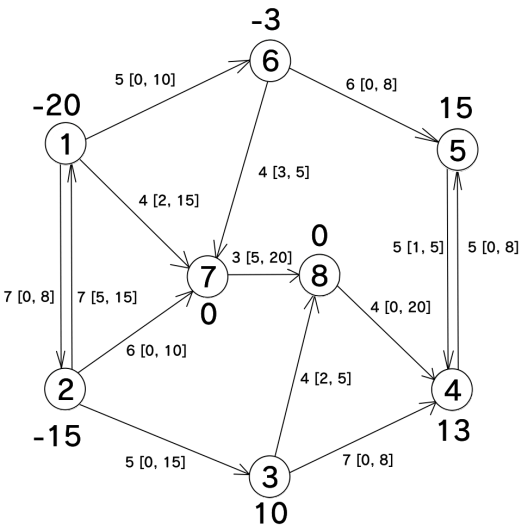
Network Flow - Army Transportation

You are the commander of a division of the army that is being responsible for the surveillance of a important island where there is a quarry that collects minerals for your country. On this island, there are surveillance with soldiers in constant activity. Recently, there were reforms in the surveillance posts, which now they need more soldiers to make better use of the infrastructure. So, they were sent ships to the island bringing the necessary platoons to supply these needs. However, the ships docked only in the northern and western ports of the island, which caused a poor distribution of new soldiers. In the figure a, you can see the map of that island.

(a) Map



(b) Graph Representation

The soldiers will be transported in trucks along roads that, for the most part, are trails through the forest. For this reason, only one vehicle can pass through them at a time. The surplus or shortage in each one of the posts is known, as well as the cost of transporting a soldier through each route. Per logistical issues, for each road, there are maximum and minimum limits of soldiers that can cross it. The points 7 and 8 are encampments located around the quarry which do not constitute surveillance posts, but which can be used as intermediate locations. The localities and roads of the island are represented in the graph illustrated in Figure b. The problem is to correctly redeploy the soldiers in the surveillance posts at the lowest possible cost.