Assignment 3
Instructor: Min Chen

Hand in your homework:
The coding assignment should be submitted through Brightspace before 11:59PM on the due date.

Late Policy:
No late assignment can be accepted except:
      1. The student has been confined to the hospital or to their room by doctor's orders.
      2. The student has participated in an activity approved by their Academic Dean.

You must use **SWI-Prolog(** https://www.swi-prolog.org/ **)** to answer the following 2 questions. Total is **50** pts.

1. Use Prolog to create a knowledge base for the family tree of Figure 1 and then ask queries about the family tree. Assume the intended interpretation of all predicates of the form p(x,y) is that "x is the p of y".
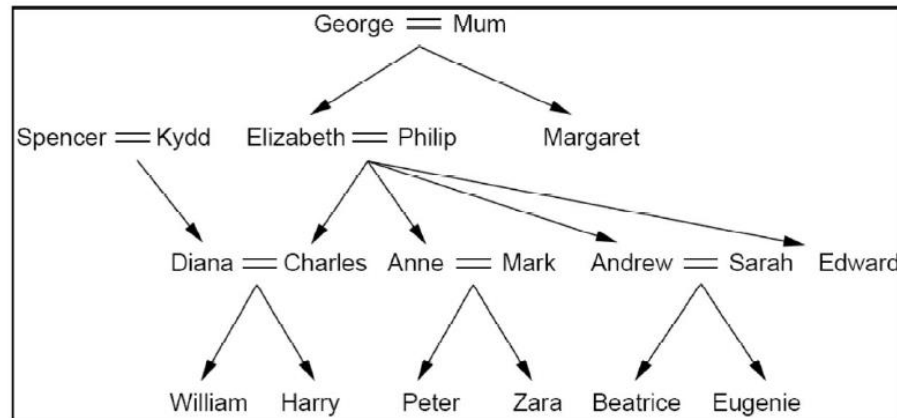

Figure 1. A typical family tree. The symbol = connects spouses and arrows point to children.

a) Enter the information from this family tree as a set of Prolog facts using only the three predicates wife, son and daughter. Note, the females are Mum, Kydd, Elizabeth, Margaret, Diana, Anne, Sarah, Zara, Beatrice, and Eugenie.

b) Now add Prolog rules that will allow you to infer information for the predicates husband, spouse, child, parent, grandChild, greatGrandParent, brother, sister, aunt, uncle, brotherInLaw, sisterInLaw and firstCousin. You may not use any facts other than those from part (a), but you may create rules for additional predicates if you find that helpful. You may look up the definitions of terms like "aunt," "uncle," "brother-in-law," "sister-in-law," and "first cousin" in the dictionary, in order to be certain that you have captured their full meaning. Please attach a printout of your program to your hardcopy submission.

c) Test your Prolog program by asking the following questions. Note, in some cases, it may be impossible to avoid getting the same answer more than once for a query.

    I.   Who is Sarah's husband?
    II.   Who are Elizabeth's grandchildren?
    III.   Who are Zara's great-grandparents?
    IV.   Who are Diana's sisters-in-law?
    V.   Who are Beatrice's uncles?

Note: Include a printout that shows your query and the program's responses (you may simply copy this from SWI-Prolog's main window).

2. You are writing a program for an online dating website. Assume you have the following profiles from different people.
The profile is the format of name, sex, height(in cm), age, education(hs, bs, ms, phd).
Profiles:

    person(lily, female, 180, 30, phd).
    person(jenny, female, 167, 25, hs).
    person(bob, male, 180, 40, phd).
    person(richard, male, 190, 30, masters).
    person(tom, male, 177, 29, hs).

You know from experience that a woman will only date a man if

    1. he is at least as tall as she is,
    2. his educational level is at least as high as hers,
    3. he is not younger, and no more than 10 years older than her.

a) Write a recursive rule degree_lower(A,B) in Prolog that succeeds if the educational degree A is lower than or equal to B:

    ?- degree_lower (hs, hs).
    yes
    ?- degree_lower (hs, bs).
    yes
    ?- degree_lower (hs,phd).
    yes
    ?- degree_lower (phd,ms).
    no

b) Write a Prolog predicate dateable(Female,Male) which encodes the dating rules above:

    ?- dateable(lily, richard).
    no
    ?- dateable(lily, bob).
    yes
    ?- dateable(jenny,tom).
    yes

Note: Include a printout that shows your query and the program's responses (you may simply copy this from SWI-Prolog's main window).

Submission:

Submit your code in a plain text and your results (in **one** pdf format) via Brightspace.