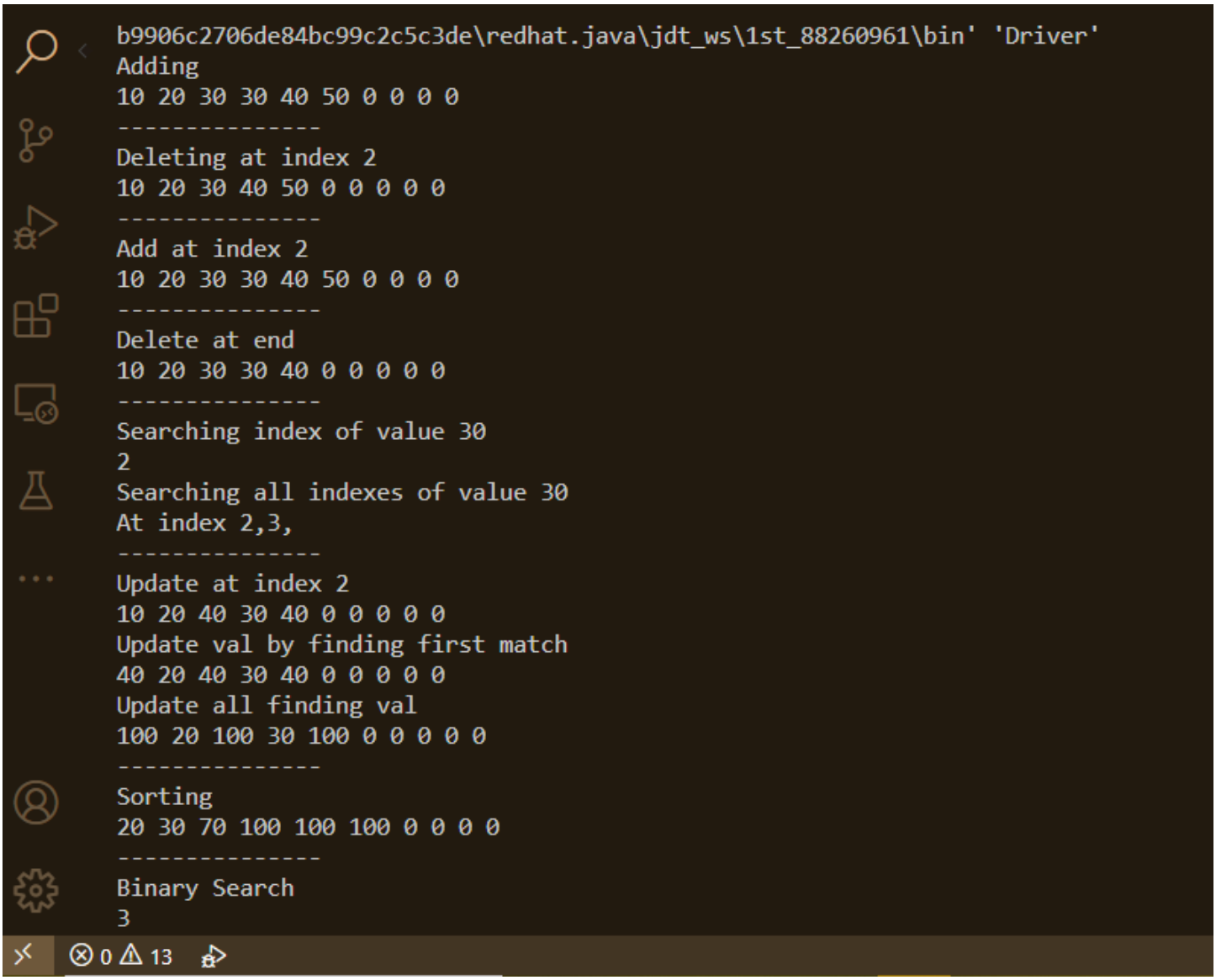
```
        if (index >= 0 && index < k) { // check if the index is valid
            temp = A[index]; // save the old value
            A[index] = val; // set the new value
        }
        return temp;
    }

    // Update a single occurrence of val with updated_val in array A
    public int updateOneVal(int val, int updated_val) {
        int temp = 0;
        // Use linear search to find the index of val in A
        int search = linearSearchOfOne(val);
        if (search != -1) {
            // Update the value at the index with updated_val
            A[search] = updated_val;
        }
        // Return temp (which is always 0 in this method)
        return temp;
    }

    // Update all occurrences of val with updated_val in array A
    public int updateAllMatchingVal(int val, int updated_val) {
        int temp = 0;
        // Use linear search to find the indices of all occurrences of val in A
        int search[] = linearSearchOfAll(val);
        if (search[0] != -1) {
            // If there is at least one occurrence of val in A
            if (search[0] == 0) {
                // If the first occurrence of val is at index 0, set temp to val
                temp = val;
                // Update the value at index 0 with updated_val
                A[0] = updated_val;
```

```
            }
            // Loop through the rest of the indices with occurrences of val and
update their
            // values
            for (int i = 1; i < search.length; i++) {
                if (search[i] != 0) {
                    A[search[i]] = updated_val;
                }
            }

        }
        // Return temp (which is either 0 or val depending on the position of the
first
        // occurrence of val)
        return temp;
    }

    // Sort array A in ascending order using selection sort
    public void sorting() {
        for (int i = 0; i < k; i++) {
            int smallestVal = A[i];
            // Find the index of the smallest value in the unsorted portion of
the array
            for (int j = i; j < k; j++) {
                if (A[j] < smallestVal) {
                    int temp = smallestVal;
                    smallestVal = A[j];
                    A[j] = temp;
                }
            }
            // Swap the smallest value with the first value in the unsorted
portion of the
```

```
            // array
            A[i] = smallestVal;
        }
    }

    // Use binary search to find the index of val in the sorted array A
    public int binarySearch(int val) {
        // Sort array A first
        sorting();
        int start = 0;
        int end = k;
        // Keep searching until start and end meet
        while (start <= end) {
            int mid = (start + end) / 2;
            if (A[mid] >= val) {
                // If the middle element is equal to val, return its index
                if (A[mid] == val) {
                    return mid;
                }
                // If the middle element is greater than val, search the left
half of the array
                end = mid - 1;
            }
            // If the middle element is less than val, search the right half of
the array
            if (A[mid] < val) {
                start = mid + 1;
            }
        }
        // If val is not found in A, return -1
        return -1;
    }
```

```
    // Print array A to the console
public void printArray(){
    for(int a:A){
        System.out.print(a+" ");
    }
    System.out.println("");
}
}
```

Output:


b9906c2706de84bc99c2c5c3de\redhat.java\jdt_ws\1st_88260961\bin' 'Driver'
Adding
10 20 30 30 40 50 0 0 0 0

Deleting at index 2
10 20 30 40 50 0 0 0 0 0

Add at index 2
10 20 30 30 40 50 0 0 0 0

Delete at end
10 20 30 30 40 0 0 0 0 0

Searching index of value 30
2
Searching all indexes of value 30
At index 2,3,

Update at index 2
10 20 40 30 40 0 0 0 0 0
Update val by finding first match
40 20 40 30 40 0 0 0 0 0
Update all finding val
100 20 100 30 100 0 0 0 0 0

Sorting
20 30 70 100 100 100 0 0 0 0

Binary Search
3
0 13