CutShort

A Hybrid Sorting Technique

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What is a Sorting technique ?

- ***Sorting*** is a process that organizes a collection of data into either ascending or descending order.

  Some sorting algorithms

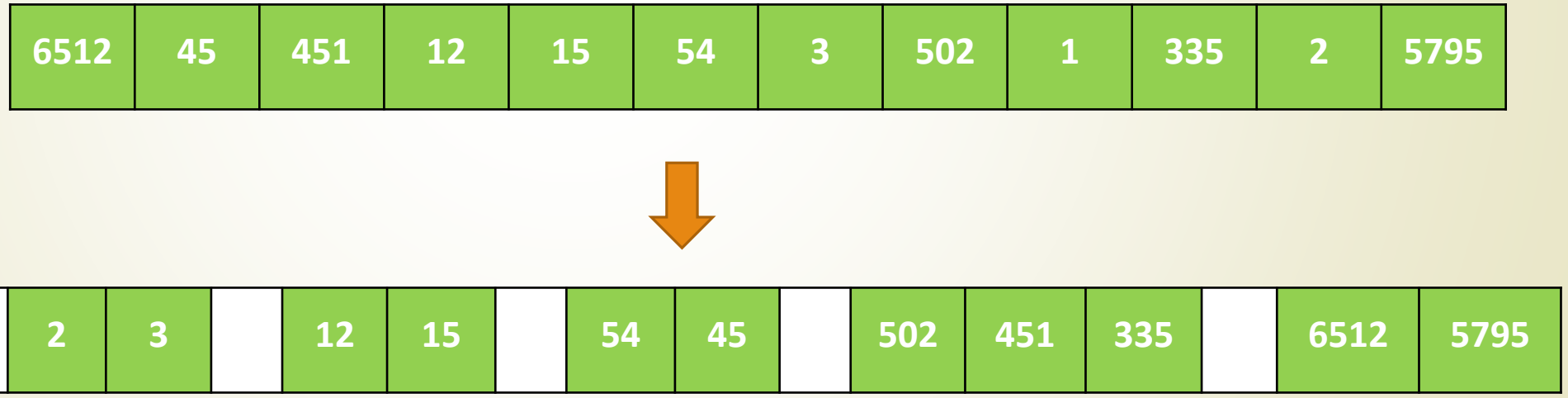
  - Insertion Sort
  - Merge Sort
  - Quick Sort

Importance of Sorting

- Data searching can be optimized to a very high level if data is sorted.
- Sorting is also done to represent data in more readable formats.
- Used in other important algorithms.

Motive

- Dividing an input array into a number of sub-arrays so as to reduce the length of the array for performing sorting on individual sub-array.



Process

Getting the counts of numbers requiring the same number of bits (BitCount) in its binary form

Arranging the numbers such that numbers with same BitCount belong a same sub-arrays

Sorting the sub-arrays with pre-existing sorting technique

BitCounts

Number	Binary Representation	No. of bits required
12	1010	4
53	110101	6
500	111110100	9
9999	10011100001111	14

