Prolog and SAS Evaluation

You have been emailed a Word document to use for this assignment. Please follow the directions carefully and answer all the questions in the indicated places.

- This assignment is **due by 4:45 p.m. on Tuesday, April 28**.
- In order to do the SAS programming, you will probably need to be on a Marshall University student computer.
- This assignment will serve as the second (and last) examination in the syllabus.
- This is **NOT a group assignment**. Each student should do his/her own work.
- Please sign or type your name below indicating that the work you are submitting is your own. You may consult the instructor but no other person.

Name_____Nicholas Alexander_____

Upcoming Events

- Class will not meet Thursday, April 30th.
- High Stakes Writing Assignment II is due Tuesday, May 5, 2015 by 11:59:59 pm.
- We will not meet during the final exam period. Submission of this exam and the last writing assignment completes all of the grading components of the class.

Feel free to contact me by email – fuller@marshall.edu - at any time if you have questions about the writing or this exam.

Name ___Nicholas Alexander___

Prolog

A long, long, long time ago, *James married Thelma*.
James and Thelma had the following children: Margaret, Harold, Clayburn, Phyllis, Hilda, and Samuel.

James had a child name Bill from a previous marriage.

In the same area, Joseph married Blanche.
Blanche and Joseph had the following children: Ira, Narsie, and Herschel.

Margaret later married Grant, Phyllis married Jim, Elsie married Harold, Hilda married Ira, Loraine married Clayburn, Charlotte married Samuel, Narsie married Arthur, and Yvonne married Herschel.

Margaret and Grant had the following children: Jay, Millicent, Betty, and Paul.
Elsie and Harold had the following children: Shirley, Booker, Brenda, and Kay
Hilda and Ira had the following children: Donna, Joe, Ben, Larry, Grant and Deanna
Phyllis and Jim had one child named Bonnie
Loraine and Clayburn has the following children: Jim, Doug, and David
Charlotte and Samuel had the following children: Ronnie and Mike
Narsie and Arthur had the following children: Woodrow and Clara
Yvonne and Herschel had the following children: Steven and Jane.

Write rules that do the following

1. Identify each of the individuals above as male or female (Narsie is a female and Booker is a male)
2. Identify all the married pairs using only `thehusbandof`, for example thehusbandof(elsie, harold).
3. Identify each person's male parent e.g. father(margaret,james). father(donna, ira). etc.

```
% male(male) %
male(james). male(harold). male(clayburn). male(samuel). male(bill).
male(herschel). male(joseph). male(grant). male(jim). male(ira).
male(arthur). male(jay). male(paul). male(booker). male(joe).
male(ben). male(larry). male(doug). male(david). male(mike).
male(woodrow). male(steven).

% female(female) %
female(thelma). female(margaret). female(phyllis). female(hilda).
female(blanche). female(narsie).  female(elsie). female(loraine).
female(charlotte). female(yvonne). female(millicent). female(betty).
female(shirley). female(brenda). female(kay). female(donna).
female(deanna). female(bonnie). female(ronnie). female(clara).

% husbandof(husband, wife) %
husbandof(james, thelma). husbandof(joseph, blanche).
husbandof(grant, margaret). husbandof(jim, phyllis).
husbandof(harold, elsie). husbandof(ira, hilda).
husbandof(clayburn, loraine). husbandof(samuel, charlotte).
husbandof(arthur, narsie). husbandof(herschel, yvonne).

% fatherof(father, child) %
fatherof(james, margaret). fatherof(james, harold).
fatherof(james, clayburn). fatherof(james, phyllis).
fatherof(james, hilda). fatherof(james, samuel).
fatherof(james, bill). fatherof(joseph, ira).
fatherof(joseph, narsie). fatherof(joseph, herschel).
fatherof(grant, jay). fatherof(grant, millicent).
fatherof(grant, betty). fatherof(grant, paul).
fatherof(harold, shirley). fatherof(harold, booker).
fatherof(harold, brenda). fatherof(harold, kay). fatherof(ira, donna).
fatherof(ira, joe). fatherof(ira, ben). fatherof(ira, larry).
fatherof(ira, grant). fatherof(ira, deanna). fatherof(jim, bonnie).
fatherof(clayburn, jim). fatherof(clayburn, doug).
fatherof(clayburn, david). fatherof(samuel, ronnie).
fatherof(samuel, mike). fatherof(arthur, woodrow).
fatherof(arthur, clara). fatherof(herschel, steven).
fatherof(herschel, jane).
```

