

240-216, Expl. CoE Tech.
Semester 1, 2025-2026

Week 2, Prolog

Instructor: Aj. Andrew Davison

Objectives

To teach the basics of Prolog, the most widely used logic programming language.

Submission Information

Place a **hard copy** of your answers to the exercises at the end of this lab sheet in the relevant lab box outside the CoE office by **Wednesday July 16th**, 4:00pm.

Do **not** submit an electronic version.

Score

Your final score will be based on the exercises at the end of this lab sheet and the exam. The exercises are marked out of 30, and the exam out of 70.

Background Information

Background information is on the PowerPoint slides "Introduction to Prolog", available from <https://coe.psu.ac.th/ad/teaching/LAB/Prolog/>. I will go through these slides during the lab.

Lab Instructions

1. Install Strawberry Prolog, which is online at https://coe.psu.ac.th/ad/teaching/LAB/Prolog/StrawberryProlog_6_1.exe.
2. Install this lab's example code `parents.pro` from <https://coe.psu.ac.th/ad/teaching/LAB/Prolog/>
3. Open `parents.pro` using Strawberry Prolog in the way explained in class. Run some simple queries.
4. Add some extra `parent/2` facts. Run the same queries as before to see how things have changed.

Lab Questions

Place a **hard copy** of your answers to all the following exercises in the relevant lab box outside the CoE office. Do **not** submit an electronic version. Also, remember:

1. Please write in English. I do not deduct marks for grammar mistakes.
2. You must illustrate your answers with *small* screenshots of your running code.
3. You must explain the execution and output of your code in words.

4. Do **not** write out the lab sheet text or Exercise questions (I know those already). I only want your answers.

Exercise 1

Download the `countries.pro` file which contains area, population, and `nextTo` facts, Write Prolog queries to do the following:

- 1.1. Find a country whose area is greater than 200,000 km² and less than 400,000 km².
- 1.2. Find all countries with more than 40 million people.
- 1.3. Find all the countries next to Germany. *Hint*: you should use ";" (or).

Exercise 2

Implement the following Prolog predicates using calls to the `countries` data:

- 2.1. `neighbor(C, C1)`: country C is a neighbor of C1.
Note: this is **NOT** the same as the `nextTo/2` predicate.
- 2.2. `mass(C, M)`: country C has a mass M.
Mass is country area / population.

Exercise 3

Explain in words what the following two predicates do, rename the predicates to have better names, and write two queries that use these predicates.

```
bar([], -1).
bar([X|Rest], Val) :-
    bar1(Rest, X, Val).

bar1([], Val, Val).
bar1([X|Rest], V, Val) :-
    X =< V,
    bar1(Rest, X, Val).
bar1([X|Rest], V, Val) :-
    X > V,
    bar1(Rest, V, Val).
```

Exercise 4

Write a query that finds the country with the largest population.

Hint: use `countries.pro`, `findall/3`, and the `bar` predicates from Ex. 3.