Finding *BitCount*

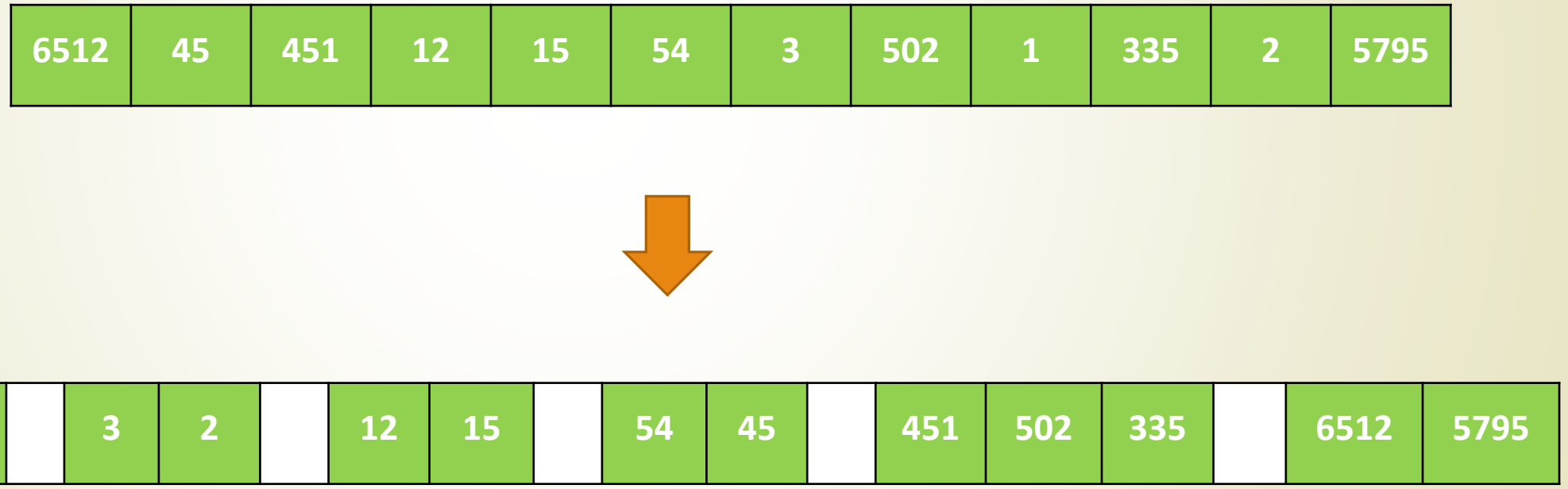
6512	45	451	12	15	54	3	502	1	335	2	5795

Array “ BitBand ” : Each element represents the counts of numbers with same BitCount

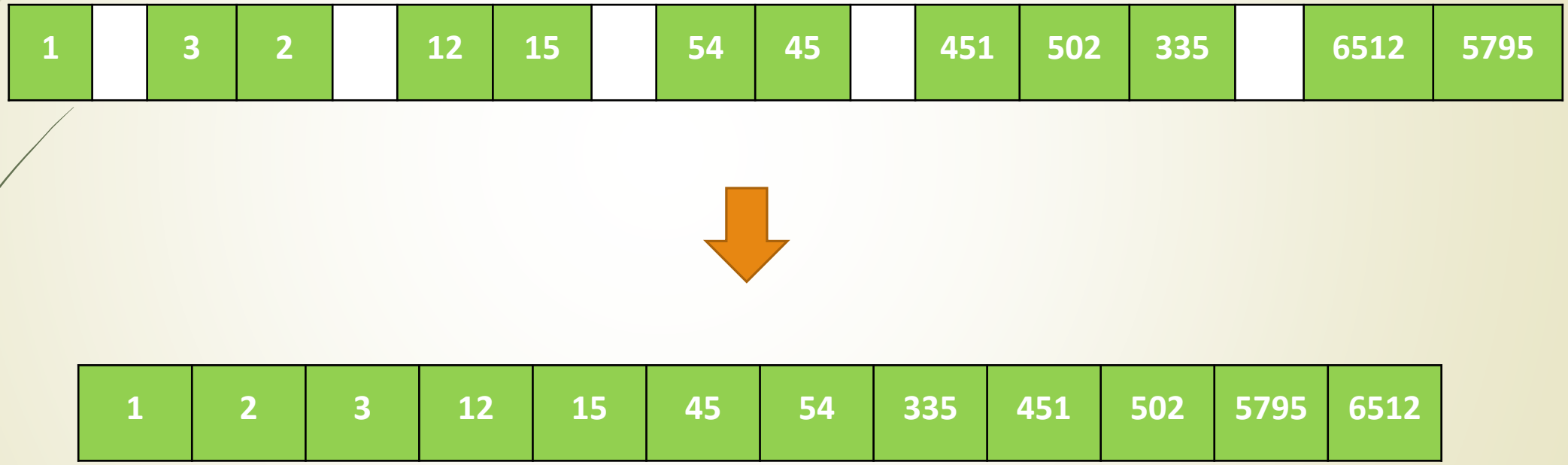
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	1	2	0	2	0	2	0	0	3	0	0	0	2	0

