

# CS 396: Assignment 1

Prolog

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## Part I: Basic Prolog

### Problem 1

Source Code:

```
% menu(type,meat,meal,cost)
```

```
menu(appetizer,veg,'Garden salad with olive oil,lemon and chives',$ 8.50).
menu(appetizer,fish,'Carpaccio of smoked salmon,rocket salad seed oil',$ 9.50).
menu(appetizer,meat,'Caesar salad topped with crisp pancetta and romano cheese
chips',$ 9.50).
menu(appetizer,veg,'Salad of tomatoes and mozzarella',$ 9.50).
menu(appetizer,veg,'Mediterranean salad topped with feta cheese',$ 9.50).
menu(appetizer,meat,'Warm duck confit on mesclun',$ 11.95).
menu(appetizer,fish,'Tataki salmon with spicy mango and coriander vinaigrette',$ 12.95).
menu(appetizer,meat,'Antipasto (prosciutto,salami,provolone cheese and artichoke
salad),$ 13.95).
menu(appetizer,fish,'Scallop ceviche marinated in lime and ginger',$ 13.95).
menu(appetizer,meat,'San Daniele prosciutto rosettes with mascarpone quenelle',$
13.95).
menu(appetizer,veg,'Agnolotti with mushrooms and ricotta',$ 11.95).
menu(appetizer,meat,'Cannelloni Braised veal topped with tomato sauce and pancetta',$
11.95).
menu(appetizer,fish,'Shrimp sauteed with garlic and sweet spicy mango chutney',$ 13.95).
menu(appetizer,fish,'Pistachio Crusted Salmon caramelized apple cider',$ 13.95).
menu(appetizer,meat,'Strudel of Brome Lake duck,shiitake mushrooms',$ 13.95).
menu(meal,fish,'Duo of scallops and salmon with shellfish jus',28.95).
menu(meal,fish,'Walleye fillet and fried mushroom risotto',28.95).
menu(meal,fish,'Roasted fillet of trout with lemon butter',28.95).
menu(meal,fish,'Salmon stuffed with crab risotto and multigrain with Eggplant',28.95).
menu(meal,fish,'Tilapia fillet with fennel and marinated red onions',29.95).
menu(meal,meat,'Chicken breast boneless,skinless',29.95).
menu(meal,meat,'Chicken breast and potato gratin',29.95).
menu(meal,meat,'Cons-grilled fillet 240 g (8 oz),cut Manhattan',37.75 ).
menu(meal,meat,'Veal medallions sautéed mushrooms and season',42.95 ).
menu(meal,meat,'Pork tenderloin stuffed with chorizo sausage and sautéed
mushrooms',30.95).
menu(meal,veg,'Portobello stuffed with spinach and tofu,dried tomato risotto',29.95).
menu(meal,veg,'Quinoa risotto with grilled tofu,crushed tomatoes',29.00).
menu(meal,veg,'Grilled Eggplant Roulade stuffed spelled',29.00).
```

menu(meal,veg,'Tian risotto three onions,fried julienne vegetables',29.00).  
menu(dessert,veg,'Cream cake cappuccino',\$ 9.25).  
menu(dessert,veg,'Cheesecake and seasonal fruit',\$ 9.25).  
menu(dessert,veg,'Exotic frozen coconut milk with berries',\$ 9.25).  
menu(dessert,veg,'Millefeuille Praline',\$ 9.25).  
menu(dessert,veg,'Cheese mousse and cherries',\$ 9.25).  
menu(dessert,veg,'Fresh fruit salad',\$ 9.25).  
menu(dessert,veg,'Sugar pie to Hilton',\$ 9.25).  
menu(dessert,veg,'Maple syrup tart with pear jelly and whipped Baileys',\$ 9.25).  
menu(dessert,veg,'Streusel pie with rhubarb and strawberry',\$ 9.25).  
menu(dessert,veg,'Tarte tatin',\$ 9.25).

- a) All meals suitable for a vegetarian
- b) All meals with fish

```
SWI-Prolog (AM
File Edit Settings Run Debug Help
1 ?-
% d:/Downloads/menu.pl compiled 0.00 sec, 40 clauses
1 ?- menu(X,veg,V,_).
X = appetizer,
Y = 'Garden salad with olive oil,lemon and chives' ;
X = appetizer,
Y = 'Salad of tomatoes and mozzarella' ;
X = appetizer,
Y = 'Mediterranean salad topped with feta cheese' ;
X = appetizer,
Y = 'Agnolotti with mushrooms and ricotta' ;
X = meal,
Y = 'Portobello stuffed with spinach and tofu,dried tomato risotto' ;
X = meal,
Y = 'Quinoa risotto with grilled tofu,crushed tomatoes' ;
X = meal,
Y = 'Grilled Eggplant Roulade stuffed spelled' ;
X = meal,
Y = 'Tian risotto three onions,fried julienne vegetables' ;
X = dessert,
Y = 'Cream cake cappuccino' ;
X = dessert,
Y = 'Cheesecake and seasonal fruit' ;
X = dessert,
Y = 'Exotic frozen coconut milk with berries' ;
X = dessert,
Y = 'Millefeuille Praline' ;
X = dessert,
Y = 'Cheese mousse and cherries' ;
X = dessert,
Y = 'Fresh fruit salad' ;
X = dessert,
Y = 'Sugar pie to Hilton' ;
X = dessert,
Y = 'Maple syrup tart with pear jelly and whipped Baileys' ;
X = dessert,
Y = 'Streusel pie with rhubarb and strawberry' ;
X = dessert,
Y = 'Tarte tatin'.

2 ?- menu(X,fish,V,_).
X = appetizer,
Y = 'Carpaccio of smoked salmon,rocket salad seed oil' ;
X = appetizer,
Y = 'Tataki salmon with spicy mango and coriander vinaigrette' ;
X = appetizer,
Y = 'Scallop ceviche marinated in lime and ginger' ;
X = appetizer,
Y = 'Shrimp sauteed with garlic and sweet spicy mango chutney' ;
X = appetizer,
Y = 'Pistachio Crusted Salmon caramelized apple cider' ;
X = meal,
Y = 'Duo of scallops and salmon with shellfish jus' ;
X = meal,
Y = 'Walleye fillet and fried mushroom risotto' ;
X = meal,
Y = 'Roasted fillet of trout with lemon butter' ;
X = meal,
Y = 'Salmon stuffed with crab risotto and multigrain with Eggplant' ;
X = meal,
Y = 'Tilapia fillet with fennel and marinated red onions'.

3 ?- ■
```

c) All meals with fish or meat in the main dish.



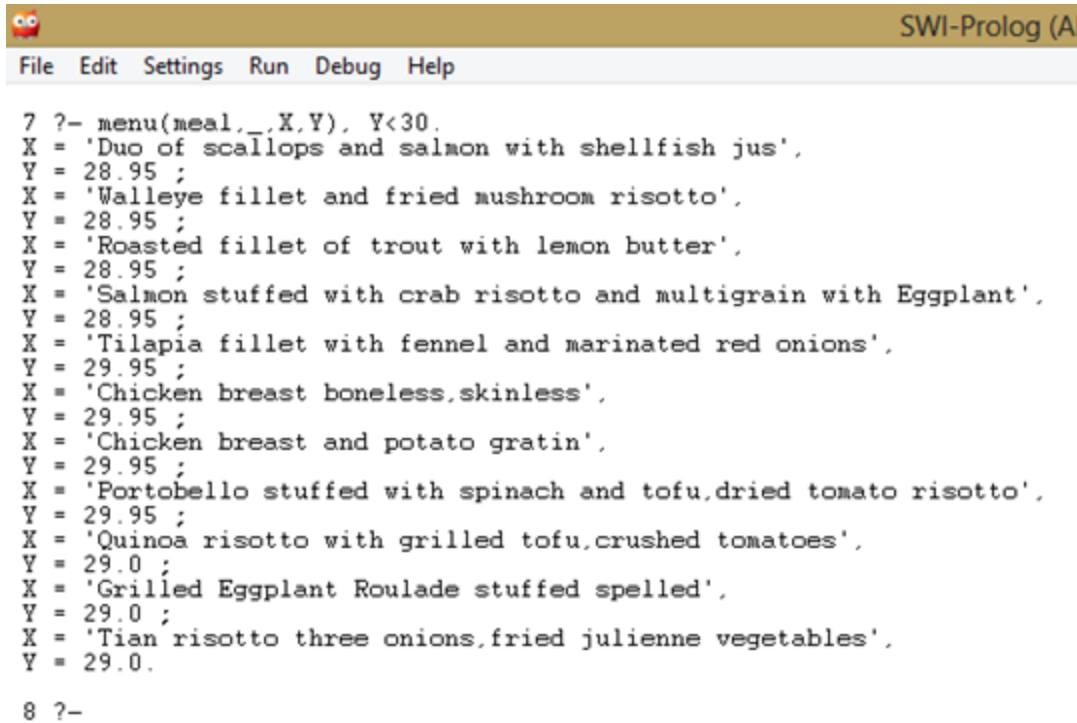
SWI-Prolog (AMD64)

