Randomized Selection

Description In this lab assignment, you are asked to implement the randomized algorithm for the selection problem; see the pseudocode on page 216 in Chapter 9. You will have to implement this pseudocode, with only one change: for the grading purpose, line 3 will be replaced with "q = Partition(A, p, r)"; see page 171 of the textbook. In other words, when you partition $A[p...r]$, we will use $A[r]$, the last element in the subarray, as the pivot. So, it really is a deterministic selection.

Input structure The input starts with an integer number which indicates the number of elements (integers) to be sorted, n, and then i—here, we want to find the ith smallest element among the n elements. Then, the elements follow, one per line.

Output structure Output all the pivots selected in the order they are selected. Also output the element we are looking for at the end, whether it is chosen as the pivot or not; output it only once. Each element output must be followed by ;.

Examples of input and output:

Input

```
9
6
1
8
4
9
7
2
3
6
5
```

Output

```
5;7;6;
```

The first function call is RS(A, 1, 9, 6) where $A[1...9]$ is 1,8,4,9,7,2,3,6,5. Here RS is a short hand for RandomizedSelection. The last element 5 is used as the pivot, so it is output first. Then, it makes a recursive call RS(A, 6, 9, 1) where A[1...9] = 1,4,2,3,5,8,9,6,7. The last element 7 is chosen as the pivot and output. Then, another recursive call RS(A, 6, 6, 1) is made where A[1...9] = 1,4,2,3,5,6,7,8,9. Then, 6 is returned as the element we're looking for and is output.

Note that the output is only one line and has no white characters.

See the lab guidelines for submission/grading, etc., which can be found in Files/Labs.