Foundations of Logic Programming
Tutorial 7 (on January 15th)

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Exercise 7.1:
Given the program P_i, determine the stable models of P_i by applying the *Gelfond-Lifschitz-Reduct.*

$$P_1 = \{a \leftarrow b, not\ c, d;\quad c \leftarrow not\ b, a;\quad b \leftarrow not\ c, not\ d;\quad a \leftarrow\}$$

$$P_2 = \{a \leftarrow b, not\ c;\quad b \leftarrow c, not\ a;\quad c \leftarrow a, not\ b;\quad b \leftarrow\}$$

$$P_3 = \{a \leftarrow not\ b, c;\quad c \leftarrow not\ a, b\}$$

Exercise 7.2:
Recall the 3-Colorability problem (c.f. Exercise 1.1 of FCP). Define an ASP encoding for an arbitrary (undirected) graph $G = (V, E)$, such that each answer-set of your encoding corresponds to a 3-coloring of the graph G.

Exercise 7.3:
Model and solve the *peer-review procedure* with ASP. For scientific conferences, researchers submit their papers which are reviewed by other researchers. The problem of assigning referees for submissions to a conference is typical for the area of computer science.

Part A:
Construct a program `check.lp` which checks, given an assignment of submissions to members of the *program committee (PC)*, where the following conditions hold:

1. each PC-member is assigned with at most five submissions;
2. no PC-member is assigned more than three papers that he or she rated with "I don't want to review this paper";
3. no PC-member can rate a submission with different bids;
4. no PC-member is assigned a paper that he or she rated with "I cannot review this paper";

5. each submission is assigned to at least one PC-member who rated the paper with "I am willing to review this paper" or higher;

6. If a PC-member does not bid on a certain paper, by default "I don't want to review this paper" is assumed as the PC-member's bid on this paper.

The bids on the papers range from 0 to 3 with the following meanings:

0: "I cannot review this paper",

1: "I don't want to review this paper",

2: "I am willing to review this paper",

3: "I really want to review this paper".

The given assignment of submissions to referees is assumed to be stored in some input files containing:

- `pc(M)`: `M` is a member of the PC;
- `paper(P)`: `P` is a submitted paper;
- `bid(M,P,B)`: PC-member `M`'s bid on paper `P`, where `B` is a constant from $\{0, 1, 2, 3\}$;
- `assigned(P,M)`: the submission `P` is assigned to PC-member `M`.

The program `check.lp` should satisfy the following condition:

- `check.lp`, together with the input data, possesses an answer set precisely when Conditions 1.-6. are met.

Important: Do not use any aggregate functions for constructing the program `check.lp`!

Part B:
Now construct a program `guess.lp` which assigns, given a collection of submissions and a given PC, the submissions to the members of the P in such a way that the following condition is satisfied:

(*) each submission is assigned to exactly three members to the PC.

Use the above defined predicates `pc(M)`, `paper(P)` and `assigned(P,M)`.