DATA STRUCTURES & ALGORITHMS

CS106.3

Coursework 2023/2024

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Coursework

Use recursive approach to solve the Binary Search:

1. Write a proper pseudocode
2. Convert in to a program
3. Test the program with [2, 8, 9, 11, 15, 45, 58, 78, 99] array locating 2.

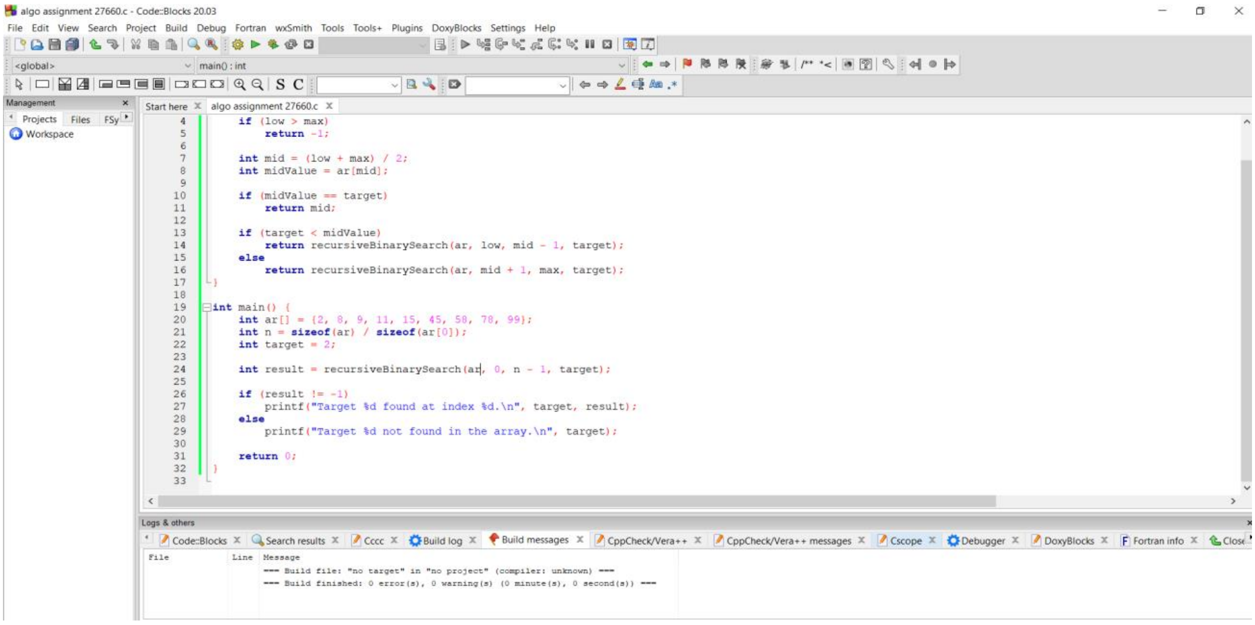
--------------------------------------- [Answer Below] ---------------------------------------

Pseudo code

```
Function recursiveBinarySearch (ar, low, max, target)
    If low > max
        Return -1

    mid = (low + max) / 2
    midValue = ar[mid]

    If midValue == target
        Return mid // Base case: target found at index mid

    If target < midValue
        Return recursiveBinarySearch (ar, low, mid - 1, target)
    Else
        Return recursiveBinarySearch (ar, mid + 1, max, target)
    End If
End Function
```