File Edit Settings Run Debug Help

```
3 ?- menu(X,fish,Y,_); menu(X,meat,Y,_).
X = appetizer,
Y = 'Carpaccio of smoked salmon,rocket salad seed oil' ;
X = appetizer,
Y = 'Tataki salmon with spicy mango and coriander vinaigrette' ;
X = appetizer,
Y = 'Scallop ceviche marinated in lime and ginger' ;
X = appetizer,
Y = 'Shrimp sauteed with garlic and sweet spicy mango chutney' ;
X = appetizer,
Y = 'Pistachio Crusted Salmon caramelized apple cider' ;
X = meal,
Y = 'Duo of scallops and salmon with shellfish jus' ;
X = meal,
Y = 'Walleye fillet and fried mushroom risotto' ;
X = meal,
Y = 'Roasted fillet of trout with lemon butter' ;
X = meal,
Y = 'Salmon stuffed with crab risotto and multigrain with Eggplant' ;
X = meal,
Y = 'Tilapia fillet with fennel and marinated red onions' ;
X = appetizer,
Y = 'Caesar salad topped with crisp pancetta and romano cheese chips' ;
X = appetizer,
Y = 'Warm duck confit on mesclun' ;
X = appetizer,
Y = 'Antipasto (prosciutto,salami,provolone cheese and artichoke salad)' ;
X = appetizer,
Y = 'San Daniele prosciutto rosettes with mascarpone quenelle' ;
X = appetizer,
Y = 'Cannelloni Braised veal topped with tomato sauce and pancetta' ;
X = appetizer,
Y = 'Strudel of Brome Lake duck,shiitake mushrooms' ;
X = meal,
Y = 'Chicken breast boneless,skinless' ;
X = meal,
Y = 'Chicken breast and potato gratin' ;
X = meal,
Y = 'Cons-grilled fillet 240 g (8 oz),cut Manhattan' ;
X = meal,
Y = 'Veal medallions sautéed mushrooms and season' ;
X = meal,
Y = 'Pork tenderloin stuffed with chorizo sausage and sautéed mushrooms'.

4 ?- ■
```

d) All meals with main dish cheaper than \$30.



```
7 ?- menu(meal,_,X,Y), Y<30.
X = 'Duo of scallops and salmon with shellfish jus',
Y = 28.95 ;
X = 'Walleye fillet and fried mushroom risotto',
Y = 28.95 ;
X = 'Roasted fillet of trout with lemon butter',
Y = 28.95 ;
X = 'Salmon stuffed with crab risotto and multigrain with Eggplant',
Y = 28.95 ;
X = 'Tilapia fillet with fennel and marinated red onions',
Y = 29.95 ;
X = 'Chicken breast boneless,skinless',
Y = 29.95 ;
X = 'Chicken breast and potato gratin',
Y = 29.95 ;
X = 'Portobello stuffed with spinach and tofu,dried tomato risotto',
Y = 29.95 ;
X = 'Quinoa risotto with grilled tofu,crushed tomatoes',
Y = 29.0 ;
X = 'Grilled Eggplant Roulade stuffed spelled',
Y = 29.0 ;
X = 'Tian risotto three onions,fried julienne vegetables',
Y = 29.0.

8 ?-
```

