

CSE12 - Lecture 13

Monday, October 30, 2023 8:00 AM

PA1 & PA2 Late/Resubmit due Wed @ 8am

Lecture 13

Sorting Quickly

Quick-sort → in-place

```
public class SortQuickly {
```

@(1)

```
    public static void swap(String[] array, int i1, int i2) {
        String temp = array[i1];
        array[i1] = array[i2];
        array[i2] = temp;
    }
```

```
    public static int partition(String[] array, int low, int high) {
        int pivotStartIndex = high - 1;
        String pivot = array[pivotStartIndex];
        int smallerBefore = low, largerAfter = high - 2;
```

Should be <=, we want to continue loop one more time when equal

```
        while (smallerBefore <= largerAfter) {
            if (array[smallerBefore].compareTo(pivot) < 0) {
                smallerBefore += 1;
            }
            else {
                swap(array, smallerBefore, largerAfter);
                largerAfter -= 1;
            }
        }
```

@(1)

```
        swap(array, smallerBefore, pivotStartIndex);
        return smallerBefore;
    }
```

```
    public static void qsort(String[] array, int low, int high) {
        if (high - low <= 1) { return; }
        int splitAt = partition(array, low, high);
        qsort(array, low, splitAt);
        qsort(array, splitAt + 1, high);
    }
```

```
    public static void sortD(String[] array) {
        qsort(array, 0, array.length);
    }
```

```
    public static void main(String[] args) {
        String[] str = {"f", "b", "a", "e", "d", "c"};
        int[] result = SortQuickly.sortD(str);
        System.out.println(Arrays.deepToString(result));
    }
}
```

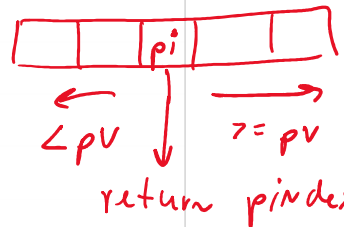
Draw the picture of sortD()

What is the tight bound of sortD:

Best case: $\Theta(N \log_2 N)$ → median value

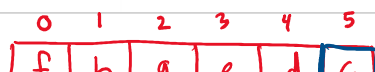
Worst case: $\Theta(N^2)$ → sorted array

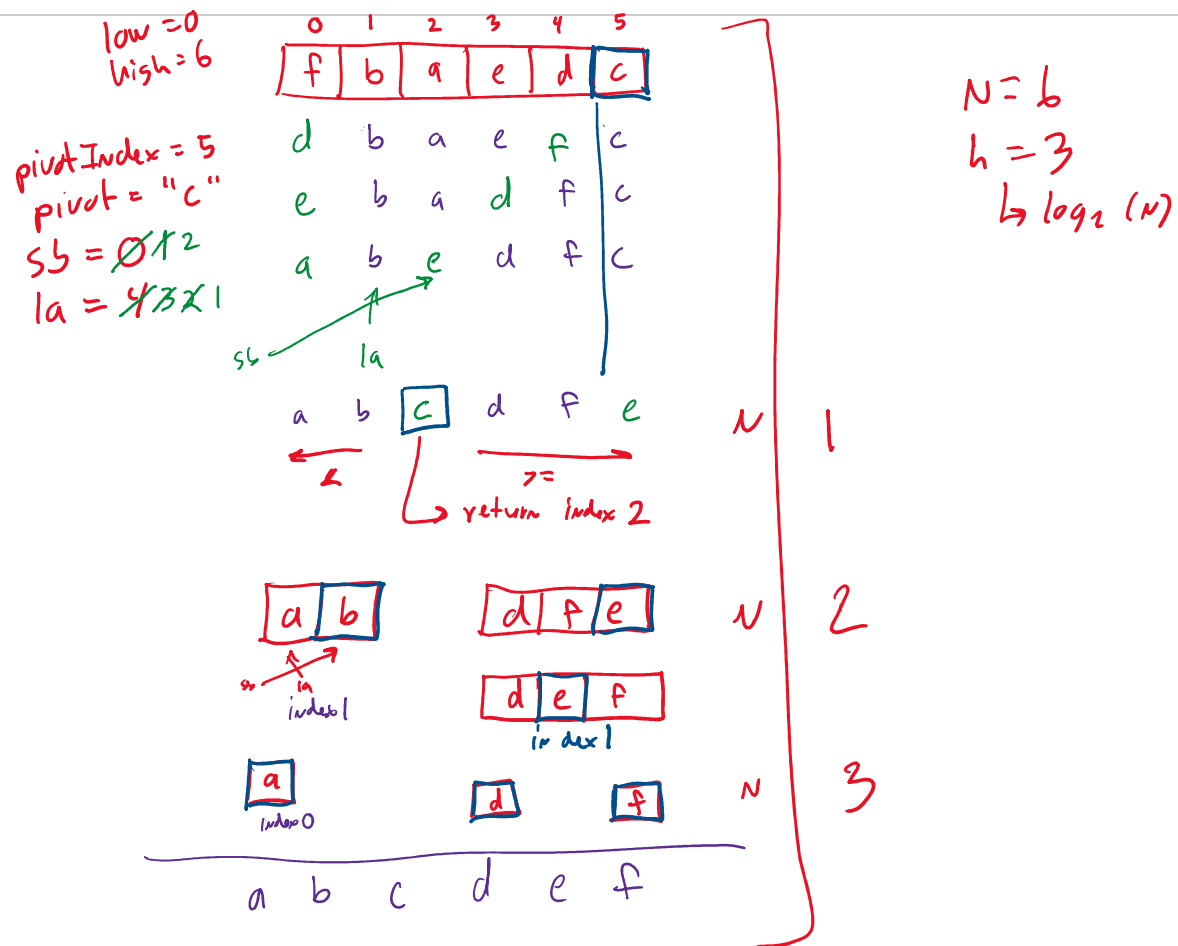
Valid partition



Name: _____ PID: _____ Code: 7148

low = 0
high = 6





Median value → best case

1 2 4 5 3

1 2 3 4 5

1 2

4 5

1

4

$\Theta(N \log_2(N))$

1	2	3	4	5		\rightarrow sorted array
1	2	3	4			$n=5$
1	2	3				length=5
1						$\mathcal{O}(N \times N) \rightarrow \mathcal{O}(N^2)$