1. An algorithm reads an input array of size n, creates a new array of size $3n^2 \cdot \log(n^2)$ and sorts the new array with Selection sort. What is the asymptotic complexity of the sort in depending on n?

2. An algorithm reads an input array of size n, creates a new array of size $2n^3 \cdot \log(n)$ and sorts the new array with Insert sort. What is the asymptotic complexity of the sort depending on n?

3. An array of n elements is sorted in decreasing order except for the first element which value is the minimum of all elements. Next, the array is processed by Selection sort. Which of the following formulas characterise correctly the complexity of the sort in this case?
a) $O(n)$ b) $\Omega(n)$ c) $\Theta(n)$ d) $O(n^2)$ e) $\Omega(n^2)$ f) $\Theta(n^2)$

4. An array of n elements is sorted in decreasing order except for the first element which value is the minimum of all elements. Next, the array is processed by Insert sort. Which of the following formulas characterise correctly the complexity of the sort in this case?
a) $O(n)$ b) $\Omega(n)$ c) $\Theta(n)$ d) $O(n^2)$ e) $\Omega(n^2)$ f) $\Theta(n^2)$

5. An array of five elements is being sorted by Insert sort. What is the maximum and minimum number of element comparisons during this sort?

6. An array of n elements which is being sorted by Insert sort was originally sorted reversely, from the biggest to the lowest values. What is the number of comparisons made by Insert sort in this case?

7. An array which is being sorted by Insert sort has a special structure: In contains n elements, n is even and the first half of the array is filled with 2's ans the second half of the array is filled with 1's. What is the number of comparisons made by Insert sort in this case?

8. T he input of a stable sorting algorithm is the sequence B_1 C_2 A_2 B_2 C_1 A_1. The following holds:
$A_1 = A_2 < B_1 = B_2 < C_1 = C_2$. Which sequence represents the output of the algorithm?
a) A_1 B_1 C_1 A_2 B_2 C_2 d) A_2 A_1 B_1 B_2 C_2 C_1
b) A_1 A_2 B_1 B_2 C_1 C_2 e) A_1 A_2 B_1 B_2 C_1 C_2
c) B_1 C_1 A_1 C_2 A_2 B_2

9. Which of the following sequences represents a heap stored in an array?
a) 9 5 4 6 3   b) 5 4 2 3 9   c) 3 8 9 5 6   d) 5 1 8 9 1   e) 1 3 6 5 4

10. Imagine that the following sequence is stored in an array. The array is intended to contain a heap. How many comparisons will it take to create the heap from this sequence?
23   29   27   4   28   17   1   24   6   30   19

11. The heap is structured according to the min-heap property, i.e. no element is smaller than its parent. We have to find the element with
a) the maximum value in the heap,   b) the fifth smallest value in the heap.
What are the complexities of the search in cases a) and b)?

12. An element is being repeatedly inserted into the heap and immediately after that removed from the heap. This sequence repeats itself N times. The heap contains N elements. What is the asymptotic complexity of the whole process?

13. The given array is to be sorted by Quick sort. Choose the value of the pivot to be   a) 6,   b) 4, c) 7. Determine how will be the array divided into "small" and "big" values after the first pass of the algorithm.
6   10   8   5   7   2   3   9   1   4

14. What is the complexity of Quick sort algorithm when the input sequence of length n contains only two values x and y? Each value appears in the sequence n/2 times the and in no particular order. What would be the most favourable and least favourable orders of the values?