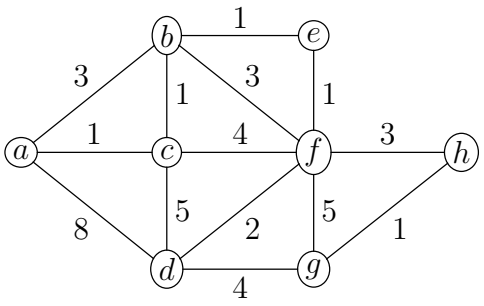
# Exercise Sheet 15

Handout: December 16th — Deadline: December 23rd, 4pm

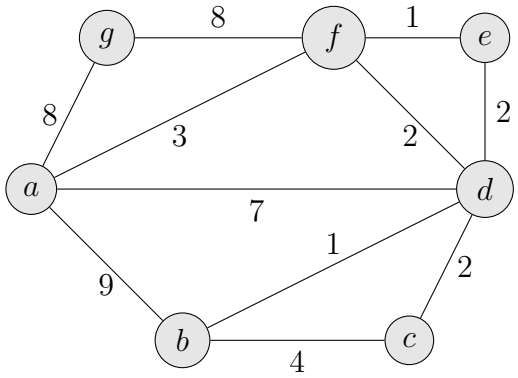
**Question 15.1** (0.25 marks)

Compute the minimum spanning tree of the following weighted graph both with Prim's and Kruskal's algorithm. List the edges in the order considered, draw the tree and calculate its weight.




**Question 15.2** (0.25 marks)

Execute Dijkstra's algorithm on the following weighted graph to find a shortest path from vertex $a$ to $c$. Show for each iteration of the while loop which vertex is added to the set $S$ and how the distance estimates of adjacent vertices are being refined.




**Question 15.3** (0.5 marks)

A precondition for Dijkstra's algorithm is that all edges of the directed graph under consideration have non-negative weight.

Somebody on the internet claims that the algorithm works for graphs with negative edge weights as well: just add an appropriate constant $c$ to each edge weight to make all weights positive, then run Dijksta's algorithm, and finally remove the constants from the shortest paths computed.

Give a directed acyclic graph as a counterexample to falsify this claim. Explain in your own words what goes wrong.

**Question 15.4** (0.5 marks)

Implement Dijkstra, Robot and Road Repair problems on the Judge system.