Lab: Logic

1 Description

1.1 Introduction of Prolog

Prolog is a logic programming language developed for applications in artificial intelligence, theorem proving, and computational linguistics. Based on first-order logic, Prolog uses a declarative approach, where programs are defined by facts and rules, and computations are performed by running queries. It was one of the first logic programming languages and remains widely used, with both free and commercial versions available. Prolog has applications in areas like theorem proving, expert systems, type systems, automated planning, and its original focus, natural language processing.

In this part, your mission is to learn the Prolog language and learn a Prolog programming environment. Recommended environment: SWI-Prolog (http://www.swi-prolog.org)

Write a report on the main features of the language. It is necessary to give many illustrative examples related to the knowledge of first-order logic you have learned. Write a report on how to implement Prolog language on the studied tool. Present at least 5 illustrative examples.

1.2 Solving deductive problems using Prolog

Solving deductive problems using Prolog language on SWI-Prolog tool.

Base on the family tree of the British Royal family as shown in the image below, your mission is to build a knowledge base describing the relationships in the figure with the following predicates

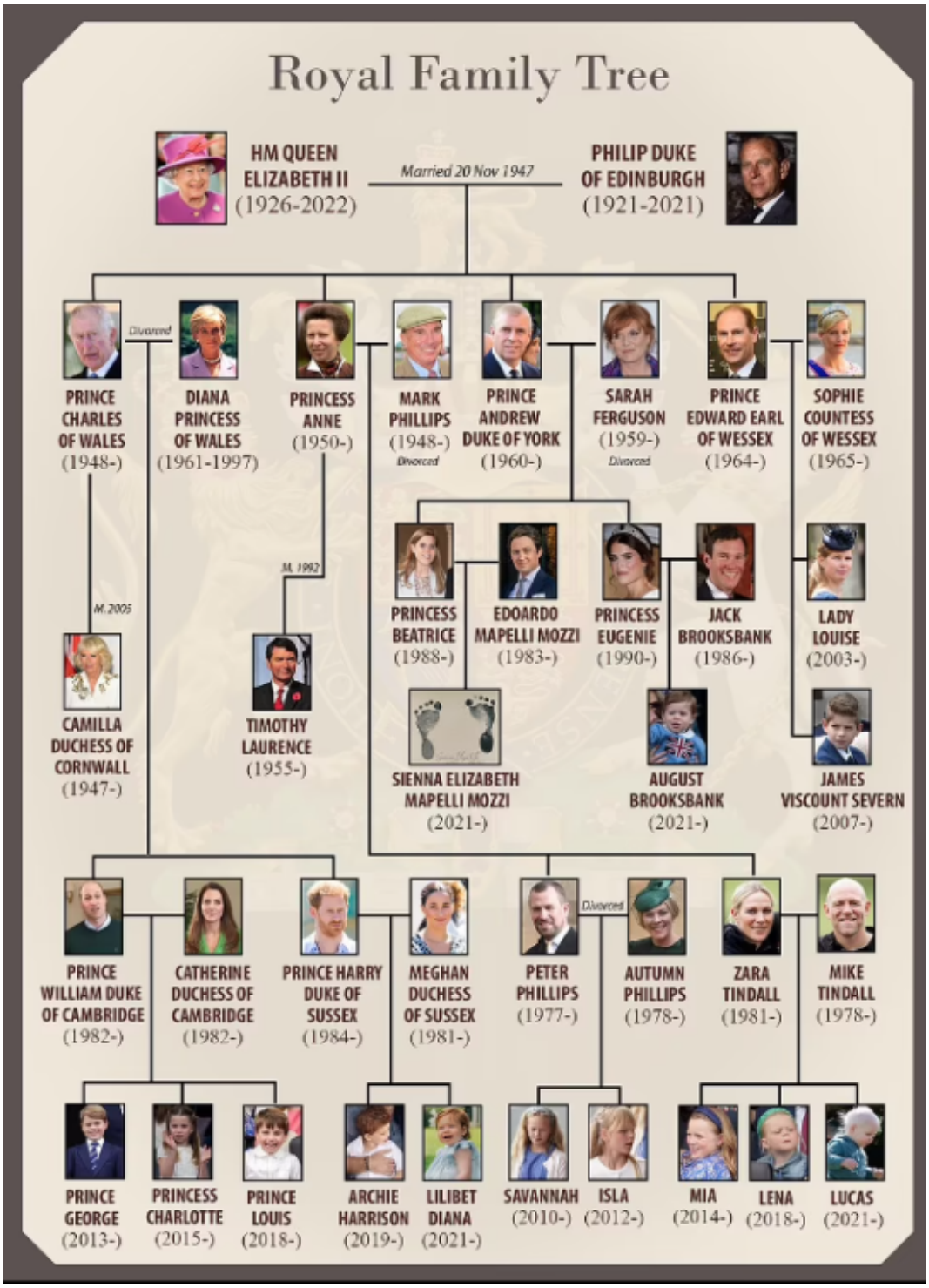
parent(Parent,Child)
deceased(Person)
male(Person)
married(Person, Person)
female(Person)
divorced(Person, Person)