BitBand

Arranging the elements



Sorting sub-arrays

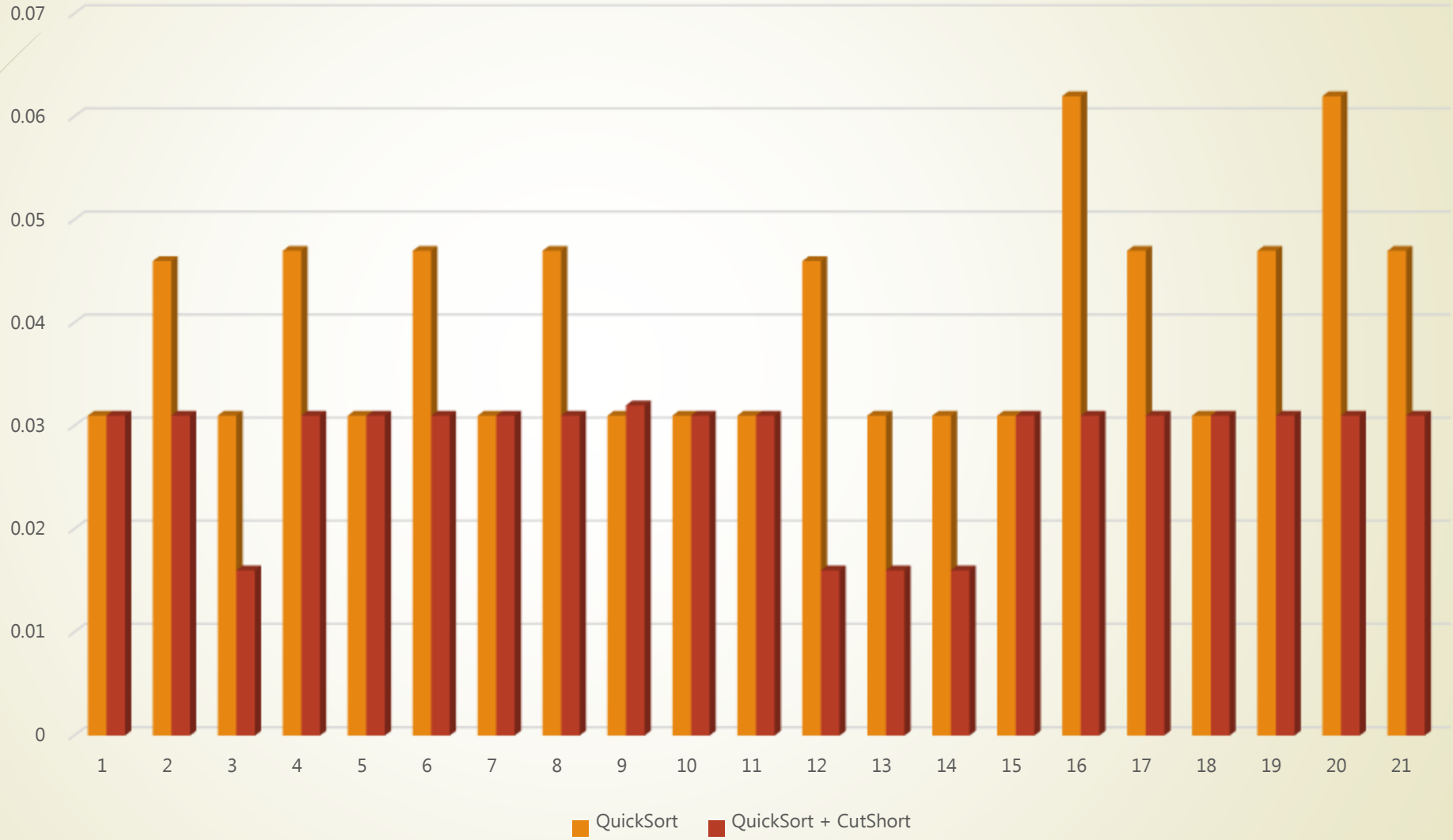


Complexity

