QUICK SORT BY RANDOMIZE ALGORITM

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SORTING

Sorting is any process of arranging items according to a certain sequence or in different sets, and therefore, it has two common, yet distinct meanings:

Ordering: arranging items of the same kind, class or nature, in some ordered sequence,

Categorizing: grouping and labeling items with similar properties together (by sorts).

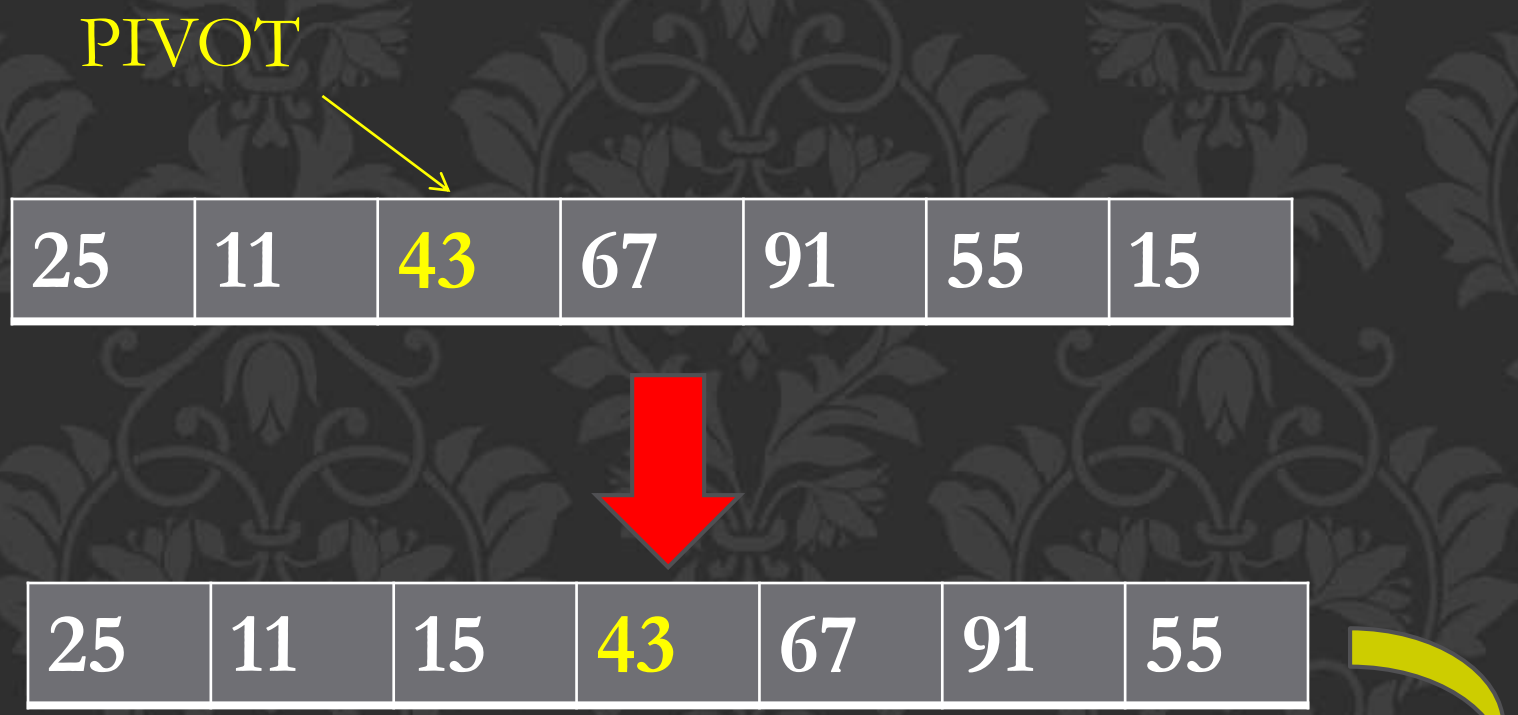
QUICK SORT

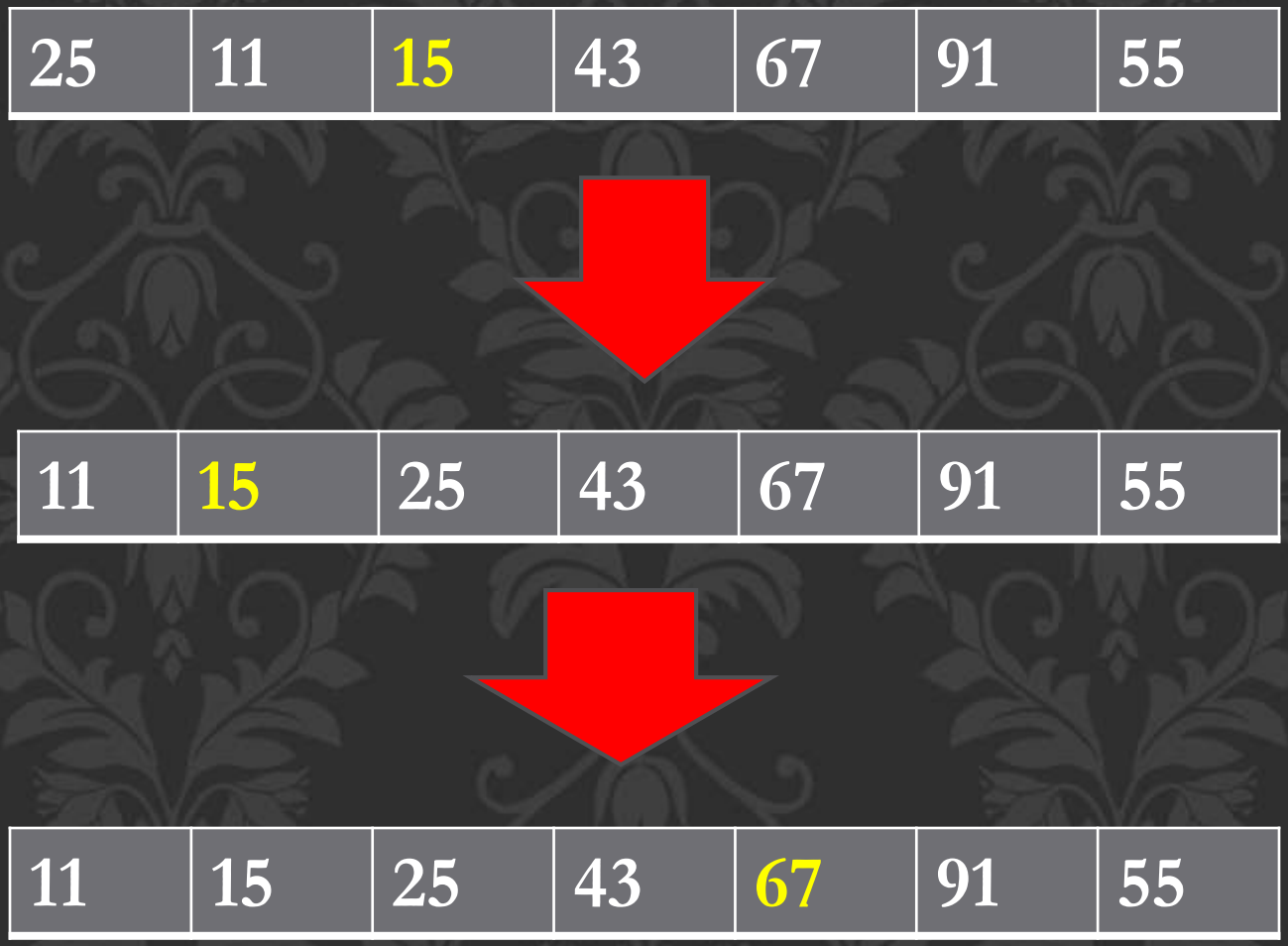
- Quick sort is an algorithm for sorting a list or array.
- It is an efficient sorting algorithm serving as a systematic method for placing the elements of an array in order.
- It was developed by Tony Hoare in 1960.
- It is sometimes called partition exchange sort.
- It is a divide and conquer algorithm.

