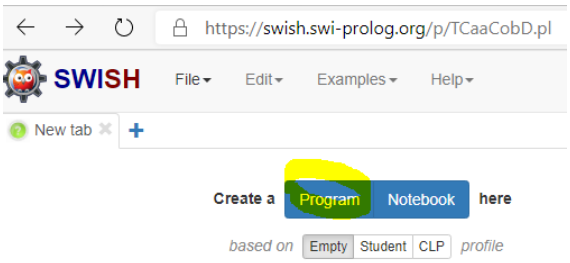
Lab 5 – Logic programming - Prolog (100 points)

Due Date: April 12, 2023 (Wednesday) – 11:59pm

To complete this lab, you can either use SWISH (SWI Shell) or SWI-Prolog. (SWI - Social Science Informatics (*Sociaal-Wetenschappelijke Informatica* - https://en.wikipedia.org/wiki/SWI-Prolog) from University of Amsterdam).

1). SWI Shell - https://swish.swi-prolog.org/ and click 'Create a Program'.



(Step 2 for SWI-Prolog is optional.)

2). Instructions to download SWI-Prolog for both Mac and Windows users can be found below.

Downloading SWI-Prolog:

Mac users: For MacOS users, you have two options when installing SWI-Prolog:

Option 1: Install SWI-Prolog via Homebrew. The explanation on how to install Homebrew can be found in the link. Note, this is a purely command line-based installation method.

1. Open Terminal.
2. Type in "`brew install swi-prolog`" this process may take a few minutes
3. Follow the prompts that are output by installation process (if any).
4. Once installation is complete, type "`swipl --version`" into Terminal. If Terminal outputs a version number, SWI-Prolog was installed successfully.

Option 2: Install SWI-Prolog application here.

1. Visit the link above.
2. Click the "SWI-Prolog 8.2.1-1 for MacOSX 10.12 (Sierra) and later on intel" download option under binaries.
3. Open the dmg file after the download finishes and drag the SWI-Prolog application into your "Applications" folder.
4. In your "Applications" folder, right click on SWI-Prolog and click open. You may get a warning here depending on your security settings, if this is the case, click the open anyway option.

Windows users: For Windows users, you must install the SWI-Prolog application here.

1. Visit the link above.

2. Click the “SWI-Prolog 8.2.1-1 for Microsoft Windows (64-bit)” download option under binaries.
3. Click the “I understand” checkbox and download exe file.
4. Open the exe and click “yes” on the Windows popup.
5. Click “next” button when “Welcome to SWI-Prolog Setup” screen appears.
6. Agree to the license agreement.
7. Important, make sure to click option that adds swipl to system path (either option that adds swipl to path is fine), once this change is made click “next”
8. Choose the installation location, the default location is fine, but you may change it if you so desire.
9. Continue through the rest of the menus leaving the options to their default state.
10. On the last menu, click “install” and wait for program to finish installation. Once this is done click the “finish” button.
11. Locate SWI-Prolog application and open it, if a white command prompt appears with a “?-“ next to the blinking cursor, the installation was successful.

Executing Your Code:

A. Mac users: For individuals who used the Homebrew method, follow the instructions below:

1. Open the “SWI-Prolog” application that you downloaded earlier.
2. Within the application, navigate to the folder where your “LAB5A_likes.pl” is located. To do this, use the “`cd().`” command. For example, if your files were located in “/Users/student/Desktop/First Semester/” folder, you would type in: “`cd('/Users/student/Desktop/First Semester/').`” into the SWI-Prolog application. You can also see your current directory by using the "`pwd.`" command or view the contents of the current directory you are in by using the "`ls.`" command.

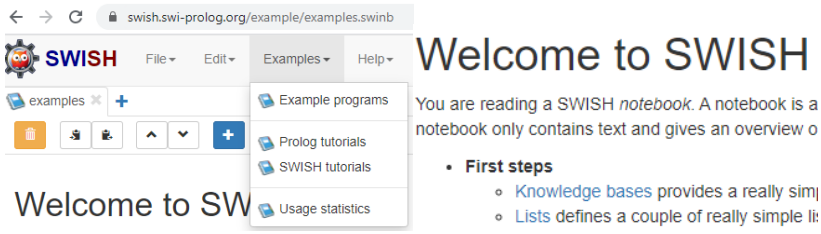
B. Windows users: To execute your code on a Windows system, follow the instructions below:

1. Open the SWI-Prolog application downloaded earlier.
2. Within the Prolog command prompt, navigate to the folder where your “LAB5A_likes.pl” is located. To do this, use the “`cd().`” command. For example, if your code files were located in "C:/Users/student/desktop/first semester/" you would type in "`cd('C:/Users/student/desktop/first semester/').`" into the SWI-Prolog command prompt and hit enter. You can also see your current directory by using the "`pwd.`" command or view the contents of the current directory you are in by using the "`ls.`" command.