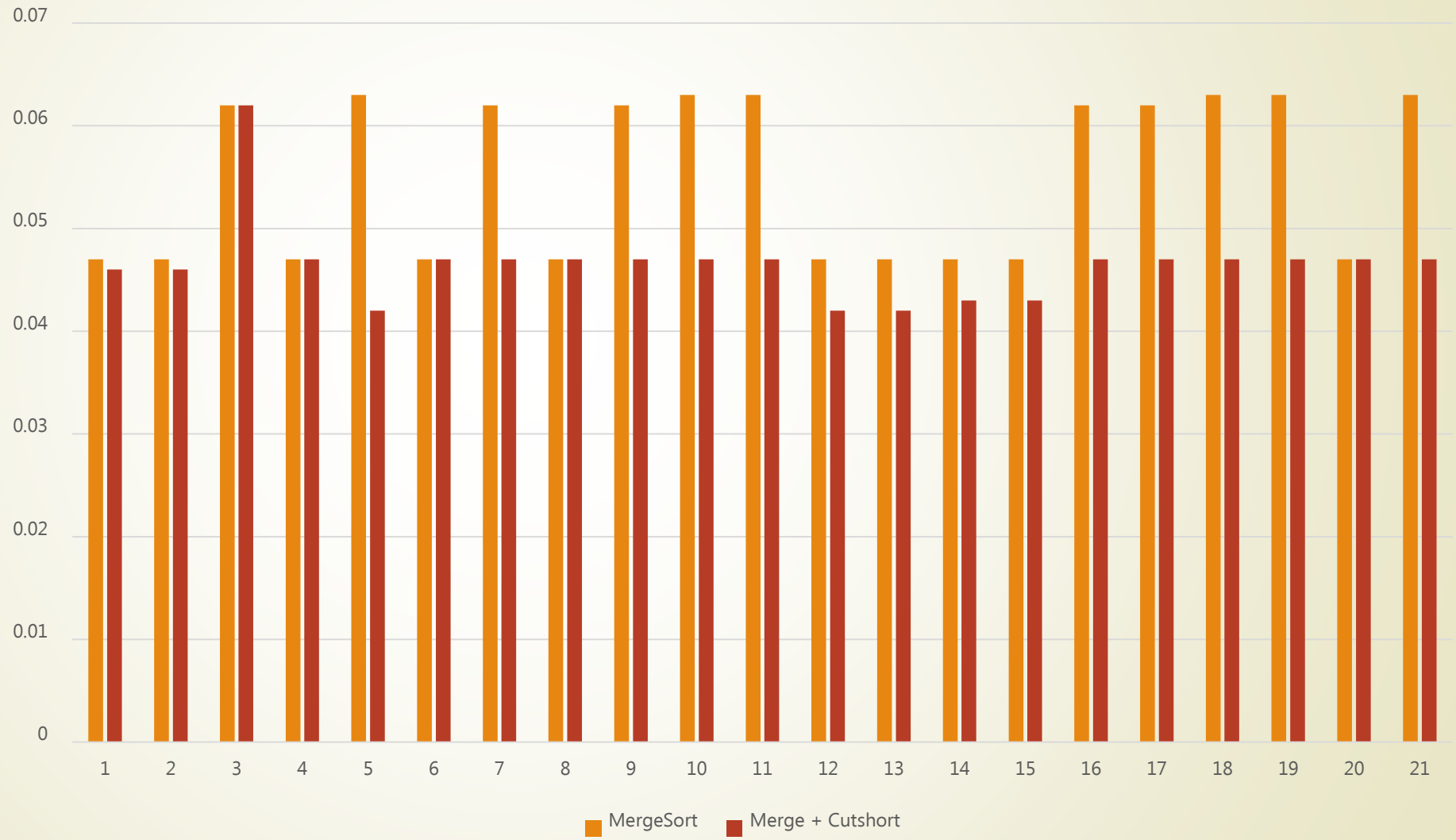
- Factor ‘ d ’ is the number of sub-array after performing the CutShort pre-processing step.

