Day 1

The task of this day is to find the minimum number of rooms needed to organize a series of events. The main restriction is that there are events that cannot be organized at the same time, since there are participants who are registered for several events, which restricts the possibility of sharing a room.

This problem can be represented as a graph coloring problem, where each event A moves to a node of the network and each event B that conflicts with A will be a node adjacent to A. Since if A conflicts with B, then B conflicts with A, we are dealing with an undirected network.

The problem can be mathematically defined as:

Given a graph

$$G = (V, E)$$

where V is the set of vertices and E is the set of edges on graph, and:

$$(u, v) \in E$$

represents an edge connecting nodes u and v, the objective is to assign a color (room) to each vertex in the graph (events) in such a way that any pair of adjacent vertices (events in conflict) share the same color. In other words, no event in conflict with another event should share a room.

Therefore, we have that the objective function of the problem is defined as:

$$min|C|$$

where C is the set of rooms (or colors) needed for solving the problem. The restrictions can be modeled as:

$$\sum_{c=1}^{|C|} x_{v,c} = 1, \ \forall v \in V \ (1)$$
$$x_{u,c} + x_{v,c} \leq 1, \ \forall (u, v) \in E, \ \forall c = 1, 2, ..., |C| \ (2)$$

Finally, the required variables for modeling the problem are:

$$x_{v,c} \in \{0, 1\}$$

, where

$$x_{v,c} = 1$$

if vertex v is colored with color c and

$$x_{v,c} = 0$$

otherwise.