Write a rule that will identify the mother of the people in the list. In English, X is the mother of Y if Z is the father of Y and Z is the husband of X.

```
% motherof(mother, child) %
motherof(Mother, Child) :-
    fatherof(Father, Child), husbandof(Father, Mother).
```

Write a second rule that identifies `thewifeof`. In English, X is the wife of Y provided Y is the husband of X.

```
% wifeof(wife, husband) %
wifeof(Wife, Husband) :-
    husbandof(Husband, Wife).
```

Write a rule that determines if X and Y are siblings. In English, X and Y are siblings if they have the same father, same mother, or both.

```
% sibling(child, child) %
siblingof(Child1, Child2) :-
    Child1 \= Child2,
    fatherof(Father, Child1),
    fatherof(Father, Child2);
    motherof(Mother, Child1),
    motherof(Mother, Child2).
```

Write code that determines if X is the grandparent of Y

```
parentof(Parent, Child) :-
    fatherof(Parent, Child) ;
    motherof(Parent, Child) .

% grandparentof(grandparent, child) %
grandparentof(Grandparent, Child) :-
     parentof(Parent, Child) ,
     parent(Grandparent, Parent) .
```

Write prolog rules that determine if X is the uncle of Y, X is the aunt of Y, X is the niece of Y, and X is the nephew of Y.

```
% uncleof(uncle, child) %
uncleof(Uncle, Child) :-
    fatherof(Father, Child), siblingof(Father, Uncle), male(Uncle) ,
    Father \= Uncle ;
    motherof(Mother, Child), siblingof(Mother, Uncle), male(Uncle) .

% auntof(aunt, child) %
auntof(Aunt, Child) :-
    motherof(Mother, Child), siblingof(Mother, Aunt), female(Aunt) ,
    Mother \= Aunt ;
    fatherof(Father, Child), siblingof(Father, Aunt), female(Aunt) .

% nephewof(nephew, person) %
nephewof(Nephew, Person) :-
    uncleof(Person, Nephew), male(Nephew) ;
    auntof(Person, Nephew), male(Nephew) .

% nieceof(niece, person) %
nieceof(Niece, Person) :-
    uncleof(Person, Niece), female(Niece) ;
    auntof(Person, Niece), female(Niece) .
```

Write a rule that determines if X is the cousin of Y. In English, X is the cousin of Y if either of the parents of X are siblings with either of the parents of Y.

```
% cousinon(person, person) %
cousinof(PersonA, PersonB) :-
    parentof(ParentA, PersonA) ,
    parentof(ParentB, PersonB) ,
    ParentA \= ParentB ,
    siblingof(ParentA, ParentB) .
```

Write code that determines if X is the son-in-law of Y. In English, X must be male and Y must be either the mother or father of the wife of X. Write code for daughter-in-law as well.

