

## Homework #2: Chapters 7-9

The following exercises are due at the beginning of class on February 24.

You must use SWI-Prolog (version 5.0.10) to answer part of exercise 5. SWI-Prolog is free software and can be downloaded from <http://www.swi-prolog.org/>. Both Linux and Windows versions are available. You should install it in your home directory or on a personal computer. In either case, you will need approximately 4 megabytes of free disk space to install the software.

1. [10 points] Do exercise 7.2 from the book (p. 236). Hint: When constructing models, the squares that have already been visited are fixed, because their contents are definitively known to the agent. Therefore, the models should only vary in the combination of the contents of the three squares in question ([1,3], [2,2], and [3,1]). The worlds in which the KB is true is exactly those that are consistent with what the agent has perceived and the rules of the game.
2. [3 points each part, 15 points total] Do exercise 7.8 (a,b,c,d, and g) from the book (p. 237)
3. [3 points each part, 15 points total] Do exercise 8.6 (a,b,c,i, and j) from the book (p. 268). Use the following constants and predicates (and no others):
  - F: a constant representing French
  - G: a constant representing Greek
  - S: a constant representing Spring 2001
  - UK: a constant representing the U.K.
  - Takes(x,c,s): student x takes course c in semester s
  - Fails(x,c): student x fails course c
  - BornIn(x,c): person x is born in country c
  - Parent(x,y): person x has parent y
  - CitizenOf(x,c): person x is a citizen of country c
  - ResidentOf(x,c): person x is a resident of country c
  - CitizenByBirth(x,c): person x is a citizen by birth in country c
  - CitizenByDescent(x,c): person x is a citizen by descent in country c
4. [10 points] Do exercise 8.16 from the book (p. 270).
5. a) [15 points] Using first-order logic, write axioms describing the binary (i.e., having arity 2) predicates GrandChildOf, GreatGrandParentOf, BrotherOf, SisterOf, DaughterOf, SonOf, AuntOf, UncleOf, HusbandOf, WifeOf, BrotherInLawOf, SisterInLawOf and FirstCousinOf. Here, a predicate of form *PredicateOf*(x,y) should be read in English as “x is the *Predicate* of y.”
  - b) [5 points] Consider the family tree in Figure 8.5 of the book (p. 270). Write down the information from this family tree as a set of Prolog facts using only the three predicates wifeOf, sonOf and daughterOf.
  - c) [15 points] Translate the axioms from part a above into Prolog. Note you may need to change or omit some axioms to make them work in Prolog. Write a Prolog program that combines these with the facts from part b into a Prolog program. You may not use any facts other than those from part b. Be sure to attach a printout of your program to your submission.
  - d) [15 points] Test your Prolog program by asking it the following questions: Who are Elizabeth’s grandchildren? Who are Diana’s brothers-in-law? Who are Zara’s great-grandparents? Include a printout that shows your query and the program’s responses (you may simply copy this from SWI-Prolog’s main window and paste it into a file for printing). In some cases, it may be impossible to avoid getting the same answer more than once for a query.