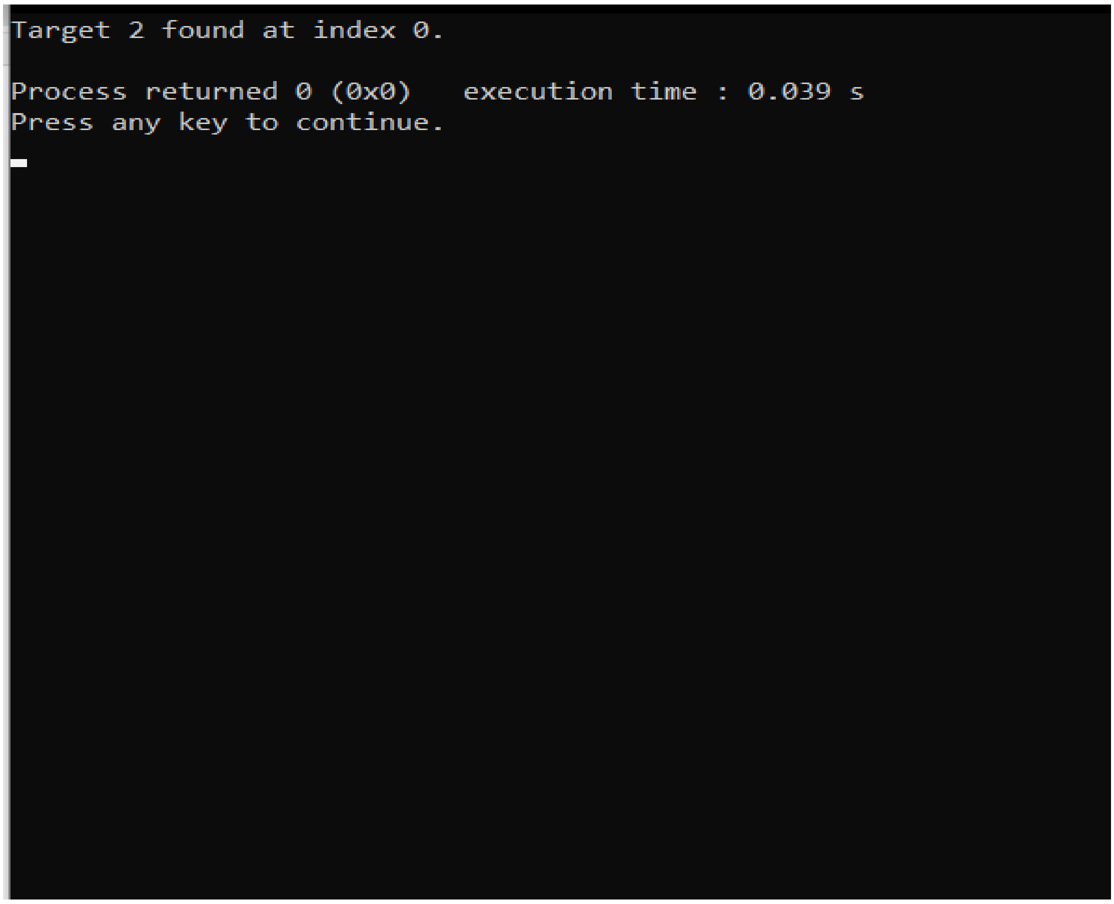
C code

```
if (low > max)
        return -1;

    int mid = (low + max) / 2;
    int midValue = ar[mid];

    if (midValue == target)
        return mid;

    if (target < midValue)
        return recursiveBinarySearch(ar, low, mid - 1, target);
    else
        return recursiveBinarySearch(ar, mid + 1, max, target);
}

int main() {
    int ar[] = {2, 8, 9, 11, 15, 45, 58, 78, 99};
    int n = sizeof(ar) / sizeof(ar[0]);
    int target = 2;

    int result = recursiveBinarySearch(ar, 0, n - 1, target);

    if (result != -1)
        printf("Target %d found at index %d.\n", target, result);
    else
        printf("Target %d not found in the array.\n", target);

    return 0;
}
```



```c
    if (low > max)
        return -1;

    int mid = (low + max) / 2;
    int midValue = ar[mid];

    if (midValue == target)
        return mid;

    if (target < midValue)
        return recursiveBinarySearch(ar, low, mid - 1, target);
    else
        return recursiveBinarySearch(ar, mid + 1, max, target);
}

int main() {
    int ar[] = {2, 8, 9, 11, 15, 45, 58, 78, 99};
    int n = sizeof(ar) / sizeof(ar[0]);
    int target = 2;

    int result = recursiveBinarySearch(ar, 0, n - 1, target);

    if (result != -1)
        printf("Target %d found at index %d.\n", target, result);
    else
        printf("Target %d not found in the array.\n", target);

    return 0;
}
```

```
File            Line  Message
                      === Build file: "no target" in "no project" (compiler: unknown) ===
                      === Build finished: 0 error(s), 0 warning(s) (0 minute(s), 0 second(s)) ===
```



```
Target 2 found at index 0.

Process returned 0 (0x0)   execution time : 0.039 s
Press any key to continue.
```