Workshop exercises set 7.

QUESTION 1

Download the files borders.pl, cities.pl, countries.pl, and rivers.pl. These files contain facts about the world circa 1980. Create a file world.pl and insert the four lines:

```
:- ensure_loaded(borders).
:- ensure_loaded(cities).
:- ensure_loaded(countries).
:- ensure_loaded(rivers).
```

These lines will automatically load the four files when you load your world.pl file.

Start up SWI Prolog and load your world.pl file.

This will define a predicate borders/2 (that notation means a predicate named borders that takes two arguments) describing which countries and oceans border which others.

Give a query to find what borders Australia (remember: Prolog symbols are all lower case).

QUESTION 2

Give a query to find what shares a border with both France and Spain.

QUESTION 3

The files you have loaded also define a predicate country/8:

```
    country(Country,Region,Latitude,Longitude,Area,
            Population,Capital,Currency)
```

where Country is a country located in Region at the indicated Latitude and Longitude, occupying the specified Area, occupied by the specified Population, with the specified Capital city and using the specified Currency.

Give a query to find what countries share a border with both France and Spain. Remember, _ specifies a "don't care" variable.

QUESTION 4

Edit your world.pl file and define a predicate country/1 so that country(C) holds when C is any country. Reload your file and use your new country/1 predicate to find what countries share a border with both France and Spain. Note that you can type the goal "make." to Prolog to reload any changed files, much like ":reload (or ":r") in GHCi.

QUESTION 5

Edit your world.pl file again to define a predicate larger/2 so that larger(Country1, Country2) holds when the area of Country1 is larger than that of Country2. You can use the (infix) predicates < and > to compare numbers, but note that you must ensure that the arguments of a comparison are bound when the comparison is executed, so the goals that bind the values to be compared must appear before the comparison.

Which is bigger, Australia or China?

QUESTION 6

The predicate river/2 relates rivers, their countries, and the sea they drain into. river(River, Countries) holds when River is a river

The member/2 predicate is an SWI Prolog built-in that relates lists and their elements. member(Elt, Lst) holds when Elt is an element of Lst.

Write a predicate river_country(River, Country) that holds when River is a river, Country is a country, and River flows into and/or out of Country.

Also write a predicate country_region(Country, Region) that holds when Country is a country in region Region.

Give a query to find a river that flows between countries in different regions.