

Question 1: Multi-modal network

It is possible to go from Renens to Lausanne by train, by metro, or by car.
Propose a network representation that captures these three possibilities.

Question 2: Incidence-path matrix

Consider the network shown in Figure 1, where nodes a , b , and c represent centroids, and nodes 1, 2, and 3 are simple intersections. We are interested in all simple paths connecting pairs of distinct centroids traversing intersections.

The number t_{ij} above each link (i, j) denotes the travel time between the upstream node i and the downstream node j . It is assumed that $t_{ij} = t_{ji}$.

1. Derive the corresponding link-path incidence matrix. Which link(s) is/are involved in the greatest number of paths?
2. Which path corresponds to the shortest travel time?
3. Now consider that node 4 becomes inaccessible, meaning no trips can enter or exit from that node. How much longer will the travel time be for a trip from c to b ?

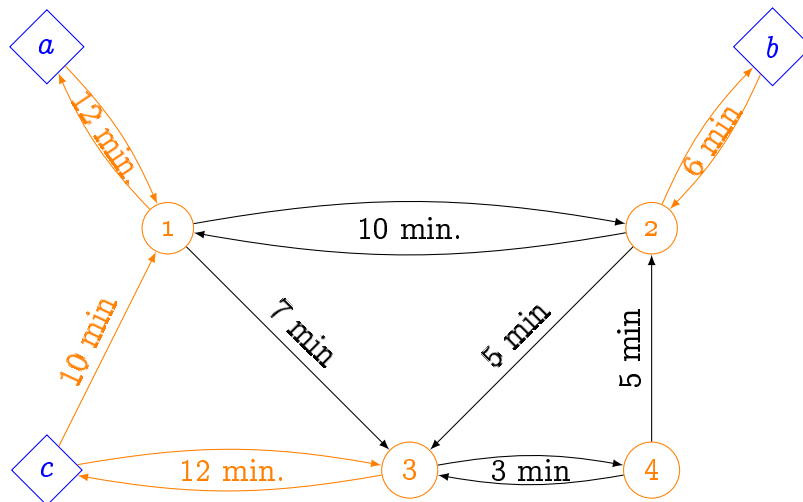


Figure 1: A transportation network