Institute of Computer Technology

B. Tech. Computer Science and Engineering

Sub: DS

Course Code: 2CSE302

Practical – 22

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Sem – 3

Branch: CS

Class: A

Batch: 32

Imagine you're looking for a card with the number "42" in two different situations.In the first case, the cards are randomly scattered in a bag. In the second case, the cards are neatly arranged in order from smallest to largest.

**Definition: If the cards are unsorted, you'd use a Linear Search—picking each card one by one until you find "42" or have checked every card. This method is straightforward but can be slow since it may require examining every single card.**

**However, if the cards are sorted, you can use a Binary Search. Here, you'd start by dividing the ordered deck in half, checking the middle card. If it's less than you'd ignore the lower half and search the upper half; if it's more, you'd search the lower half. By repeatedly halving the search area, you quickly zero in on without needing to check each card individually.**

**Code:**

```c
#include <stdio.h>

// Function for Linear Search
void linearSearch(int arr[], int n, int target) {
    printf("Performing Linear Search...\n");
    for (int i = 0; i < n; i++) {
        if (arr[i] == target) {
            printf("Found %d at index %d using Linear Search.\n", target, i);
```

```c
            return;
        }
    }
    printf("%d not found using Linear Search.\n", target);
}


// Function for Binary Search
void binarySearch(int arr[], int n, int target) {
    int left = 0, right = n - 1, mid;

    printf("Performing Binary Search...\n");
    while (left <= right) {
        mid = left + (right - left) / 2; // Calculate middle index

        if (arr[mid] == target) {
            printf("Found %d at index %d using Binary Search.\n", target,
mid);
            return;
        } else if (arr[mid] < target) {
            left = mid + 1; // Search in the right half
        } else {
            right = mid - 1; // Search in the left half
        }
    }
    printf("%d not found using Binary Search.\n", target);
}

int main() {
    int unsorted_cards[] = {34, 21, 42, 5, 19}; // Unsorted cards for Linear
Search
    int sorted_cards[] = {5, 19, 21, 34, 42};   // Sorted cards for Binary
Search
    int target = 42;

    int n_unsorted = sizeof(unsorted_cards) / sizeof(unsorted_cards[0]);
    int n_sorted = sizeof(sorted_cards) / sizeof(sorted_cards[0]);

    // Perform Linear Search on unsorted array
    linearSearch(unsorted_cards, n_unsorted, target);

    // Perform Binary Search on sorted array
    binarySearch(sorted_cards, n_sorted, target);

    return 0;
}
```
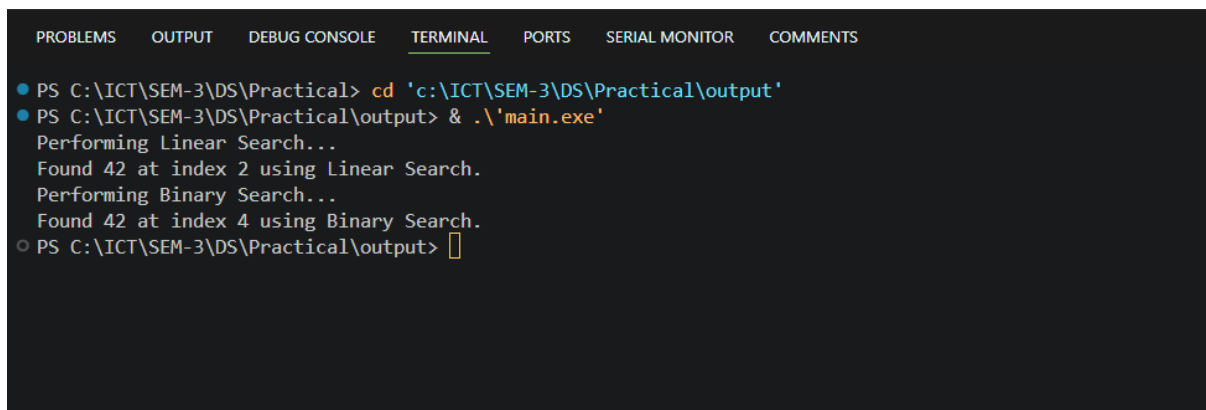
**Output:**

```
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL    PORTS    SERIAL MONITOR    COMMENTS

● PS C:\ICT\SEM-3\DS\Practical> cd 'c:\ICT\SEM-3\DS\Practical\output'
● PS C:\ICT\SEM-3\DS\Practical\output> & .\'main.exe'
  Performing Linear Search...
  Found 42 at index 2 using Linear Search.
  Performing Binary Search...
  Found 42 at index 4 using Binary Search.
○ PS C:\ICT\SEM-3\DS\Practical\output> 
```