Week 6

Exercises

E06-01. Implement Kruskal's algorithm of minimum spanning tree and give some examples to test it. (If you implement Kruskal in homework5, please implement Prim)

   Input: a undirected graph with n nodes and e edges, the length of each

edge (x_i, x_j, l)

   Output: the sum of all edges in minimum spanning tree.
   Example:
      Input:
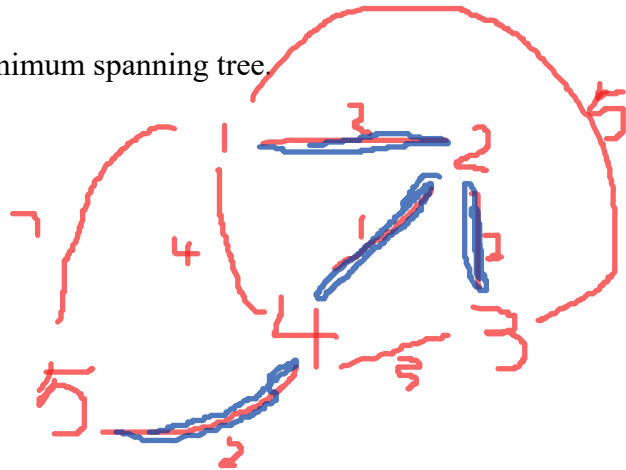   5 8
         1 2 2
         2 3 2
         2 4 1
         1 3 5
         3 4 3
         1 4 4
         1 5 7
         4 5 2
      Output:
         7

E06-02. Implement greedy algorithms of Huffman codes and give some examples to test it.
   Input: The first line is the number n for symbols. The second line is the frequency of the symbols.
   Output: The average length of Huffman codes.
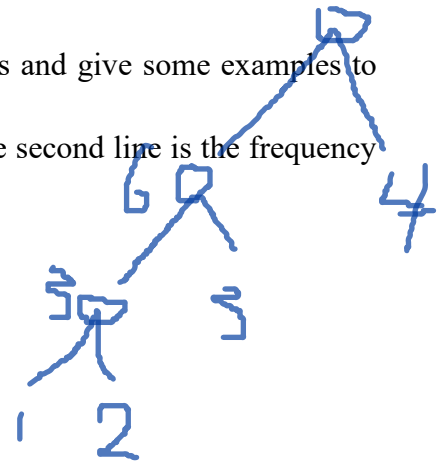   Example:
      Input:
         4
         1 2 3 4
      Output:
         1.90

E06-03. Implement divide-and-conquer algorithms of mergesort and give some examples to test it.
   Input: The first line is the number n for integers. The second line is a list of n integers
   Output: a list of sorted n integers.
   Example:
      Input:

2 5 6/3 4 | 5 7 9 / 1 2

10
2 5 6 3 4 5 9 7 1 2
Output:

2 3 4 5 6   1 2 2 3 4 5 5 6 7 9   1 2 5 7 9

E06-04. Implement divide-and-conquer algorithms of counting inversions and give some examples to test it.

Input: The first line is the number n for integers. The second line is a list of n integers

Output: the number of inversions

Example:

Input:

12

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

Output:

22

E06-05. Implement divide-and-conquer algorithms of finding the closest pairs of points in 2D space and give some examples to test it.

Input: a list of n points in 2D space.

Output: the euclidean distance of the closest pairs of points, the coordinates of two points.

Example:

Input:

8

1 1

2 2

4 4

8 8

2 2.8

5 6

7 9

11 11

Output:

0.64

1 2 4 5 7 8 11