Day -5

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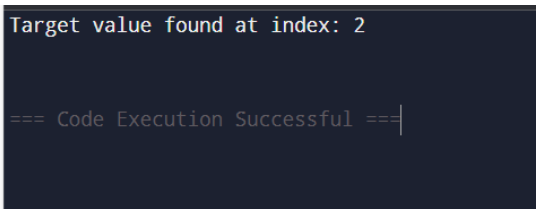
Section : 620 -B

Q1. Implementation of Linear Search

```
#include <iostream>
using namespace std;

int linearSearch(int arr[], int size, int target) {
    for (int i = 0; i < size; i++) {
        if (arr[i] == target) {
            return i;
        }
    }
    return -1;
}

int main() {
    int arr[] = {10, 20, 30, 40, 50};
    int size = sizeof(arr) / sizeof(arr[0]);
    int target = 30;

    int result = linearSearch(arr, size, target);

    if (result != -1) {
        cout << "Target value found at index: " << result << endl;
    } else {
        cout << "Target value not found in the array." << endl;
    }

    return 0;
```

```
}
```

Output:

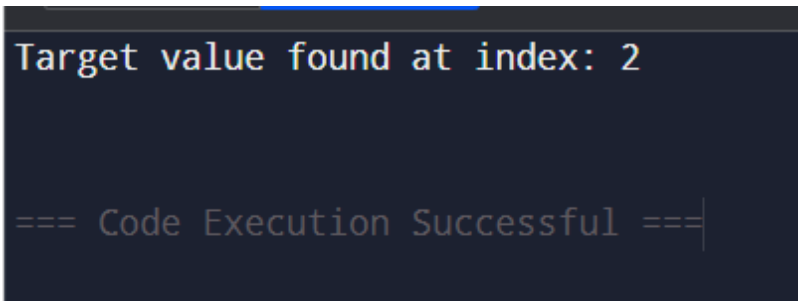


Q2. Implementation of Binary Search to Find Index Value

```
#include <iostream>
using namespace std;

int binarySearch(int arr[], int size, int target) {
    int left = 0;
    int right = size - 1;

    while (left <= right) {
        int mid = left + (right - left) / 2;

        if (arr[mid] == target) {
            return mid;
        }

        if (arr[mid] < target) {
            left = mid + 1;
        } else {
            right = mid - 1;
        }
    }

    return -1;
}

int main() {
    int arr[] = {10, 20, 30, 40, 50};
```

```
    int size = sizeof(arr) / sizeof(arr[0]);
    int target = 30;

    int result = binarySearch(arr, size, target);

    if (result != -1) {
        cout << "Target value found at index: " << result << endl;
    } else {
        cout << "Target value not found in the array." << endl;
    }

    return 0;
}
```

Output:

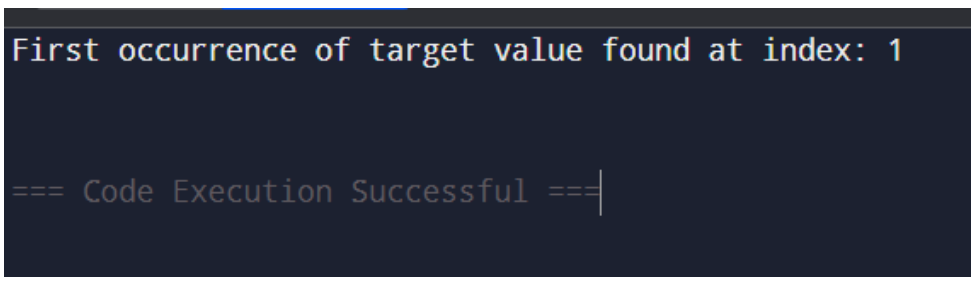


Q3. Binary Search to Find First Occurrence of Target Value in Sorted Array

```
#include <iostream>
using namespace std;

int binarySearchFirstOccurrence(int arr[], int size, int target) {
    int left = 0;
    int right = size - 1;
    int result = -1;

    while (left <= right) {
        int mid = left + (right - left) / 2;
```

```
        if (arr[mid] == target) {
            result = mid;
            right = mid - 1;
        } else if (arr[mid] < target) {
            left = mid + 1;
        } else {
            right = mid - 1;
        }
    }

    return result;
}

int main() {
    int arr[] = {10, 20, 20, 20, 30, 40, 50};
    int size = sizeof(arr) / sizeof(arr[0]);
    int target = 20;

    int result = binarySearchFirstOccurrence(arr, size, target);

    if (result != -1) {
        cout << "First occurrence of target value found at index: " << result
<< endl;
    } else {
        cout << "Target value not found in the array." << endl;
    }

    return 0;
}
```

Output:

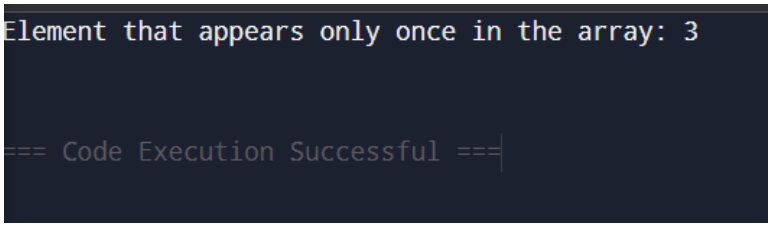


Q4. Binary Search to Find Element that Appears Only Once in Sorted Array

```
#include <iostream>
using namespace std;

int findUniqueElement(int arr[], int size) {
    int left = 0;
    int right = size - 1;

    while (left < right) {
        int mid = left + (right - left) / 2;

        if (mid % 2 == 0) {
            if (arr[mid] == arr[mid + 1]) {
                left = mid + 2;
            } else {
                right = mid;
            }
        } else {
            if (arr[mid] == arr[mid - 1]) {
                left = mid + 1;
            } else {
                right = mid - 1;
            }
        }
    }

    return arr[left];
}

int main() {
    int arr[] = {1, 1, 2, 2, 3, 4, 4, 5, 5};
    int size = sizeof(arr) / sizeof(arr[0]);

    int result = findUniqueElement(arr, size);
```

```
    cout << "Element that appears only once in the array: " << result <<
endl;

    return 0;
}
```

Output:

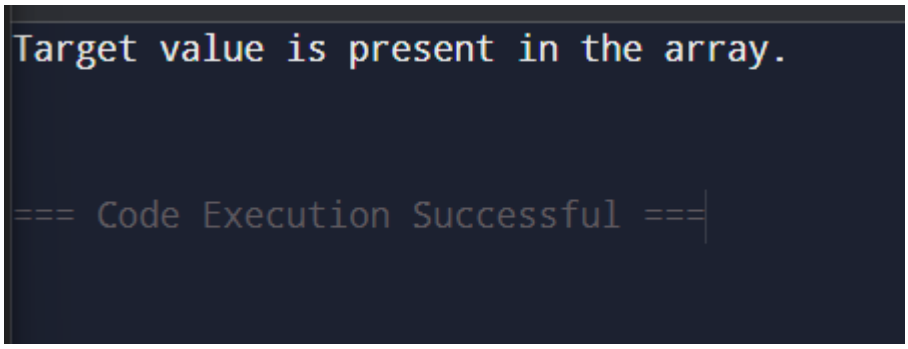


Q5. Given an Array Sorted in Ascending Order and an Integer k, Return True if k is Present in the Array Otherwise False

```
#include <iostream>
using namespace std;

bool binarySearch(int arr[], int size, int target) {
    int left = 0;
    int right = size - 1;

    while (left <= right) {
        int mid = left + (right - left) / 2;

        if (arr[mid] == target) {
            return true;
        }

        if (arr[mid] < target) {
            left = mid + 1;
        } else {
            right = mid - 1;
        }
    }
```

```
    return false;
}

int main() {
    int arr[] = {10, 20, 30, 40, 50};
    int size = sizeof(arr) / sizeof(arr[0]);
    int target = 30;

    bool result = binarySearch(arr, size, target);

    if (result) {
        cout << "Target value is present in the array." << endl;
    } else {
        cout << "Target value is not present in the array." << endl;
    }

    return 0;
}
```