Define the following predicates based on the predicate above

husband(Person,Wife)	**grandparent(GP,GC)**	**sibling(Person1,Person2)**
wife(Person,Husband)	**grandmother(GM,GC)**	**brother(Person,Sibling)**
father(Parent,Child)	**grandfather(GF,GC)**	**sister(Person,Sibling)**
mother(Parent,Child)	**grandchild(GC,GP)**	**aunt(Person,NieceNephew)**
child(Child,Parent)	**grandson(GS,GP)**	**uncle(Person,NieceNephew)**
son(Child,Parent)	**granddaughter(GD,GP)**	**niece(Person,AuntUncle)**
daughter(Child,Parent)		**nephew(Person,AuntUncle)**

Give a set of at least 3 questions for each predicate to ask the newly constructed knowledge system, for example:
- Who is Prince Andrew's mother?
- Was Queen Elizabeth the wife of Mia Grace Tindall?

Students need to submit a file containing the knowledge base building code and test dataset.



1.3 Build Your Own Knowledge Base

Students choose a topic to build a knowledge base so that there are many types of hierarchical relationships between objects (similar to the genealogical tree topic above).

Present the diagram of the relationship between the objects in the selected topic in the report.

Identify the most basic relationships in the topic and build a knowledge base with a minimum of predicates representing the underlying relations. The knowledge base must contain at least 30 predicates.

Note: Your knowledge base must not be the same as the example provided by the instructor in section 1.2.

Give a set of at least 3 questions for each predicate to ask the newly constructed knowledge system.

Students must submit a file containing the knowledge base building code and test dataset.

1.4 Submission Requirements

Your submission should include the following components:

1. SourceCode Folder: This should contain the knowledge base images describing the relationships in the figure and the Prolog code (including the code for building the knowledge base and the test dataset) for requirement 1.2.
2. SourceCode2 Folder: This should contain the knowledge base images describing the relationships in the figure and the Prolog code (including the code for building the knowledge base and the test dataset) for requirement 1.3.
3. Report Folder: This should include the report containing:
   (a) Title Page
   (b) Table of Contents
   (c) Self-assessment of the completion level for each requirement
   (d) Content, which should cover:
   - Requirement 1.1
   - Requirement 1.2: Introduction and description of the knowledge base, predicates, and the questions for each predicate, along with their answers
   - Requirement 1.3: Introduction and description of the knowledge base, predicates, and the questions for each predicate, along with their answers

   (e) References

No.	Criteria	Scores
1	Requirement 1.1	30%
2	Requirement 1.2	35%
3	Requirement 1.3	35%

2 Notice

- This is a lab for individuals
- Besides the above requirements, the report must also give the following information:
  - Estimating the degree of completion level for each requirement.
  - References (if any)
- Any plagiarism, any tricks, or any lie will have a zero score for the COURSE grade