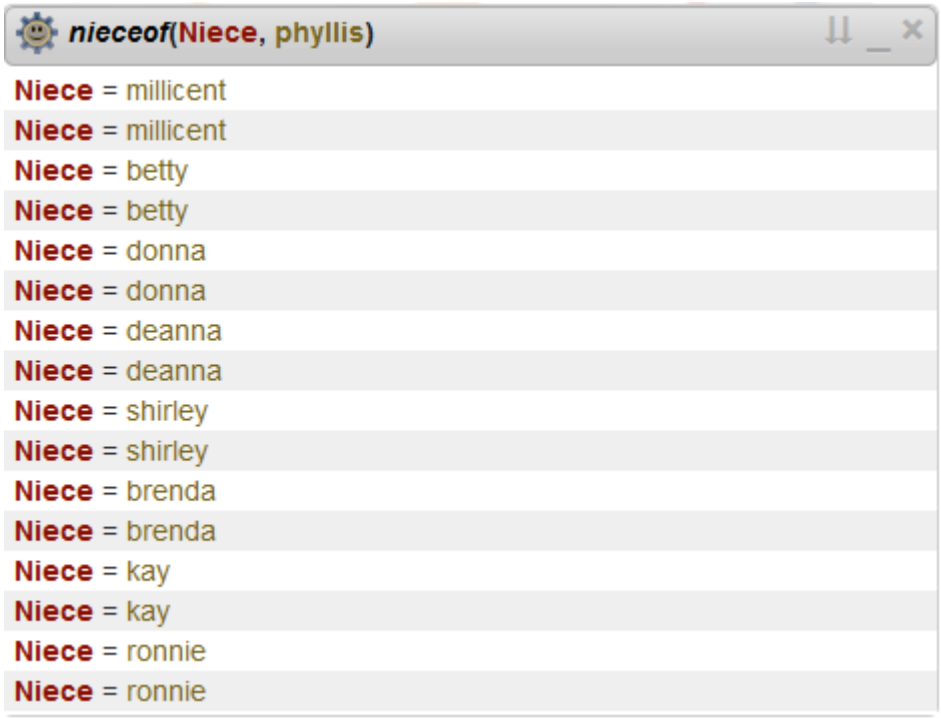
```
% soninlawof(son, parent) %
soninlawof(Son, Parent) :-
    male(Son) ,
    wifeof(Wife, Son),
    parentof(Parent, Wife) .

% daughterinlawof(daughter, parent) %
daughterinlawof(Daughter, Parent) :-
    female(Daughter) ,
    husbandof(Husband, Daughter) ,
    parentof(Parent, Husband) .
```

Write code that determines if X is the brother-in-law of Y. In English, X is the brother-in-law of Y if the wife of X is a sibling of Y. Write code for sister-in-law as well.