- Best case: $T(n) = O(n.\log (n / dmax))$
- Average Case: $T(n) = O(n.\log n/d)$
- Worst case: $T(n) = O(n.\log n)$

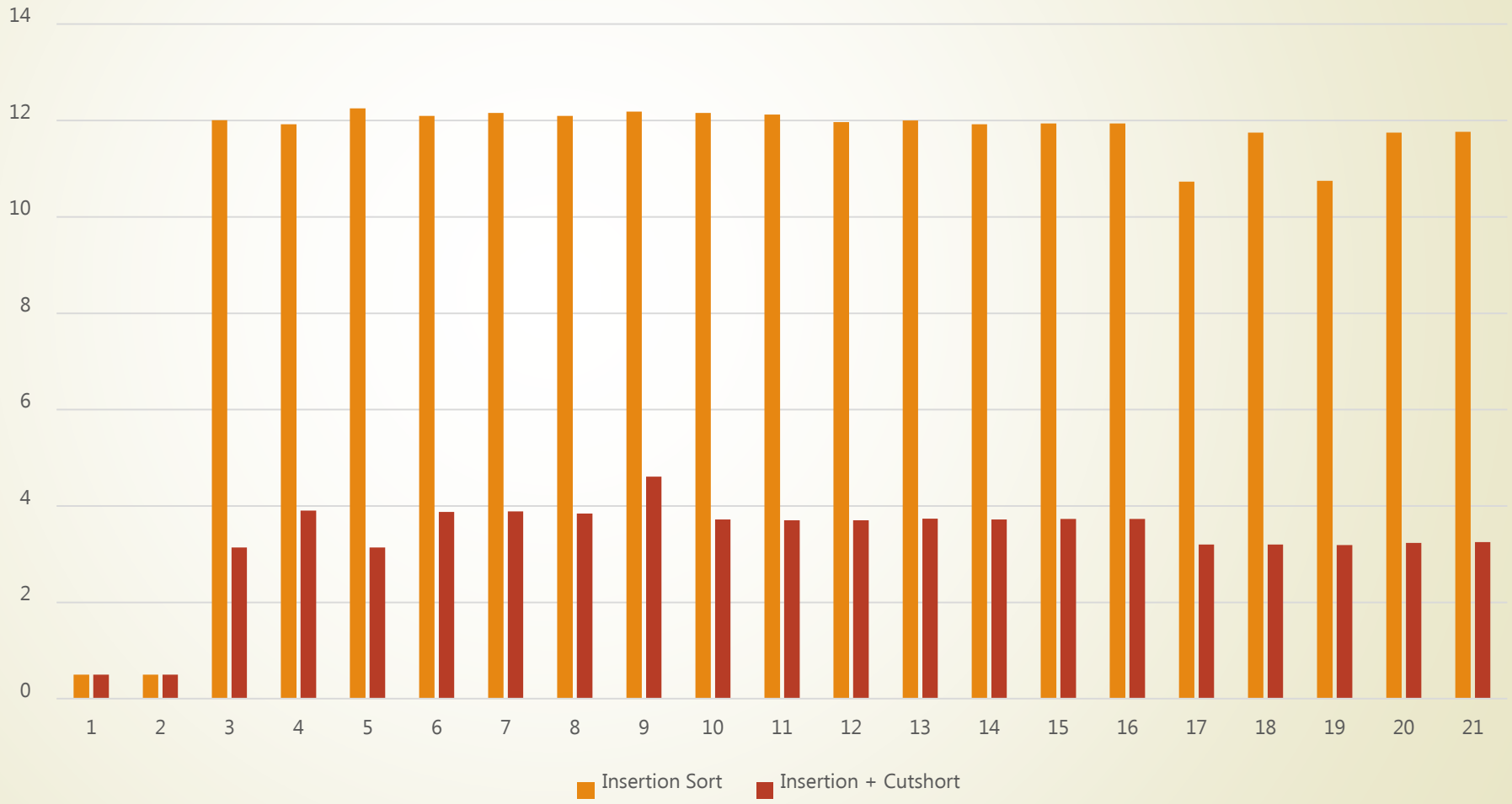
Time Complexity Comparsion with QuickSort



Time Complexity Comparsion with MergeSort



Time Complexity Comparsion with Insertion Sort



Thank You