

numbers 157, 110, 147, 122, 111, 149, 151, 141, 123, 112, 117, 133.

Quick sort - 1st elem as pivot

157, 110, 147, 122, 111, 149, 151, 141, 123, 112, 117, 133

110 \rightarrow less than 157 \rightarrow to the left

147 \rightarrow less than 157 \rightarrow to the left

122, 111, 149, 151, 141, 123, 112, 117,

133 - all to left.

steps - or iterations - ~~10~~ 10 but 1 swap
 (swap when $\text{elem} \leq \text{pivot}$)
 left!

last elem as pivot.

lst = [157, 110, 147, 122, 111, 149, 151, 141, 123, 112, 117, 133]

~~from [lst[end] till lst[0]: i~~
~~pivot = 133~~
~~if $\text{lst}[i] \leq \text{pivot}$~~
~~then swap~~

int, i = -1, j = 0;

if $\text{arr}[i] < \text{pivot}$ {

i++;

temp = arr[i];

arr[i] = arr[j];

arr[j] = temp;

arr[i] = temp;

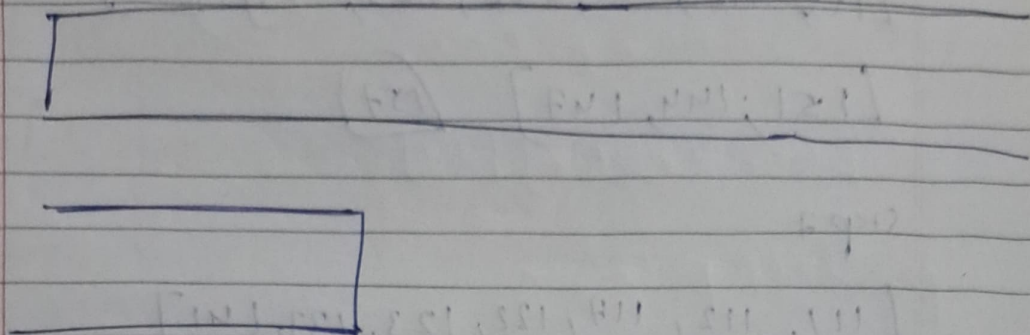
else {

j++;

temp = arr[j];

arr[j] = pivot;

(ii) median take 149



Step 1:

[133, 147, 122, 111, 149, 151, 141, 123, 112, 117];

Step 2:

[123, 117, 122, 111, 112, 133, 141, 151, 149, 147] 157

Step 3:

[112, 117, 122, 111] [123, 133] [141, 151, 149, 147] 157

Step 4

[111, 112], [122, 117] [123, 133], [141, 151, 149, 147] 157

Step 5:

[11, 112]; [122, 117], [123, 133], [141, 151, 149, 147] 157

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Step 6

[114, 112, 117, 122, 123, 133] [141]

[151, 144, 147] (157)

Step 7

[111, 112, 117, 122, 123, 133, 141]

[147, 144] (157, 157)

Step 8

¹¹⁰
[111, 112, 117, 122, 123, 133, 141, 144, 147, 151, 157]

2. Last element

Step 1: [157, ~~147~~,

117, 110, 112, 122, 111, 123, (133), ~~141~~, 144, 147, 157, 147]

↓

Step 2

[110, 122, 111, 123, 112, (17)] (133) [141, 147, 157, 147, (41)]

Step 3

[110, 111, (112)] (117) [122, (123)] (133)

(141), [157, 147, 147, (151)]

step 4:

[110, 111] [112] [117] [122] [123] [133]

step 5: [141] [147, 149] [151] [157]

all combined:

[110, 111, 112, 117, 122, 123, 133, 141, 147, 149, 151, 157]

Part 3: Random pivot element

let pivot be 149

[157, 110, 147, 122, 111, 149] [151, 141, 123, 112, 117, 133]

Step 1:

left

[110, 147, 122, 111, 141, 123, 112, 117, 133],

[149], [~~151, 141, 123, 112, 117, 133~~] [157, 151] right

Step 2: left

a random pivot is 123

[~~147~~] [110, 122, 111, 112, 117], [123], [147, 141, 133], ...

steps: right part random pivot: 157

[151], [157]

left
Step 4: ~~right~~ part:

in $[110, 112, 111, 112, 117]$
random pivot = 112

$[110, 111], [112], [117]$

Step 5: left part again:

for $[110, 111]$

random pivot = 111

$\rightarrow [110, 111]$

Step 6: ~~combining~~ combining ALL sorted sublists:

$[110, 111, 112; 117, 122, 123, 133, 141, 147, 149, 151, 157]$

Time Comp.	Pivot choice	approx steps (pivots)	
$O(n^2)$	first element	7 to 8	unbalanced
Better than $O(n^2)$	last element	6	Moderate
$O(n \log n)$	random element	5	Most balance