Output:

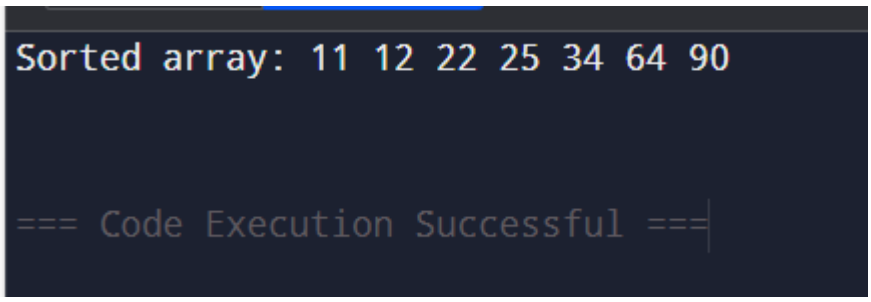


Q6. Bubble Sort

```
#include <iostream>
using namespace std;

void bubbleSort(int arr[], int size) {
    for (int i = 0; i < size - 1; i++) {
```

```
        for (int j = 0; j < size - i - 1; j++) {
            if (arr[j] > arr[j + 1]) {
                swap(arr[j], arr[j + 1]);
            }
        }
    }
}

int main() {
    int arr[] = {64, 34, 25, 12, 22, 11, 90};
    int size = sizeof(arr) / sizeof(arr[0]);

    bubbleSort(arr, size);

    cout << "Sorted array: ";
    for (int i = 0; i < size; i++) {
        cout << arr[i] << " ";
    }
    cout << endl;

    return 0;
}
```

Output:

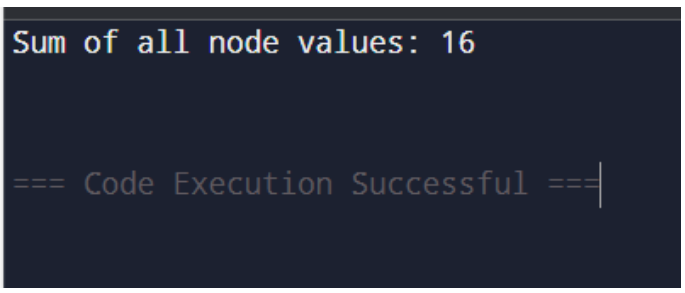


Q7. Sum of Binary Tree Nodes

```
#include <iostream>
using namespace std;
```

```
struct TreeNode {
    int val;
    TreeNode* left;
    TreeNode* right;
    TreeNode(int x) : val(x), left(NULL), right(NULL) {}
};

int sumOfNodes(TreeNode* root) {
    if (root == NULL) {
        return 0;
    }
    return root->val + sumOfNodes(root->left) + sumOfNodes(root-
>right);
}

int main() {
    TreeNode* root = new TreeNode(1);
    root->left = new TreeNode(2);
    root->right = new TreeNode(3);
    root->left->left = new TreeNode(4);
    root->right->left = new TreeNode(6);

    int sum = sumOfNodes(root);
    cout << "Sum of all node values: " << sum << endl;

    return 0;
}
```

Output:

