# Data Structures 2018
Exercise 12, solutions (Week 48)

1.-2. See file Graph.java. The file GraphTest.java is updated as well. The previous version didn't test the breadth-first-search.

3. Dijkstra's algorithm always traverses along the shortest path one dge at a time. If the path to some node gets shorter, the edges will be exchanged accordingly. Shortest paths have been marked to the figure with thick lines. A thick dashed line represents an edge that was exchanged. A thing dashed line represents an edge that has already been visited at least once. A node from which one advances on each step has been marked with a thick circle.
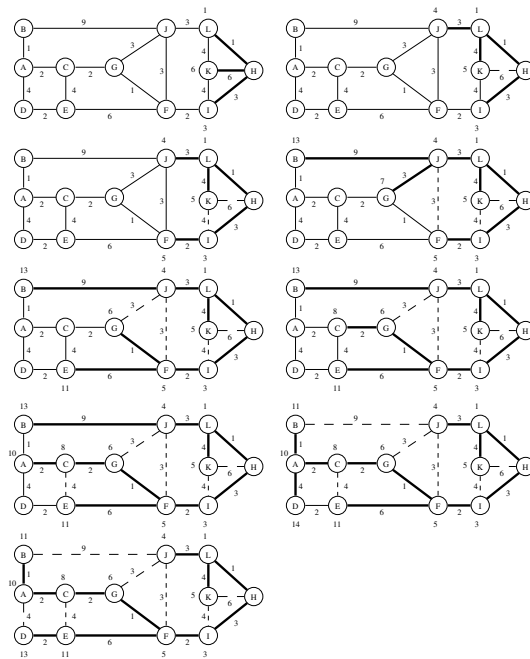
