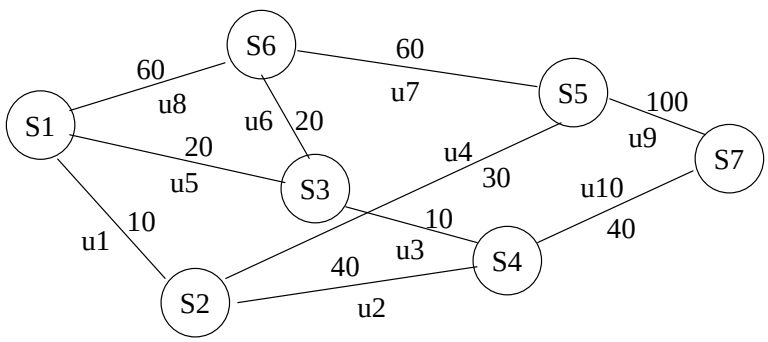
Exercices
Graphs

Focus : MST, coloring, scheduling

1 Minimum Spanning Tree (MST) - Prim algorithm

Q1: On which kind of graph can be applied MST algorithm ?



Q2: Apply Prim algorithm to the above graph start at node `S1`.

Q3: What is the result, what does it mean ?

2 Graph Coloring

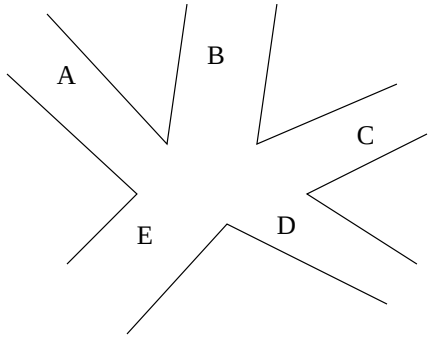
Q4: Propose a greedy algorithm for graph coloring of $G = (V, E)$.

Q5: 7 students, designed as A,B,C,D,E,F and G went to the library today. The following table indicates *who met together*.

student	A	B	C	D	E	F	G
met	D,E	D,E,F,G	E,G	A,B,E	A,B,C,D,F,G	B,E,G	B,C,E,F

How many seats are required within the library if nobody had to stand during this day ?

Q6: Next scheme represents a crossroads. The table indicates wich crossings are allowed.



Coming from	A	B	C	D	E
you can go to	C,E	A,E,D	A,D	C,A	C,D

Crossings A-C et B-E can naturally not be realized simultanously.

Modelize these incompatibilities using a graph (nodes are possible crossings, and edges incompatibilities between crossings). Propose a coloring for your graph. What means the fact thtat 2 nodes have the same color ? How to interpret the chromatic number of this graph ?

3 Scheduling

Q7: Running a new mineral deposit implies a number of tasks. The following table them, with their anteriority constraints.

task	Description	days	prior tasks
A	Obtaining mineral rights	120	-
B	building a 6 km trail	180	A
C	transport and installation of 2 drilling machines	3	B
D	temporary office and living buildings	30	B
E	tarring of the track	60	B
F	water pipeline	90	D
G	drilling campaign	240	C,D
H	equipment and drilling of 3 boreholes	180	E,F,G
I	transport and installation of associated exploitation equipment	30	J,H
J	definitive housing and office building	240	E,F,G
K	tunneling	360	J,H
L	processing plant building	240	J,H

Q8: Build the PERT graph of the project.

Q9: find ASAP and ALAP dates and the critical path of the PERT graph.