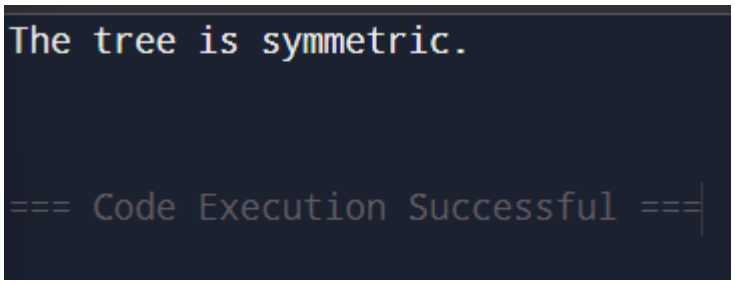


Q8. Find if the Tree is Symmetric or Not

```
#include <iostream>
using namespace std;

struct TreeNode {
    int val;
    TreeNode* left;
    TreeNode* right;
    TreeNode(int x) : val(x), left(NULL), right(NULL) {}
};

bool isMirror(TreeNode* left, TreeNode* right) {
    if (left == NULL && right == NULL) {
        return true;
    }
    if (left == NULL || right == NULL) {
        return false;
    }
    return (left->val == right->val) && isMirror(left->left, right->right)
&& isMirror(left->right, right->left);
}

bool isSymmetric(TreeNode* root) {
    if (root == NULL) {
        return true;
    }
    return isMirror(root->left, root->right);
}

int main() {
    TreeNode* root = new TreeNode(1);
    root->left = new TreeNode(2);
    root->right = new TreeNode(2);
    root->left->left = new TreeNode(3);
    root->left->right = new TreeNode(4);
    root->right->left = new TreeNode(4);
    root->right->right = new TreeNode(3);
```

```
    bool result = isSymmetric(root);

    if (result) {
cout << "The tree is symmetric." << endl; } else { cout << "The tree is
not symmetric." << endl; } return 0;
}



        cout << "The tree is symmetric." << endl;
    } else {
        cout << "The tree is not symmetric." << endl;
    }


    return 0;
}
```

Output:

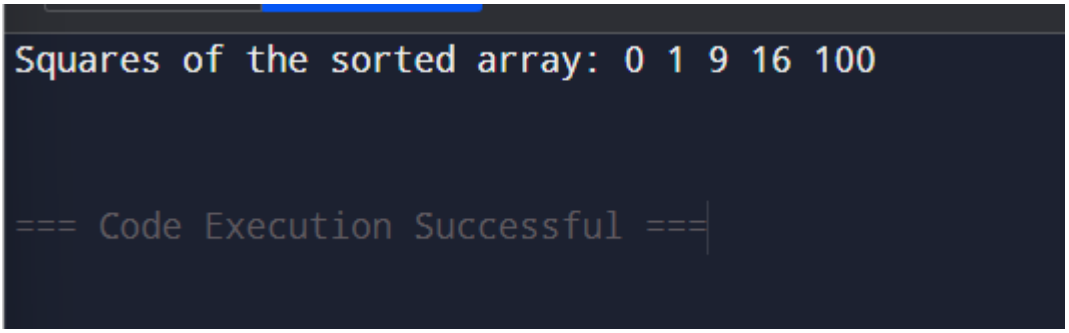


Q9. Squares of a Sorted Array

```
#include <iostream>
#include <vector>
#include <algorithm>
```

```
using namespace std;

vector<int> sortedSquares(vector<int>& nums) {
    for (int& num : nums) {
        num = num * num;
    }
    sort(nums.begin(), nums.end());
    return nums;
}

int main() {
    vector<int> nums = {-4, -1, 0, 3, 10};
    vector<int> result = sortedSquares(nums);

    cout << "Squares of the sorted array: ";
    for (int num : result) {
        cout << num << " ";
    }
    cout << endl;

    return 0;
}
```

Output:



Q10. Smallest Positive Missing Number

```
#include <iostream>
#include <vector>
#include <algorithm>
using namespace std;

int smallestMissingPositive(vector<int>& nums) {
    sort(nums.begin(), nums.end());
    int smallest = 1;

    for (int num : nums) {
        if (num == smallest) {
            smallest++;
        }
    }

    return smallest;
}
```

```
int main() {
    vector<int> nums = {3, 4, -1, 1};
    int result = smallestMissingPositive(nums);

    cout << "Smallest positive missing number: " << result << endl;

    return 0;
}
```

Output: