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//QUESTION#1

#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) / 2;

if (arr[mid] == target) {

return mid;

} else if (arr[mid] < target) {

left = mid + 1;

} else {

right = mid - 1;

}

}

return -1;

```
}
```

```
int main() {
```

```
    int arr[] = {1, 3, 5, 7, 9, 11, 13, 15, 17, 19};
```

```
    int size = 10;
```

```
    int target;
```

```
    cout << "Enter target value: ";
```

```
    cin >> target;
```

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

```
    if (result != -1) {
```

```
        cout << "Target found at index: " << result << endl;
```

```
    } else {
```

```
        cout << "Target not found." << endl;
```

```
    }
```

```
    return 0;
```

```
}
```

The screenshot shows a web browser window with the URL `onlinegdb.com/online_c++_compiler#`. The interface includes a toolbar with buttons for Run, Debug, Stop, Share, Save, and Beautify. The main editor displays a C++ program for binary search. Below the editor, the 'input' section shows the user entering '3' for the target value, and the output section shows 'Target found at index: 1'. The program concludes with 'Program finished with exit code 0' and a prompt to press ENTER.

```
12-     } else {
13-     } else {
14-     right = mid - 1;
15-     }
16-     }
17-     return -1;
18- }
19- int main() {
20-     int arr[] = {1, 3, 5, 7, 9, 11, 13, 15, 17, 19};
21-     int size = 10;
22-     int target;
23-     cout << "Enter target value: ";
24-     cin >> target;
25-     int result = binarySearch(arr, size, target);
26-     if (result != -1) {
27-         cout << "Target found at index: " << result << endl;
28-     } else {
29-         cout << "Target not found." << endl;
30-     }
31-     return 0;
32- }
```

input

Enter target value: 3
Target found at index: 1

...Program finished with exit code 0
Press ENTER to exit console.

//QUESTION#2

#include <iostream>

using namespace std;

int findFirstOccurrence(int arr[], int size, int target) {

int left = 0;

int right = size - 1;

int result = -1;

while (left <= right) {

int mid = (left + right) / 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[] = {1, 3, 5, 7, 7, 7, 9, 11, 13, 15};
    int size = 10;
    int target;

    cout << "Enter target value: ";
    cin >> target;

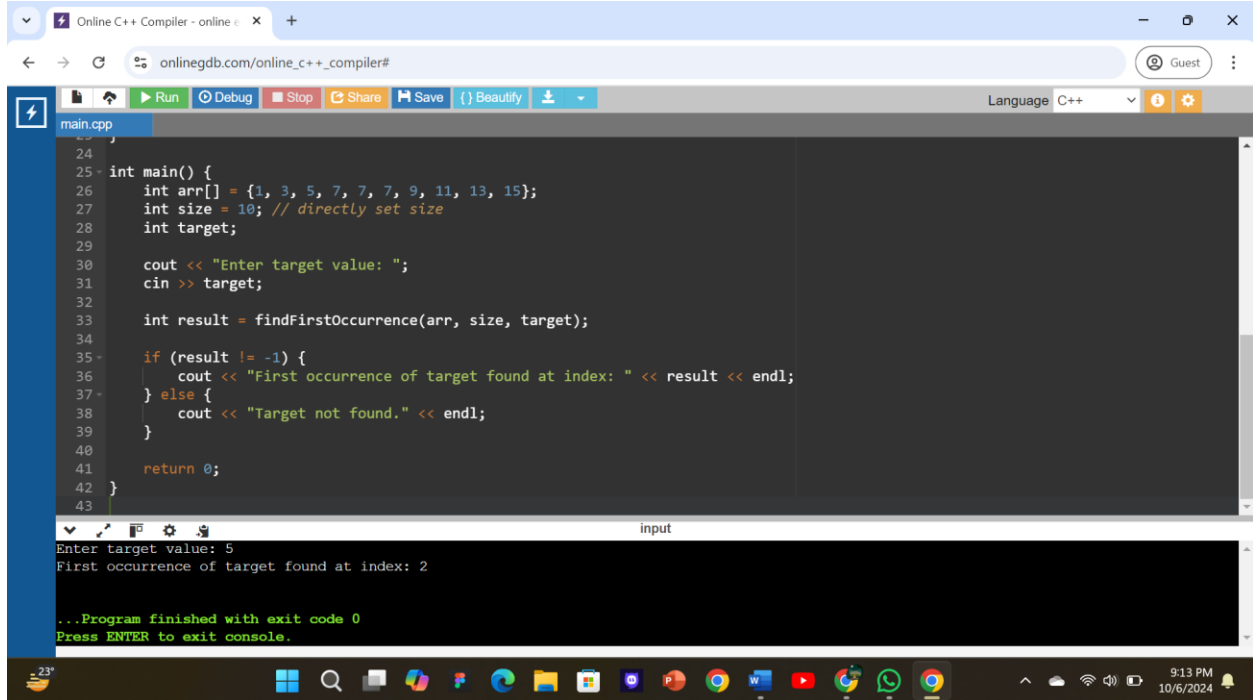
    int result = findFirstOccurrence(arr, size, target);

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

```

return 0;

}



The screenshot shows a web browser window with the URL `onlinegdb.com/online_c++_compiler#`. The browser's address bar shows the site name and a "Guest" user profile. The compiler interface has a top toolbar with buttons for Run, Debug, Stop, Share, Save, and Beautify. The language is set to C++. The main editor shows a C++ program in `main.cpp` with line numbers 24 to 43. The code defines an array `arr` with values {1, 3, 5, 7, 7, 7, 9, 11, 13, 15}, sets `size` to 10, and prompts the user for a target value. It then calls `findFirstOccurrence` and prints the result. The output window shows the user entered "5" and the program printed "First occurrence of target found at index: 2". The program finished with exit code 0.

```
24
25 int main() {
26     int arr[] = {1, 3, 5, 7, 7, 7, 9, 11, 13, 15};
27     int size = 10; // directly set size
28     int target;
29
30     cout << "Enter target value: ";
31     cin >> target;
32
33     int result = findFirstOccurrence(arr, size, target);
34
35     if (result != -1) {
36         cout << "First occurrence of target found at index: " << result << endl;
37     } else {
38         cout << "Target not found." << endl;
39     }
40
41     return 0;
42 }
43
```

input

Enter target value: 5
First occurrence of target found at index: 2

...Program finished with exit code 0
Press ENTER to exit console.

//QUESTION#3

#include <iostream>

using namespace std;

int findLastOccurrence(int arr[], int size, int target) {

int left = 0;

int right = size - 1;

int result = -1;

while (left <= right) {

int mid = (left + right) / 2;

```

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

    return result;
}

int main() {
    int arr[] = {1, 3, 5, 7, 7, 7, 9, 11, 13, 15};
    int size = 10;
    int target;

    cout << "Enter target value: ";
    cin >> target;

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

    if (result != -1) {
        cout << "Last occurrence of target found at index: " << result << endl;
    } else {

```

```

        cout << "Target not found." << endl;
    }

```

```

    return 0;
}

```

The screenshot shows a web browser window with the URL `onlinegdb.com/online_c++_compiler#`. The page title is "Online C++ Compiler - online e". The browser's address bar shows the URL. The page has a toolbar with buttons for Run, Debug, Stop, Share, Save, and Beautify. The language is set to C++. The code editor shows the following C++ code:

```

24
25 int main() {
26     int arr[] = {1, 3, 5, 7, 7, 9, 11, 13, 15};
27     int size = 10;
28     int target;
29
30     cout << "Enter target value: ";
31     cin >> target;
32
33     int result = findLastOccurrence(arr, size, target);
34
35     if (result != -1) {
36         cout << "Last occurrence of target found at index: " << result << endl;
37     } else {
38         cout << "Target not found." << endl;
39     }
40
41     return 0;
42 }
43

```

The console output shows the following text:

```

input
Enter target value: 7
Last occurrence of target found at index: 5

...Program finished with exit code 0
Press ENTER to exit console.

```

//QUESTION#4

```
#include <iostream>
```

```
using namespace std;
```

```
int findFirstOccurrence(int arr[], int size, int target) {
```

```
    int left = 0;
```

```
    int right = size - 1;
```

```
    int result = -1;
```

```
while (left <= right) {  
    int mid = (left + right) / 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 findLastOccurrence(int arr[], int size, int target) {  
    int left = 0;  
    int right = size - 1;  
    int result = -1;  
  
    while (left <= right) {  
        int mid = (left + right) / 2;  
  
        if (arr[mid] == target) {  
            result = mid;  
        }  
    }
```



```

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

return result;
}

int countOccurrences(int arr[], int size, int target) {
    int first = findFirstOccurrence(arr, size, target);
    if (first == -1) {
        return 0;
    }
    int last = findLastOccurrence(arr, size, target);
    return last - first + 1;
}

int main() {
    int arr[] = {1, 3, 5, 7, 7, 7, 9, 11, 13, 15};
    int size = 10;
    int target;

    cout << "Enter target value: ";

```

```
cin >> target;
```

```
int count = countOccurrences(arr, size, target); // find occurrences
```

```
if (count > 0) {
```

```
    cout << "The target appears " << count << " times." << endl;
```

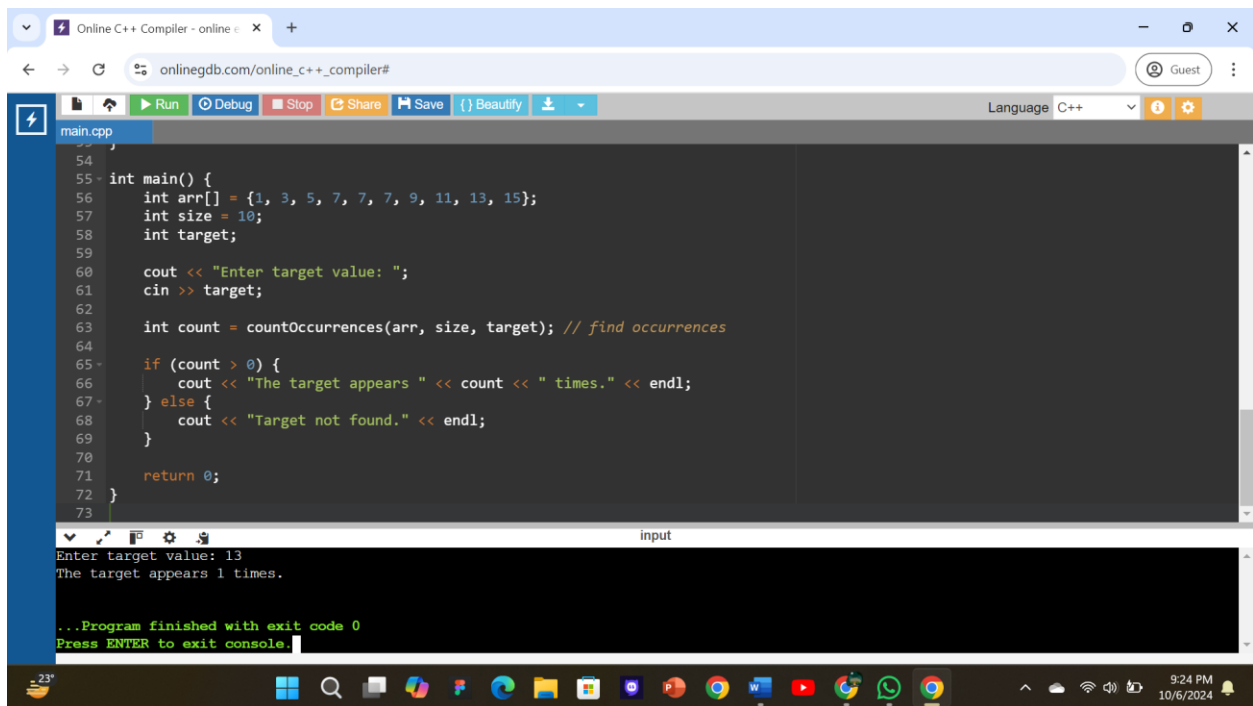
```
} else {
```

```
    cout << "Target not found." << endl;
```

```
}
```

```
return 0;
```

```
}
```



The screenshot shows a web browser window with the URL `onlinegdb.com/online_c++_compiler#`. The browser's address bar shows the page title "Online C++ Compiler - online c++". The compiler interface includes a toolbar with buttons for Run, Debug, Stop, Share, Save, and Beautify. The code editor displays the following C++ code:

```
54  
55 - int main() {  
56     int arr[] = {1, 3, 5, 7, 7, 7, 9, 11, 13, 15};  
57     int size = 10;  
58     int target;  
59  
60     cout << "Enter target value: ";  
61     cin >> target;  
62  
63     int count = countOccurrences(arr, size, target); // find occurrences  
64  
65     if (count > 0) {  
66         cout << "The target appears " << count << " times." << endl;  
67     } else {  
68         cout << "Target not found." << endl;  
69     }  
70  
71     return 0;  
72 }  
73
```

The output window shows the following text:

```
Enter target value: 13  
The target appears 1 times.  
  
...Program finished with exit code 0  
Press ENTER to exit console.
```

The Windows taskbar at the bottom shows the system clock as 9:24 PM on 10/6/2024.