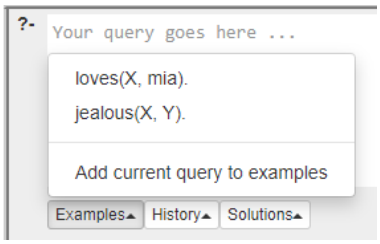
Your Task: This lab has 3 parts – A, B, and C.

Part A: Relationship

1. Goto : https://swish.swi-prolog.org/ and click examples and **knowledge bases**.



2. You can run the queries using the Examples tab at the bottom of the screen.



3. Add the following facts:
    a. likes(dan,sally).
    b. likes(sally,dan).
    c. likes(josh,brittney).
4. Add 2 rules:
    a. dating(X,Y) :-
    b. friendship(X,Y) :-

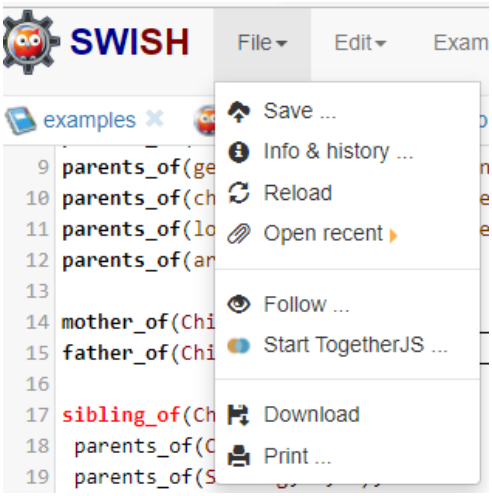
    For a, if X and Y like each other, then it is dating.
    For b, if X likes Y or Y likes X, then it is friendship.
5. Run these queries.

```
?- dating(sally,dan).
?- friendship(josh,brittney).
```

6. Put the queries in the Examples section of the code.

```
/** <examples>
?- loves(X, mia).
?- jealous(X, Y).
?- dating(sally,dan).
?- friendship(josh,brittney).
*/
```

7. Take a screen shot of your output and put it in a Word doc.
8. Download the file and rename it to 'LAB5A_likes.pl'.



Part B: Weather

1. Refer to the following code:

```
/*weather(City, Season, Temp) */
weather(phoenix,hot,summer).
weather(la,warm,summer).

warmer_than(C1,C2) :-
weather(C1,hot, summer),
weather(C2,warm, summer),
write(C1), write(' is warmer than '), write(C2), nl.
```

2. Copy the code to the SWISH program screen: Click the '+' tab in the menu bar, and click 'create a program'.
3. If you run this query, you will get 'true':
   ?- warmer_than(phoenix,la).
4. Add the following facts and write the similar rule for 'colder_than(C1,C2)'.
   weather(boston,cold,winter).
   weather(dallas,mild,winter).
5. Query the following and put them in the examples section.
   ?- colder_than(boston,dallas).
6. Take a screen shot of your output and put it in a Word doc.
7. Download the file and rename it to 'LAB5B_weather.pl'.

Part C: Movie Database

1. Goto : https://swish.swi-prolog.org/ and click examples, then **'Movie database'**.
2. Answer the following questions by running the queries there.
   a. Find the actors who have also directed a movie(s).
   (Clicking 'next' 3 times will be enough.)
   b. Find the movie in which John Goodman and Jeff Bridges were co-stars.
   Put your answers in a Word doc.

3. Add the following rules to the movie database:
    a. released_after(M, Y) <- the movie was released after the given year.
    b. released_before(M, Y) <- the movie was released before the given year.
    c. same_year(M1, M2) <- the movies are released in the same year.
    d. co_star(A1, A2) <- the actor/actress are in the same movie.

4. Run the following queries to show that the rules in step 3 are working: (Clicking 'next' 3 times will be enough when you run the queries.)
    a. released_after(M, 2000).
    b. released_before(M, 2000).
    c. same_year(M1, M2).
    d. co_star(A1, A2).

5. Take screen shots of the output and put them in a word doc.

5. Download the file and rename it to 'LAB5C_movie.pl'.

Submit your Word doc with screenshots and the program files to canvas.