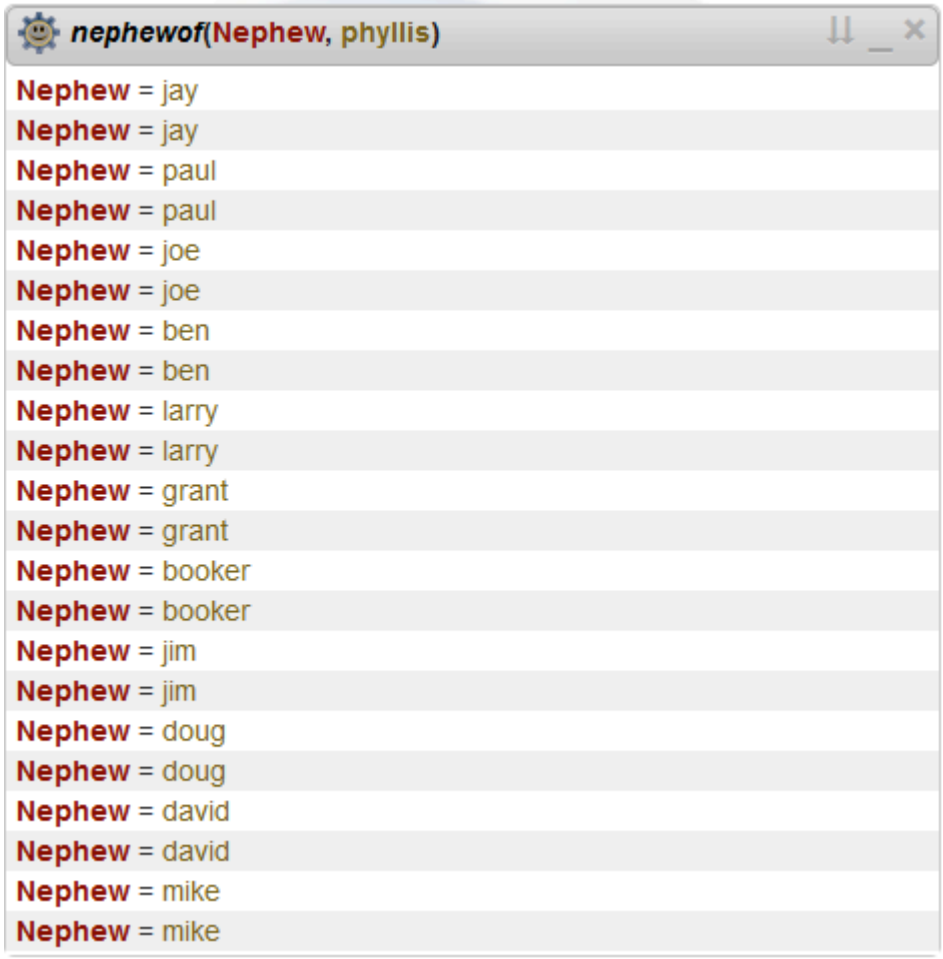
```
% brotherinlawof(brother, sibling) %
brotherinlawof(Brother, Sibling) :-
    male(Brother) ,
    wifeof(Wife, Brother) ,
    siblingof(Wife, Sibling) ,
    Sibling \= Wife .

% sisterinlawof(sister, sibling) %
sisterinlawof(Sister, Sibling) :-
    female(Sister) ,
    husbandof(Husband, Sister) ,
    siblingof(Husband, Sibling) ,
    Sibling \= Husband .
```