## Problem 2 [2 points]

Answers to questions:

known(X) : to mean that anyone knows X. known(X) :- know(X,A).

recognize(X,Y) : that is if X and Y know each other. recognize(X,Y) :- friend(X,Y).

presenter(X,Y,Z) : X can present Y to Z if X and Z are friend and if X knows Y.

presenter(X,Y,Z) :- friend(X,Z),know(X,Y).

triangle(X,Y,Z) : this is if X knows Y and Z and if Y and Z are friends. triangle(X,Y,Z) :- know(X,Y),friend(Y,Z).

Source Code:

```
know('Alex','James').
```

```
know('James','Alex').
```

```
know('Alex','Susan').
```

```
know('Susan','Alex').
```

```
know('James','Susan').
```

```
know('Susan','James').
```

```
friend(X,Y) :- know(X,Y),know(Y,X).
```

```
known(X) :- know(X,Y).
```

```
recognize(X,Y) :- friend(X,Y).
```

```
presenter(X,Y,Z) :- friend(X,Z),know(X,Y).
triangle(X,Y,Z) :- know(X,Y),friend(Y,Z).
```

Sample Run:

```
1 ?- friend(X,Y).
X = 'Alex';
Y = 'James';
Unknown action: + (h for help)
Action? ,

2 ?- recognize(X,Y).
X = 'Alex';
Y = 'James' .

3 ?- presenter(X,Y,Z).
X = 'Alex';
Y = Z, Z = 'James' .

4 ?- triangle(X,Y,Z).
X = Z, Z = 'Alex';
Y = 'James' .
```

Issues:

In theory this looks like it should work fine but it does not show results for 'Susan'.

### Problem 3 [2 points]

#### Part II: Calculations in Prolog

##### Problem 4. Calculate the duration of a flight.

Source Code:

```
% flight(ID, FROM, TO, DEPARTURE_TIME, ARRIVAL_TIME).
flight(CA101, flag, tus, 15:30, 16:15).
flight(CA102, chicoutimi, sherbrooke, 17:10, 17:50).
```

```
duration(X,Y,T) :-
    flight(_,X,Y,A:B,C:D),
    T is ((C-A)*60+(D-B)).
```

Sample Run:

```
% d:\Downloads\flights.pl compiled 0.02 sec, 61 clauses
1 ?- duration(flag,tus,T).
T = 45.

2 ?-
```

### Problem 5.

Source Code:

```
flight(CA101, flag, tus, 15:30, 16:15).  
flight(CA102, chicoutimi, sherbrooke, 17:10, 17:50).  
flight(CA103, chi, san, 13:30, 16:15).
```

flightServesMeal(FROM,TO) :-

```
    flight(_,X,Y,A:B,C:D),  
    T is ((C-A)*60+(D-B)),  
    A < 10, T > 60.
```

```
% d:\Downloads\problem5.pl compiled 0.00 sec, 5 clauses  
3 ?- flightServesMeal(chi,san).  
true.  
4 ?- ■
```

Issues:

The code works when I use it for breakfast, lunch and dinner separately (with minor changes to the last line). When I try to use OR (;) to join even simple statements like the ones for breakfast and dinner, as shown below, I get an error saying “Singleton variable in branch” and “argument not sufficiently initialized. I was not able to solve this error.

(A < 10, T > 60);

(A > 18, T > 180).

### Problem 6.

Source Code:

```
Imv([A,B,C|As], [B|Xs]) :-  
    B > A, B > C,  
    Imv([C|As], Xs).
```

Issues: I ran out of time because I have been busy, but this was the code I was working on before I ended up having to turn the project in.