FEDERAL URDU UNIVERSITY OF ARTS, SCIENCES & TECHNOLOGY

ISLAMABAD

Name : Malik Taqi Abbas

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Mis Id : 40585

Subject : DSA_Lab

-> Assignment # 01 <-

Binary Search Implementation

```
#include <iostream>

#include <vector> using

namespace std;


int binarySearch(vector<int> arr, int target) {

int left = 0, right = arr.size() - 1;     while (left

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

2;        if (arr[mid] == target)            return

mid; // Target found        else if (arr[mid] <

target)            left = mid + 1;        else

right = mid - 1;

   }     return -1; // Target not

found

}


int main() {     vector<int> arr = {2, 3,

4, 10, 40};     int target = 10;
```

```
    int result = binarySearch(arr, target);     if (result != -1)         cout <<
"Binary Search: Target found at index " << result << endl;
    else
        cout << "Binary Search: Target not found." << endl;


    return 0;
}
```

Linear Search Implementation

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

int linearSearch(vector<int> arr, int target) {
for (int i = 0; i < arr.size(); i++) {         if (arr[i]
== target)            return i; // Target found
    }     return -1; // Target not
found
}
```

```
int main() {     vector<int> arr = {2, 3,
4, 10, 40};     int target = 10;

    int result = linearSearch(arr, target);
if (result != -1)
        cout << "Linear Search: Target found at index " << result << endl;
    else         cout << "Linear Search: Target not found." <<
endl;

    return 0;
}
```

How to Run the Program in Dev-C++

1. Open Dev-C++: Launch the Dev-C++ IDE on your system..

2. Create Separate Files:

Create a new file for Binary Search (binary_search.cpp):

Go to File > New > Source File.

Paste the Binary Search code into the editor.

Save the file as binary_search.cpp.

Repeat the same steps for Linear Search (linear_search.cpp).

3. Compile the Program:

Open the desired file (e.g., binary_search.cpp) in Dev-C++.

Click on Execute > Compile and Run or press F11.

This will compile the code and execute it directly within the IDE.

4. View Output:

After running, the output will appear in the console window at the bottom of Dev-C++.

5. Repeat for Other Program:

Close the current file and open linear_search.cpp in Dev-C++.

Compile and run it to view the Linear Search program output.

Purpose of the Code

This project implements two fundamental searching algorithms:

1. Binary Search: Efficiently finds the position of a target element in a sorted list.

2. Linear Search: Iterates through the list to find the target element.

Time Complexity

Binary Search:

Best Case: O(1)

Worst Case: $O(\log_n)$

Linear Search:

Best Case: O(1)

Worst Case: O(n)

The End