For the following problems, paste screen dumps from Prolog that show the answers. You can use a program such as Snag It or you can do a screen dump and cut the desired output in a program such as Paint.

1. **List all of Phyllis' nieces**



2. **List all of Phyllis' nephews**

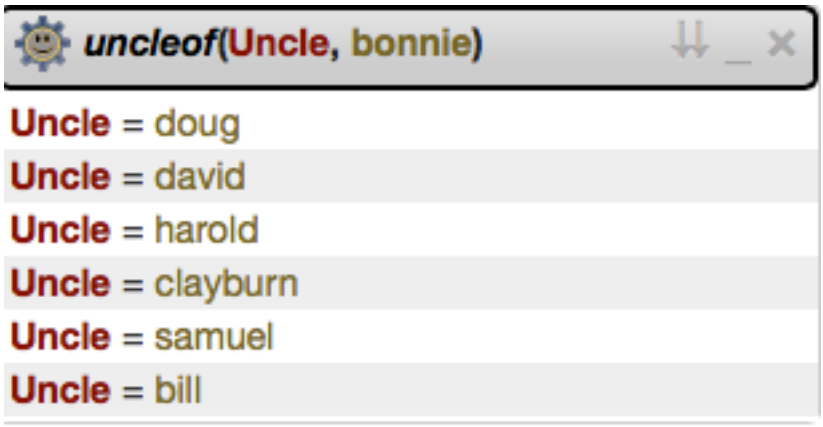


3. **List all of Ira's brother-in-laws**

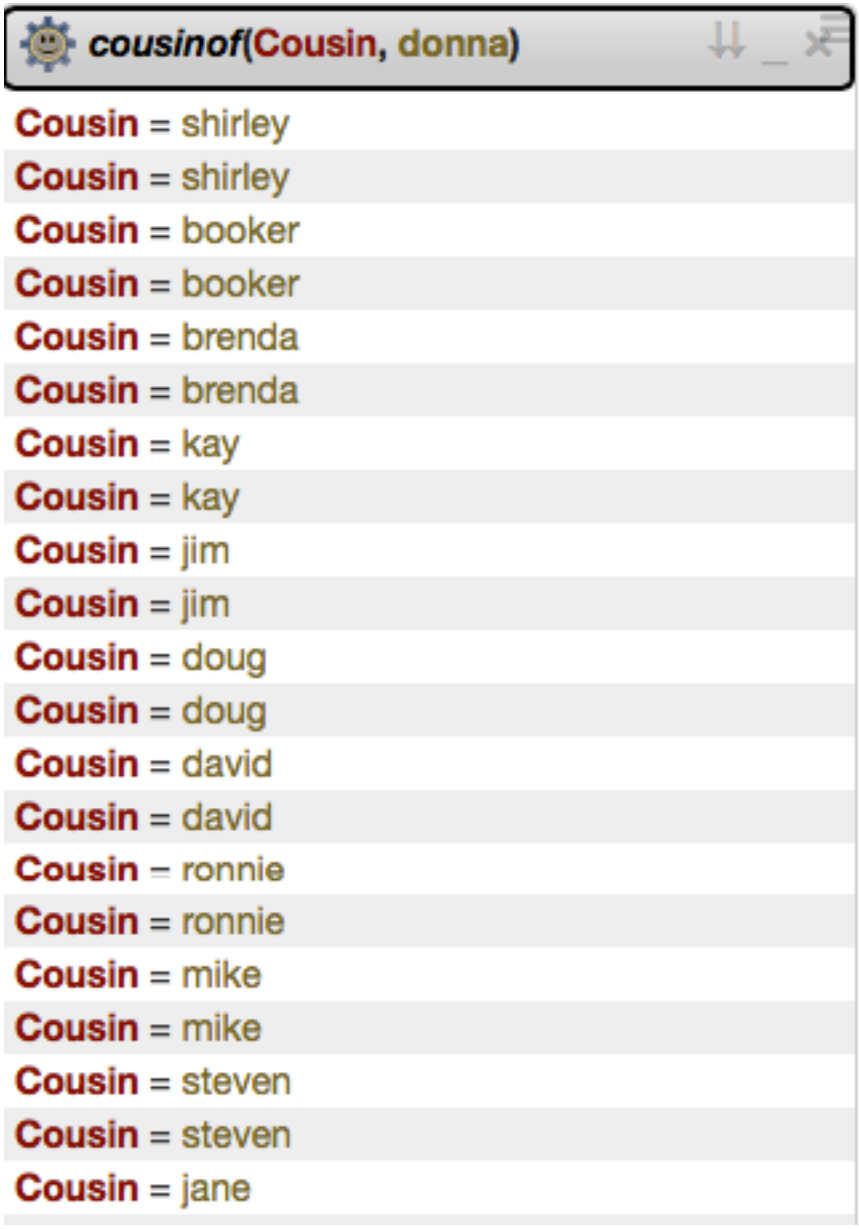
4. **List all of Ira's sister-in-laws**

5. **List all of Bonnie's aunts**

6. **List all of Bonnie's uncles**



7. **List all of Donna's cousins**



Cousin = jane
Cousin = jay
Cousin = jay
Cousin = millicent
Cousin = millicent
Cousin = betty
Cousin = betty
Cousin = paul
Cousin = paul
Cousin = bonnie
Cousin = bonnie
Cousin = woodrow
Cousin = woodrow
Cousin = clara
Cousin = clara

8. **List all of Ben's grandparents.**

Grandparent = joseph
Grandparent = blanche
Grandparent = thelma
Grandparent = james

SAS

You have been emailed (MU Online) two Excel spreadsheets. The first is called `SAS_DATA_1.xls` and contains the following information: ID, age, IQ, high school GPA, composite ACT score, gender, and state of residence. The second is called `SAS_DATA_2.xls` and contains ID, political party, and major.