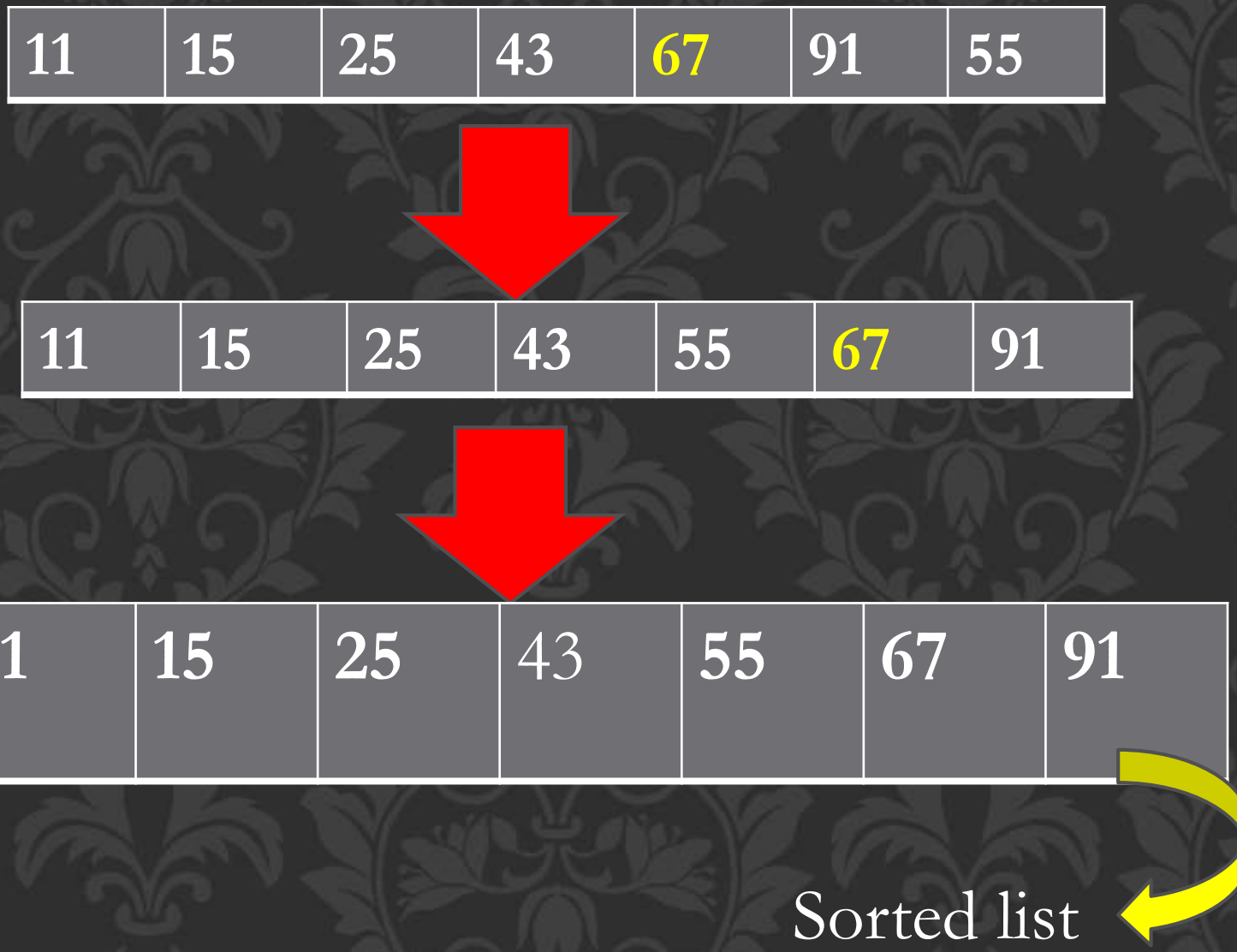
QUICK SORT ALGORITHM

- ***Pick an element, called a pivot, from the array.***
- ***Reorder the array so that all elements with values less than the pivot come before the pivot, while all elements with values greater than the pivot come after it . After this partitioning, the pivot is in its final position. This is called the partition operation.***
- ***Recursively apply the above steps to the sub-array of elements with smaller values and separately to the sub-array of elements with greater values.***

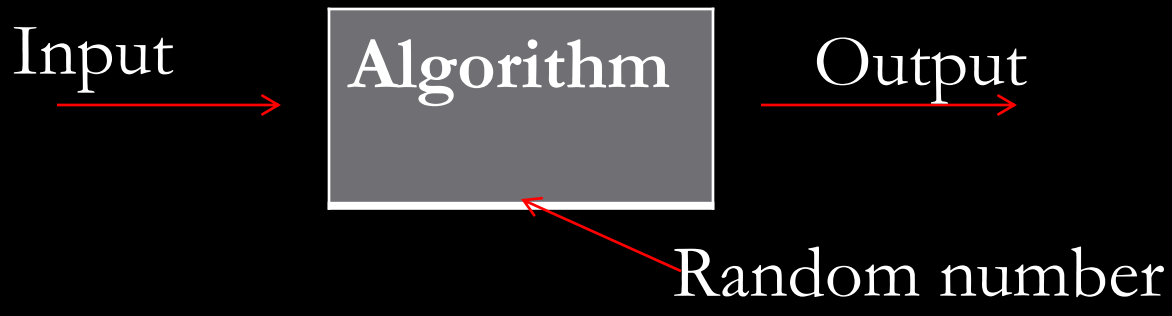
For eg. the array is :- 25 11 43 67 91 55 15




25 11 15 43 67 91 55
11 15 25 43 67 91 55
11 15 25 43 67 91 55


11 15 25 43 67 91 55
11 15 25 43 55 67 91
11 15 25 43 55 67 91
Sorted list

RANDOMIZED ALGORITHM



- In addition to the input, the algorithm uses a source of random numbers. During execution, it takes random choices depending on those random numbers.
- The behavior (output) can vary if the algorithm is run multiple times on the same input

