## Câu hỏi 4

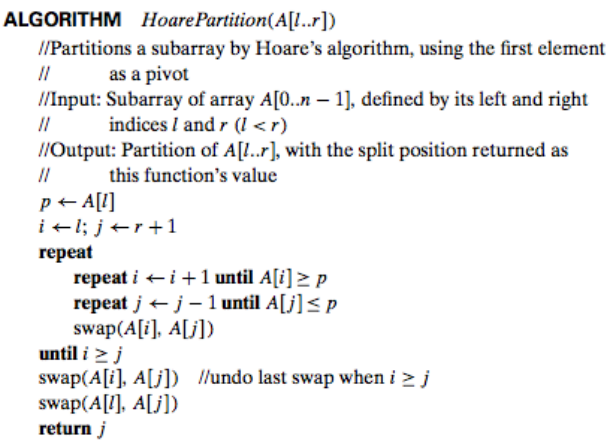
Chính xác

Chấm điểm của 2,00

Implement static methods **Partition** and **QuickSort** in class Sorting to sort an array in ascending order.

```
#ifndef SORTING_H
#define SORTING_H
#include <sstream>
#include <iostream>
#include <type_traits>
using namespace std;
template <class T>
class Sorting {
private:
    static T* Partition(T* start, T* end) ;
public:
    static void QuickSort(T* start, T* end) ;
};
#endif /* SORTING_H */
```

You can read the pseudocode of the algorithm used to in method Partition in the below image.




**For example:**

| Test | Result |
|---|---|
| `int array[] = { 3, 5, 7, 10 ,12, 14, 15, 13, 1, 2, 9, 6, 4, 8, 11, 16, 17, 18, 20, 19 };`<br>`cout << "Index of pivots: ";`<br>`Sorting<int>::QuickSort(&array[0], &array[20]);`<br>`cout << "\n";`<br>`cout << "Array after sorting: ";`<br>`for (int i : array) cout << i << " ";` | `Index of pivots: 2 0 0 6 1 0 2 1 0 0 2 1 0 0 0 0 0 0 1 0`<br>`Array after sorting: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20` |

**Answer:** (penalty regime: 0 %)

Reset answer

```
1 static T* Partition(T* start, T* end) {
2     // TODO: return the pointer which points to the pivot afte
3     T pivot = start[0];    // pivot
4     int i = 0;
5     int j = end - start;
6     do {
7         do {
8             i++;
```

```
        while (start[i] <= pivot);
        do {
            j--;
        }
        while (start[j]>pivot);

        swap(start[i], start[j]);
    }
    while (i<j);

    swap(start[i], start[j]);
    swap(start[0], start[j]);
    return start + j;
}

static void QuickSort(T* start, T* end) {
    // TODO
    // In this question, you must print out the index of pivot
    if (start >= end) return;
    T* index = Partition(start, end);
    cout << index - start << " ";
    QuickSort(start, index);
    QuickSort(index + 1, end);
}
```

Precheck | Kiểm tra

| | Test | Expected | Got | |
|---|---|---|---|---|
| ✔ | `int array[] = { 3, 5, 7, 10 ,12, 14, 15, 13, 1, 2, 9, 6, 4, 8, 11, 16, 17, 18, 20, 19 };`<br>`cout << "Index of pivots: ";`<br>`Sorting<int>::QuickSort(&array[0], &array[20]);`<br>`cout << "\n";`<br>`cout << "Array after sorting: ";`<br>`for (int i : array) cout << i << " ";` | `Index of pivots: 2 0 0 6 1 0 2 1 0 0 2 1 0 0 0 0 0 0 1 0`<br>`Array after sorting: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20` | `Index of pivots: 2 0 0 6 1 0 2 1 0 0 2 1 0 0 0 0 0 0 1 0`<br>`Array after sorting: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20` | ✔ |

Passed all tests! ✔

(028) 38 651 670 - (028) 38 647 256 (Ext: 5258, 5234)

elearning@hcmut.edu.vn