# CSE 4/563 Knowledge Representation
# Professor Shapiro
# Homework 8
# Maximum Points: 48
# Due: 1:30 PM, Thurdsay, November 12, 2009

### November 5, 2009

For this homework set, you are to submit four files:

1. A file named `hw8a.prolog` containing your Prolog program for question (1).

2. A file named `hw8b.prolog` containing your Prolog program for question (2).

3. A file named `hw8c.prolog` containing your Prolog program for question (3).

4. A file named `hw8.ext` (for some appropriate *ext*) containing your name, your Prolog programs and copies of your Prolog runs. This file can be a text file, or produced by some word processing software, but it must be formatted so it is easy to read.

The first two files are to end with commented versions of the Prolog versions of the questions, surrounded by Prolog's comment brackets, `/*` and `*/`. (Not including the period.)

1. (15)

   (a) (13) Express the following as a Prolog program. The atomic terms that are variables are $x$, $y$, and $z$. All other atomic terms are individual constants.

   i. If someone can eat steak and they can eat seafood, then they can eat surf and turf.[1]
   $\forall x [canEat(x, steak) \land canEat(x, seafood) \Rightarrow canEat(x, surfNturf)]$

   ii. If someone dines at a restaurant that serves some dish, that person can eat that dish.
   $\forall x \forall y \forall z [dinesAt(x, z) \land serves(z, y) \Rightarrow canEat(x, y)]$

   iii. Any restaurant located at a marina serves seafood.
   $\forall x \forall y [at(x, y) \land marina(y) \Rightarrow serves(x, seafood)]$

   iv. Every steak house serves steak.
   $\forall x [steakHouse(x) \Rightarrow serves(x, steak)]$

   v. Sam's Steak House is a steak house.
   $steakHouse(SamsSteakHouse)$.

   vi. Joe's Bistro is a steak house.
   $steakHouse(JoesBistro)$.

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[1] "Surf and turf or Surf 'n' Turf is a main course particularly common in British pubs and North American steakhouses which combines seafood and meat ... The term originated along the Atlantic coast of North America. Its earliest-known published use is in a 1967 advertisement in the Buffalo, New York Yellow Pages, placed by a restaurant called Michael's House of Steaks." [`http://en.wikipedia.org/wiki/Surf_and_turf`, where the Oxford English Dictionary is cited as the soucrce of the information.]

vii. Joe's Bistro is located at the Amherst Marina
   $at(JoesBistro, AmherstMarina)$

viii. Fran's Fine Fish is located at the Amherst Marina
   $at(FransFineFish, AmherstMarina)$

ix. Sam's Steak House is located at the Walde Galleria.
   $at(SamsSteakHouse, WaldenGalleria)$

x. The Amherst Marina is a marina.
   $marina(AmherstMarina)$

xi. Betty dines at Joe's Bistro.
   $dinesAt(Betty, JoesBistro)$

xii. Tom dines at Fran's Fine Fish.
   $dinesAt(Tom, FransFineFish)$

xiii. Sally dines at Sam's Steak House.
   $dinesAt(Sally, SamsSteakHouse)$

(b) (2) Use your Prolog program to find a person who can eat *surfNturf*.

2. (19)

(a) (9) Express as a Prolog program the information that Chrysler cars, Ford cars, and GM cars partition the category of American cars.

(b) (2) Include in your Prolog program the information that `item1` is a chryslerCar.

(c) (2) Include in your Prolog program the information that `item2` is an American car, but neither a Chrysler car, nor a GM car.

(d) (2) Use your Prolog program to find out if `item1` is an American car. The answer should be `yes`.

(e) (2) Use your Prolog program to find out if `item2` is a Ford car. The answer should be `yes`.

(f) (2) Use your Prolog program to find out if `item1` is a GM car. The answer should be `no`.

3. (14)

(a) (6) Express as a Prolog program the information that the area of a triangle is one-half its base times its height, and that the area of a circle is pi times the square of its radius. (Use 3.14159 for pi.) Use the Prolog translations of the following predicates:

- $circle(x)$: Figure $x$ is a circle.
- $triangle(x)$: Figure $x$ is a triangle.
- $area(x, y)$: The area of figure $x$ is $y$.
- $base(x, y)$: The base of figure $x$ is $y$.
- $height(x, y)$: The height of figure $x$ is $y$.
- $radius(x, y)$: The radius of figure $x$ is $y$.

(b) (2) Include in your Prolog program the information that figure `f1` is a triangle, with a base of 5 and a height of 6.

(c) (2) Include in your Prolog program the information that figure `f2` is a circle, with a radius of 8.

(d) (2) Use your Prolog program to calculate the area of `f1`.

(e) (2) Use your Prolog program to calculate the area of `f2`.