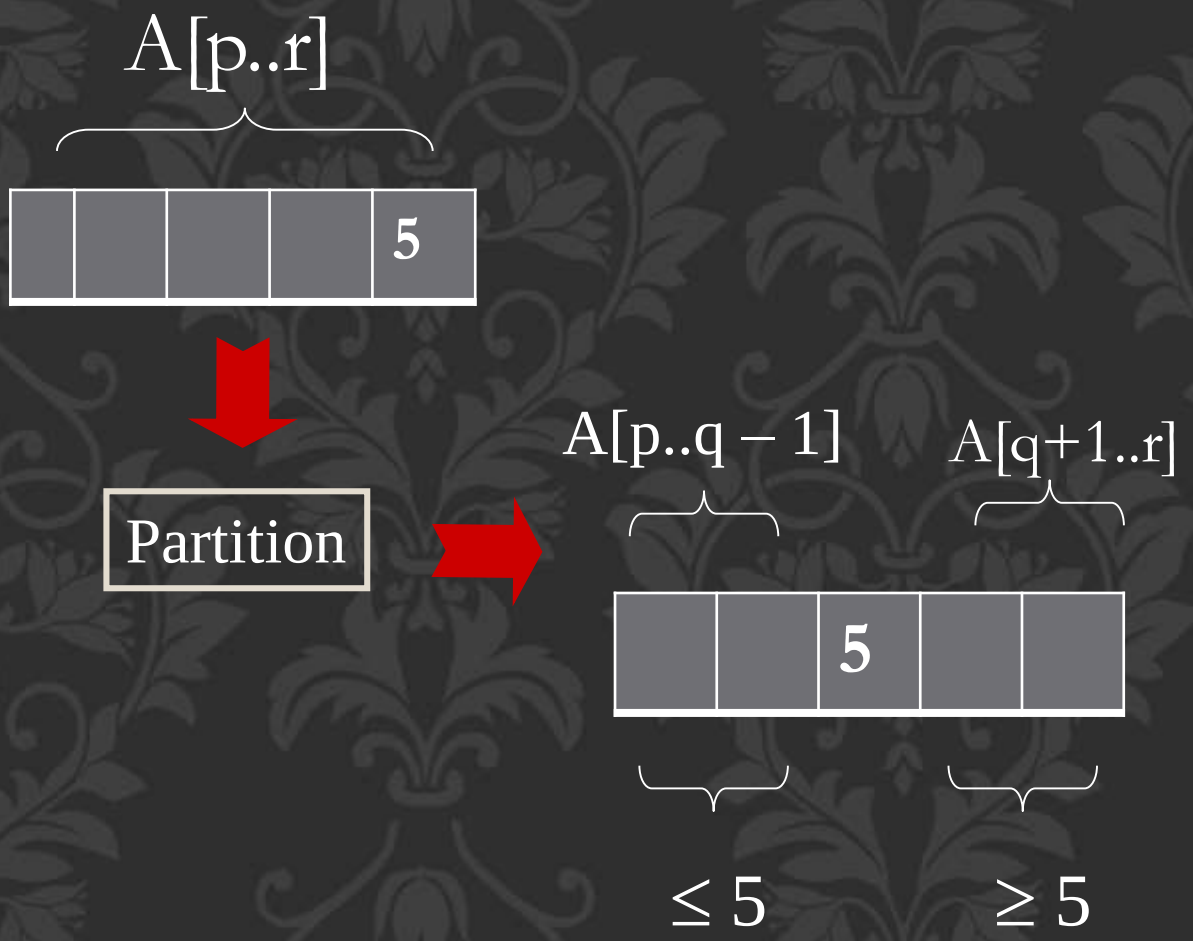
CONTINUE…..

Randomized algorithm can be categorized into two classes:-

1. **Las Vegas algorithms:** These type of algorithms always produce the same(correct) output for same input.
2. **Monte Carlo algorithms:** **The output of such algorithms might differ from run to run for same input.**

RANDOMIZED QUICK SORT

- Exchange $A[r]$ with an element chosen at random from $A[p \ldots r]$ in **Partition**.
- The pivot element is equally likely to be any of input elements.
- *For any given input, the behavior of Randomized Quick Sort* is determined not only by the input but also by the *random choices of the pivot.*
- We add randomization to Quick Sort to obtain for any input the expected performance of the algorithm to be good.


A[p..r]
5
Partition
A[p..q – 1]
A[q+1..r]
5
≤ 5
≥ 5

ADVANTAGES

- The algorithm is usually simple and easy to implement,
- The algorithm is fast with very high probability, and/or
- It produces optimum output with very high probability.

DISADVANTAGES

- There is a finite probability of getting incorrect answer..
- Getting truly random numbers is impossible. One needs to depend on pseudo random numbers. So, the result highly depends on the quality of the random numbers.


Thank you