**Sorting**

*Elementary Sorts*

1. What is the maximum number of exchanges involving any particular item during selection sort? What is the average number of exchanges involving one specific item x?

**Solution**. The average number of exchanges is exactly 2 because there are exactly n exchanges and n items (and each exchange involves two items). The maximum number of exchanges is n.

1. Which method runs fastest for an array with all keys identical, selection sort or insertion sort?

**Solution**. Insertion sort runs in linear time when all keys are equal.

1. Suppose that we use insertion sort on a randomly ordered array where items have only one of three key values. Is the running time linear, quadratic, or something in between?

**Solution**. Quadratic. Insertion performon me mire kur vektori eshte gjysme i renditur dhe jo random.

1. Why not use selection sort for h-sorting in shellsort?

**Solution**. Insertion sort is faster on inputs that are partially-sorted. Selection sort i ka best, average dhe worst case te gjitha kompleksitet ne katror.

1. **To do**. Minimum number of moves to sort an array. Given a list of N keys, a move operation consists of removing any one key from the list and appending it to the end of the list. No other operations are permitted. Design an algorithm that sorts a given list using the minimum number of moves.
2. Binary insertion sort. Develop an implementation BinaryInsertion.java of insertion sort that uses binary search to find the insertion point j for entry a[i] and then shifts all of the entries a[j] to a[i-1] over one position to the right. The number of compares to sort an array of length n should be ~ n lg n in the worst case. Note that the number of array accesses will still be quadratic in the worst case.
3. Insertion sort without exchanges. Develop an implementation InsertionX.java of insertion sort that moves larger items to the right one position rather than doing full exchanges.