4. In Kruskal's algorithm, the shortest edge that connects two clusters is added to the tree on each round, and the two clusters are combined. At the beginning, each vertex has its own cluster that contains no other vertices.
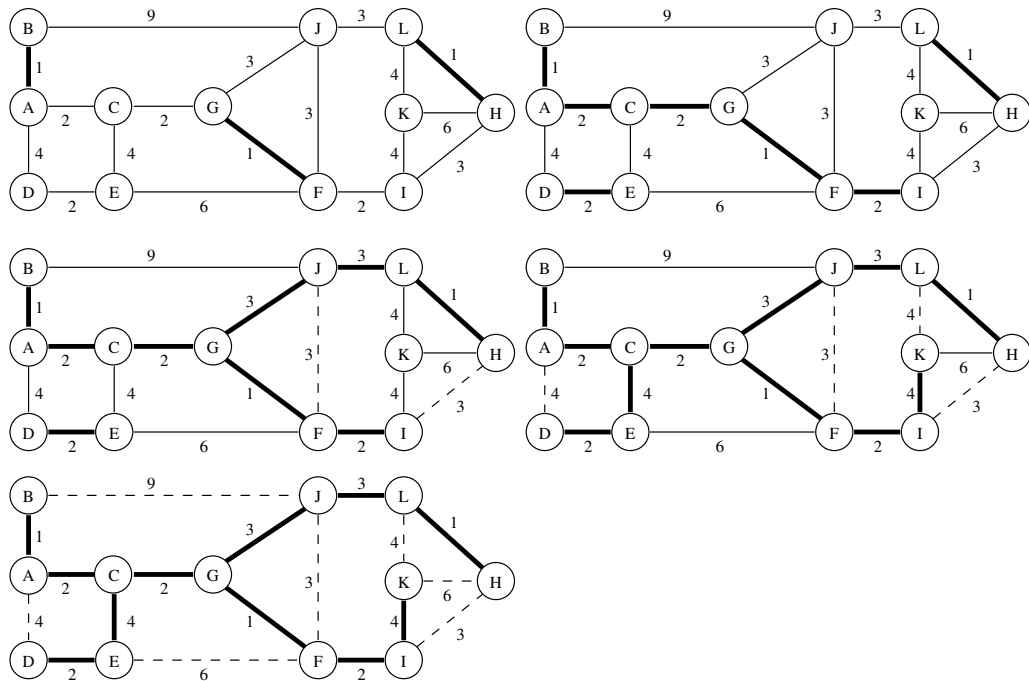
5. Prim-Jarnik's algorithm expands the tree to the direction of the shortest edge, and checks that the edge doesn't lead to a vertex already in the tree.
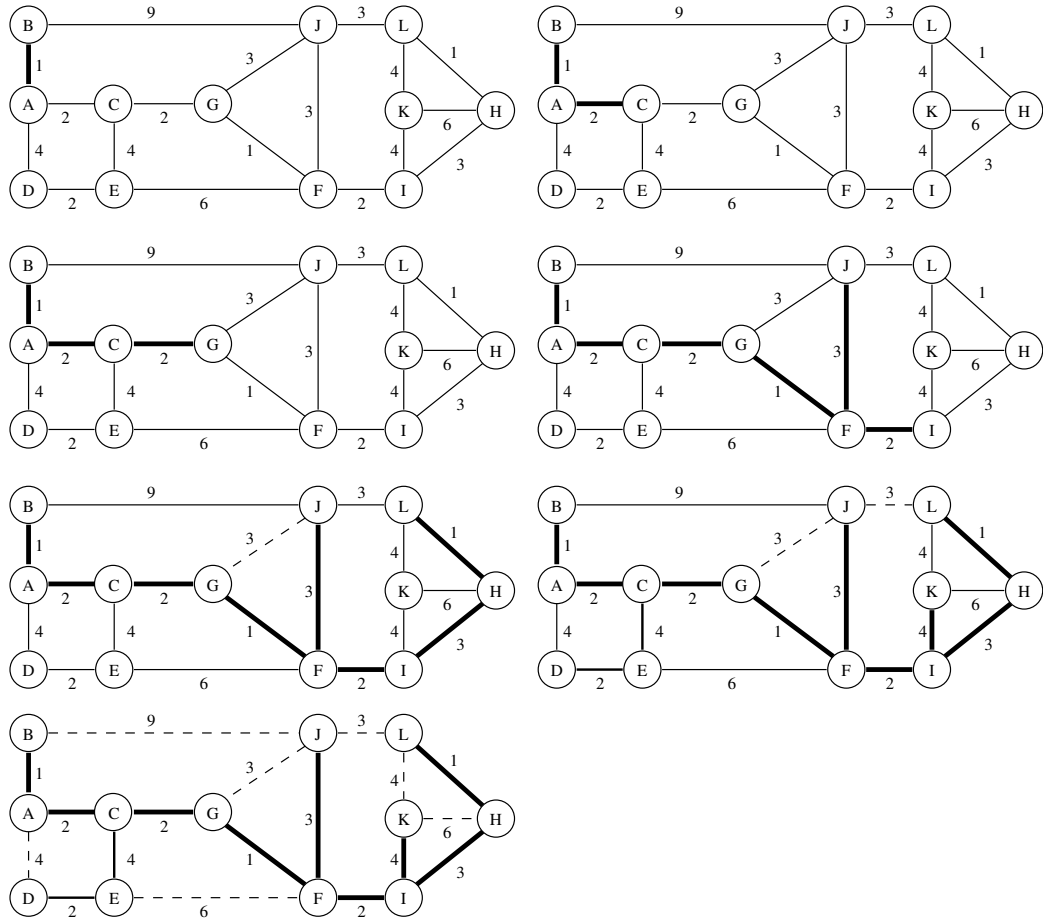
```
6.      abcbabcababcab
   1  aba
   2   a
   3    a
   4     a
   5       aba
   6         a
   7          a
   8             ababc   match found
```

7.
```
abcababcd
000121230

abcabcbabcababcdacd   failure and action

abcaba                f(4) = 2
   abca                f(2) = 0
      a                advance (j = 0 => i = i + 1)
        abcababcd
```