- Use the import wizard to create SAS data sets from each of these spreadsheets. **Recall that you may have to save these file as CSV files with an all lower case file name.** Create the following new variables:
  - Genius: Genius = 1 if IQ >= 120 and 0 otherwise
  - Honor Student = 1 if GPA >=3.25 and ACT >= 22

- The data sets have a common field called ID. Sort the data sets by ID and merge them into one SAS data set. Paste your code for this step below.

```
proc sort data=DATA1;
by id;
proc sort data=DATA2;
by id;
data MERGED;
merge DATA1 DATA2;
by id;
```

- Use SAS to find the average IQ, GPA, Age, and ACT score.

```
proc means data=DATA1;
var iq gpa age act;
```

- Fill in the following table

	Average	Max	Min
IQ	110	130	95
GPA	2.88	3.99	2.03
Age	22	24	19
ACT	24	31	18

- Repeat the analysis from above but separate the results by state. In the space below, fill in the results for KY. (You will probably get all states but only list the results for KY).

```
proc sort data=DATA1;
by state;
proc means data=DATA1;
var iq gpa age act;
by state;
```

State = KY	Average	Max	Min
IQ	107	117	95
GPA	2.63	3.53	2.14
Age	21	23	19
ACT	22	27	18

- Give the SAS code that will determine the frequency for each value of gender, state, party, and major

```
proc freq data=MERGED;
tables gender state party major;
```

- Give the frequencies (actual numbers)of
  - Dem, Rep, and Ind

```
Dem = 9
Rep = 13
Ind = 3
```

  - WV, OH, and KY residents

```
WV = 14
KY = 6
OH = 5
```

- Give the SAS code that will determine
  - Number of geniuses that are male and the number that are female

```
proc freq data=MERGED;
tables gender*genius;
```

  - Number of honor students from OH, WV, and KY

```
proc freq data=DATA3;
tables honors*state;
```

  - Number of independents, democrats, and republicans from KY, WV, and OH

```
proc freq data=DATA3;
tables party*state;
```

  - How many of the students are male geniuses?

```
There are 3 male geniuses.
```

  - How many democrats are from WV (give an actual number)?

```
There are 5 democrats from WV.
```

- Use SAS to find: (Just **provide numerical answers**. You do not have to provide code)
  - Average IQ of WV students

```
110
```

  - Average age of OH students

```
22
```

  - Average GPA of Ohio students

```
3.02
```

  - Number of Protestants, Catholics, Jewish, and other religions

```
Protestant = 11
Catholic = 7
Jewish = 3
Other = 1
```

  - Number of Catholics that live in WV

```
4
```

  - Number of CS majors that are male

```
6
```

  - How many non-honors students had an ACT score >=22?

```
9
```

  - Which state has the most honors students? How many?

```
WV with 3
```

- Which religion had the most geniuses?

  Catholic with 4

C Programming

In the space below, paste the code from a C program that

1. Contains a `void` function called `swap`.
    - The input to `swap` should be the addresses of two integers. Recall this means that the two integers are passed by reference.
    - The function should *swap or exchange* the values of the two integers

2. Contains a main program that
    - Prompts the user to enter two integer values – say x and y
    - Reads the two integer values for x and y
    - Prints the integers in the order they were read in
    - Calls `swap` with the x and y as parameters
    - Prints the values of x and y again to verify that they have been swapped
    - Use a loop so the user can enter as many pairs of integers as he/she desires

```
#include <stdio.h>

void swap(int *x, int *y)
{
      int tmp = *y; // Set the value of tmp to the value at y
      *y = *x; // Set the value at y to the value at x
      *x = tmp; // Set the value at x to the value of tmp
}

int main()
{
      int done = 0;
      while (!done) {
            int first, second;
            printf("Enter an integer or -1 to Quit: ");
            scanf("%i", &first);
            printf("Enter an integer or -1 to Quit: ");
            scanf("%i", &second);
            if (first == -1 || second == -1) {
                  printf("Goodbye!\n");
                  return 0;
            }
            printf("First: %i\n", first);
            printf("Second: %i\n", second);
            printf("Swapping!\n");
            swap(&first, &second);
            printf("First Swapped: %i\n", first);
            printf("Second Swapped: %i\n", second);
      }
      return 0;
}
```