Homework 8: Sorting

Data Structures

Write pseudo-code not Java for problems requiring code. You are responsible for the appropriate level of detail. For all the questions in this set, assume you are working in arrays.

1. How many comparisons and interchanges (in terms of file size n) are performed by Simple insertion sort for the following files:
   1. A sorted file
   2. A file that is sorted in reverse order (that is, from largest to smallest)
   3. A file in which x[0], x[2], x[4]... are the smallest elements in sorted order, and in which x[1], x[3], x[5]... are the largest elements in sorted order, e.g. [3, 14, 5, 15, 9, 8, 11, 19].
2. How many comparisons and interchanges (in terms of file size n) are performed by Shell Sort using increments 2 and 1 for the following files:
   1. A sorted file
   2. A file that is sorted in reverse order (that is, from largest to smallest)
   3. A file in which x[0], x[2], x[4]... are the smallest elements in sorted order, and in which x[1], x[3], x[5]... are the largest elements in sorted order, e.g. [3, 14, 5 15, 9, 18, 11, 19].
3. Determine the number of comparisons (as a function of n and m) that are performed in merging two ordered files a and b of sizes n and m, respectively, by the merge method presented in the lecture, on each of the following sets of ordered files:
   1. m=n and a[i] < b[i] < a[i+1], e.g. a=[6, 9, 12, 15, 29, 37] and b=[8, 10, 14, 25, 33, 45]
   2. m=n and a[n] < b[1], e.g. a=[2, 5, 9] and b=[12, 14, 16]

a[i] refers the value in position i of file a, etc.

1. Determine the number of comparisons (as a function of n and m) that are performed in merging two ordered files a and b of sizes n and m, respectively, by the merge method presented in the lecture, on each of the following sets of ordered files:
   1. m=n and a[n/2] < b[1] < b[m] < a[(n/2)+1], e.g. a=[2, 5, 7, 55, 61, 72] and b=[9, 15, 17, 21, 29, 46]
   2. m=1 and b[1] < a[1]
   3. m=1 and a[n] < b[1], a[i] refers the value in position i of file a, etc.