

1. Merge sort

- a) Can be implemented in such way that it becomes unstable
- b) is stable because its complexity is $\Theta(n \cdot \log(n))$
- c) is not stable because its complexity is $\Theta(n \cdot \log(n))$
- d) is fast ($\Theta(n \cdot \log(n))$) because it is stable
- e) is more stable than any of the slower $O(n^2)$ sorts

2. A certain problem is being solved by the algorithm A. The input data size is n . In the process of solution the algorithm creates an array which contains $2n^3$ values and sorts it using Merge sort. What is the asymptotic complexity of the sort in terms of n ? Write the answer in the most simple form.

3. The array contains $n^{1.5} + \log(n^2)$ values and is being sorted by Merge sort. What is the asymptotic complexity of the sort in terms of n ?

4. Merge sort is sorting the array $\{8, 1, 7, 6, 4, 2\}$. In the last iteration of the sort, just before the last Merge operation which merges two halves of the original array the values in the array will be in the order:

- a) 1 7 8 2 4 6
- b) 1 2 4 6 7 8
- c) 8 7 6 4 2 1
- d) 1 2 4 7 8 6
- e) 2 4 6 1 7 8

5. The input array of length n is (by accident) sorted in ascending order. The asymptotic complexity of Heap sort which sorts this particular array is

- a) $\Theta(n)$, because Heap sort creates a heap in time $\Theta(n)$
- b) $\Theta(n^2)$, because Heap sort creates a heap in time $\Theta(n^2)$
- c) $\Theta(n \cdot \log_2(n))$, because Heap sort creates a heap in time $\Theta(n \cdot \log_2(n))$
- d) $\Theta(n \cdot \log_2(n))$, because Heap sort processes the heap in time $\Theta(n \cdot \log_2(n))$
- e) $\Theta(n)$, because Heap sort creates and also processes the heap in time $\Theta(n)$

6. Which of the following sequences represents a heap stored in an array?

- a) 1 3 4 2
- b) 1 4 2 3
- c) 1 2 4 3
- d) 2 3 4 1

7. The following sequence represents a heap stored in an array. Perform the first step of the sorting phase of the Heap sort, namely

- a) remove the heap top
- b) repair the heap

1 5 2 17 13 24 9 19 23 22

8. Sort the given sequence using Heap sort. What is the number of value comparisons during the whole process?

23 29 27 4 28 17 1 24 6 30 19

9. Both sorts in the given pair of sorts can be implemented as stable sorts

- a) Heap sort and Insertion sort
- b) Selection sort and Quick sort
- c) Insertion sort and Merge sort
- d) Heap sort and Merge sort
- e) Radix sort and Quick sort

10. We have many different data arrays to sort. We sort each data array by Quick Sort (QS) and also by Merge sort (MS). Decide which of the statements is true

- a) QS is always asymptotically faster than MS
- b) MS is always asymptotically faster than QS
- c) sometimes, QS might be asymptotically faster than MS
- d) sometimes, MS might be asymptotically faster than QS
- e) both algorithm have always the same asymptotical complexity